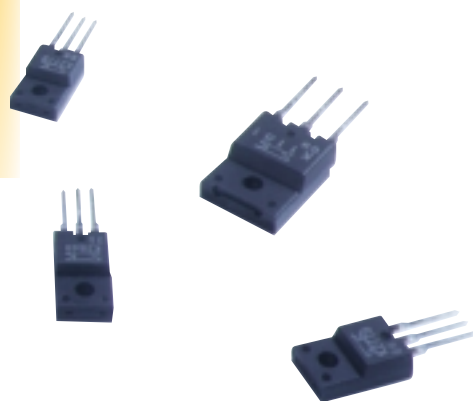
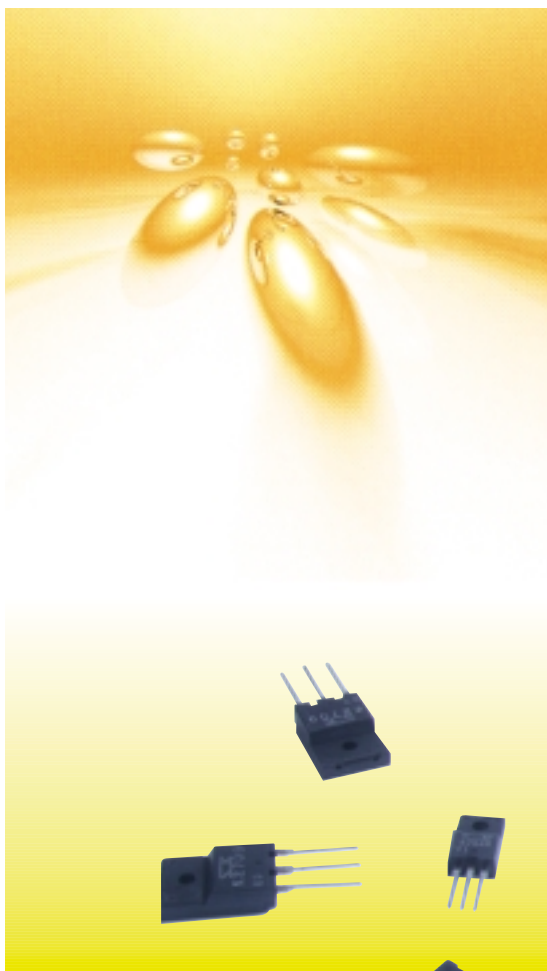


# SANKEN MOSFET

- Nch MOSFET
- Pch MOSFET





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### Standard Minimum Packaged Quantity

Specify the number of standard minimum packaged units when placing order.

| Series | Standard Minimum package Unit |
|--------|-------------------------------|
| FM20   | 100                           |
| FM100  | 105                           |

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# Storage, characteristic inspection, and handling precautions

Inappropriate storage, characteristic inspection, or handling may impair the reliability of the device. To ensure high reliability, observe the following precautions:

## 1. Storage precautions

- It is recommended to store the device at room temperature (between 5 and 35°C) and relative humidity at 40 to 75%. Avoid storing the device in a place where the temperature or humidity is high or changes greatly.
- Store the device in a clean place that is not exposed to direct sunlight, and is free from corrosive or harmful gases.
- If the device is stored for a long time, check the solderability and lead condition before using the device.

## 2. Precautions on characteristic inspections

When carrying out characteristic inspections on receiving products or other occasions, take care to avoid applying a surge voltage from the measuring equipment and check the terminals of the measuring equipment for a short circuit or wiring errors. Measure the device within the range of its rated values.

## 3. Silicone Grease

When attaching heatsink, apply a small amount of silicone evenly to the back of the device and both sides of the insulator to reduce the thermal resistance between the device and heatsink.

### Recommended silicone grease

- G746 SHINETSU SILICONE CO., LTD.
- YG6260 TOSHIBA SILICONE CO., LTD.
- SC102 DOW CORNING TORAY SILICONE CO., LTD.

Please select a silicone grease carefully since the oil in some grease can penetrate the product, which will result in an extremely short product life.

## 4. Screw tightening torque

If screws are not tightened with sufficient torque, this can increase the thermal resistance and reduce the radiation effect. Tightening screws with too great a torque damage the screw thread, deform the heatsink, or twist the device frame until it is damaged. There, tighten screws with a torque as shown below (Table 1).

Table 1: Screw Tightening Torque

| Package | Tightening Torque                  |
|---------|------------------------------------|
| TO-220F | 0.490 to 0.686 N•m (5 to 7 kgf•cm) |
| TO-3PF  | 0.686 to 0.822 N•m (7 to 9 kgf•cm) |

## 5. Soldering temperature

If soldering is necessary, take care to keep the application of heat as brief as possible, and within the following limits:

- 260±5°C for 10 s max
- 350°C for 3 s max (soldering iron)

## 6. Heatsink

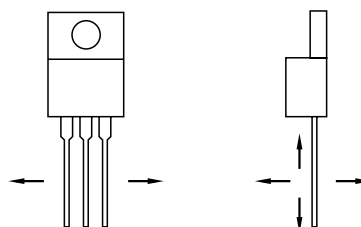
A large contact area between the device and the heatsink for effective heat radiation is required. To ensure a large contact area, minimize mounting holes and select a heatsink with a sufficiently smooth surface and that is free from burring or metal debris.

## 7. Handling precautions to protect power MOS FET from static damage

- When handling the device, physical grounding is necessary. Wear a wrist strap with a 1 MΩ resistor close to the body in the wrist strap to prevent electric shock.
- Use a conductive table mat or floor mat at the device handling workbench and to ensure grounding.
- When using a curve tracer or other measuring equipment, ground the equipment as well.
- When soldering, ground the bit of the soldering iron and the dip tank to prevent a leakage voltage from damaging the device.
- Store the device in the shipping container or a conductive container or use aluminum foil to protect the device from static electricity.

## 8. Load on Leads

When excessive load is exerted on leads, internal connections may be break. Load exerted in each of the following directions should be limited to below 1 kg for TO-220F and 2.5 kg for TO-3PF.



Directions in which load is exerted on leads

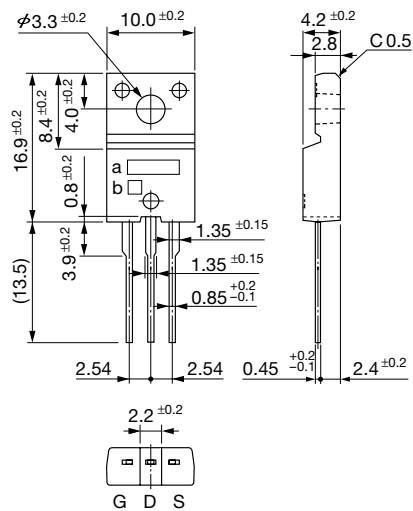
## 9. Lead Forming

We make several types of lead forming available, please consult with our personnel when necessary.

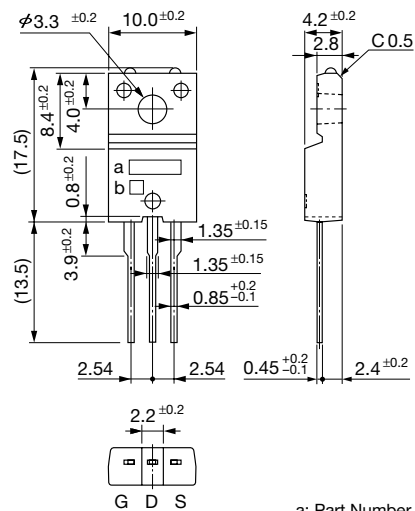
# External dimensions (Unit: mm)

## ① FM20 (TO-220F)

General product



UL approved product

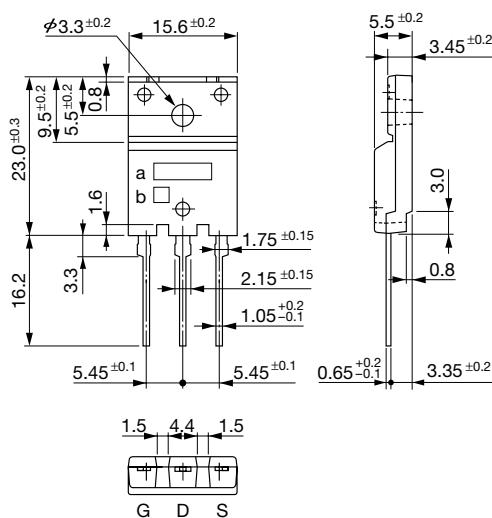


a: Part Number  
b: Lot Number

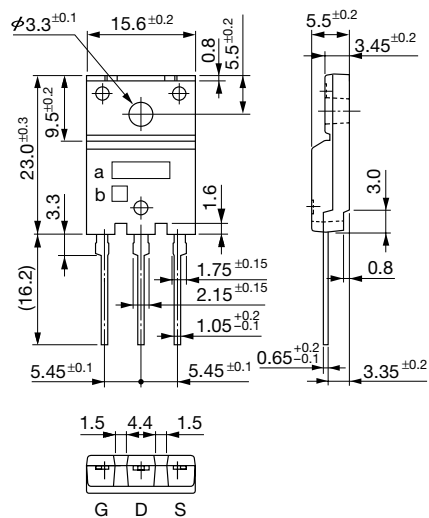
Weight: Approx 2.0g

## ② FM100 (TO-3PF)

General product



UL approved product



a: Part Number  
b: Lot Number

Weight: Approx 6.5g

# Avalanche energy capability of MOS FET

Sanken MOS FETs feature guaranteed avalanche energy capability.

## 1. What is avalanche energy capability ?

When a MOS FET is used for high-speed switching, the inductive load and wiring inductance may cause a counter electromotive voltage at cutoff that the device cannot withstand.

Avalanche energy capability is the non-clamped ability to withstand damage expressed as energy. As long as the energy applied to the device at cutoff is within the guaranteed avalanche energy capability, the device will not be damaged even if the Drain-Source voltage exceeds the capability.

For example, a Drain-Source voltage that is within the guaranteed capability when electrically stationary may exceed the limit at startup or cutoff. Usually, a snubber circuit or similar surge absorbing circuit is used to keep the Drain-Source voltage within the guaranteed capability. Sanken MOS FETs, however, do not require this kind of protective circuit because the avalanche energy capability is guaranteed. Sanken MOS FETs enable the number of parts to be reduced, saving board area.

\* Consult the engineering department of Sanken when planning to use MOS FETs in avalanche mode.

## 2. EAS calculation method

If the current in an inductive load L is  $I_{LP}$  at the moment when the MOS FET is cut off, EAS can be expressed as follows:

$$E_{AS} = \frac{1}{2} \cdot L \cdot I_{LP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}} \quad \text{..... ①}$$

\*  $V_{DD}$ : Supply voltage

If the value of L is not known in an actual circuit, EAS can also be calculated from the actual voltage and current waveforms as follows:

$$E_{AS} = P_s \cdot t \quad \text{..... ②}$$

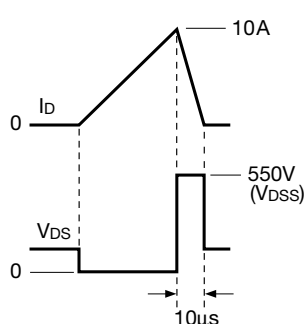
\*  $P_s$ : Surge power \*  $t$ : Surge time

The following calculation is used to determine EAS where the voltage and current shown in Fig.A are applied to the MOS FET in a circuit.

Integrate the overlapping section of  $I_D$  and  $V_{DS}$  to calculate  $\int I_D \cdot V_{DS} \cdot dt$ . When the  $I_D$  waveform is triangular, EAS will be as follows:

$$E_{AS} = \frac{1}{2} \cdot 10(A) \cdot 550(V) \cdot 10(\mu s) = 27.5(mJ)$$

Fig. A



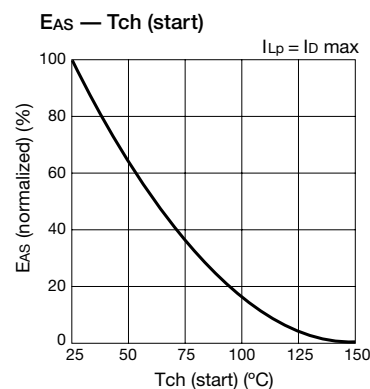
## 3. Temperature derating for EAS

The EAS Value in the specifications is guaranteed when the channel temperature  $T_{ch}$  is 25°C. Since the EAS Value drops as the channel temperature rises, derating depending on the temperature is necessary.

Fig.B shows the derating curve for single avalanche energy capability. This is the derating curve of EAS and the channel temperature ( $T_{ch}$  (start)) immediately before the avalanche occurs in the product, with the EAS value (maximum rating) at 25°C as 100%.

For example, if the product temperature is 50°C, the EAS value is derated to 64% of the value at 25°C.

Fig. B



## 4. Continuous avalanche energy capability

This section explains the derating method for continuous avalanche.

Considering continuous avalanche as the repetition of a single avalanche, the safe operating area (SOA) is determined using the derating curve shown in Fig. B.

Calculate the energy and  $T_{ch}$  (start) of avalanche in the worst condition and determine SOA using the calculated data and the derating curve shown in Fig.B. The temperature rise due to avalanche should not cause the channel temperature to exceed the maximum rating.

The following is an example of determining SOA judgment by calculation when a MOS FET enters a transient avalanche state at power-on then changes to a stationary state.

Supposing that the waveform is as shown in Fig.C until the MOS FET changes to the stationary state, calculate the start loss and switching (turn-on/off) loss. To simplify the calculation, the average loss  $P_a$  and the last two waveforms are used for approximation. (Fig. D)

First, calculate the channel temperature  $T_{ch}$  ( $\tau$ ) at time ( $\tau$ ) where the temperature condition is severest.

If the  $T_{ch}$  ( $\tau$ ) value is within the maximum rating, there is no problem as far as the temperature is concerned.

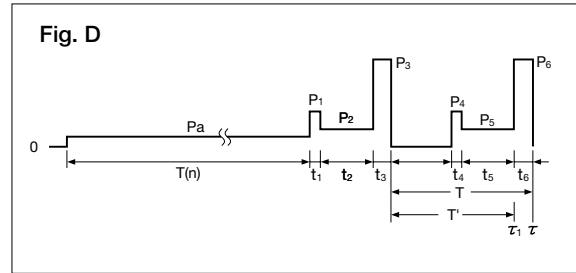
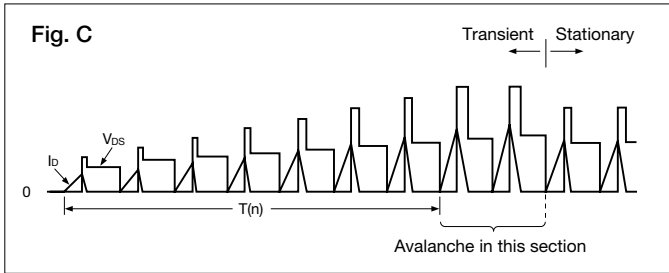
$$\begin{aligned}
Tch(\tau) = & Ta + Pa \cdot rch-c (Tn + T + t_1 + t_2 + t_3) \\
& + (P_1 - Pa) \cdot rch-c (T + t_1 + t_2 + t_3) \\
& - (P_1 - P_2) \cdot rch-c (T + t_2 + t_3) \\
& + (P_3 - P_2) \cdot rch-c (T + t_3) \\
& - P_3 \cdot rch-c (T) + P_4 \cdot rch-c (t_4 + t_5 + t_6) \\
& - (P_4 - P_5) \cdot rch-c (t_5 + t_6) \\
& + (P_6 - P_5) \cdot rch-c (t_6) \quad \dots\dots\dots ③
\end{aligned}$$

\*  $Ta$  : Ambient temperature  
 $rch-c(t)$ : Transient thermal resistance at pulse width  $t$

Then calculate the channel temperature  $Tch(\tau_1)$  immediately before avalanche.

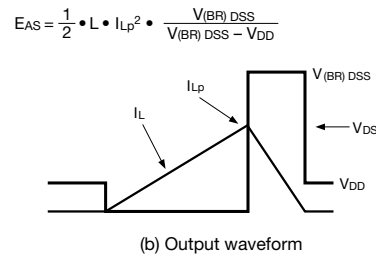
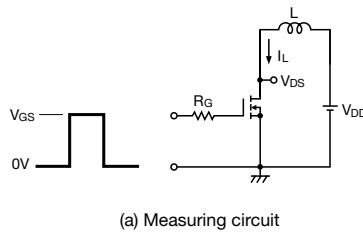
$$\begin{aligned}
Tch(\tau_1) = & Ta + Pa \cdot rch-c (Tn + T' + t_1 + t_2 + t_3) \\
& + (P_1 - Pa) \cdot rch-c (T' + t_1 + t_2 + t_3) \\
& - (P_1 - P_2) \cdot rch-c (T' + t_2 + t_3) \\
& + (P_3 - P_2) \cdot rch-c (T' + t_3) \\
& - P_3 \cdot rch-c (T') + P_4 \cdot rch-c (t_4 + t_5 + t_6) \\
& - (P_4 - P_5) \cdot rch-c (t_5 + t_6) \\
& + (P_6 - P_5) \cdot rch-c (t_6) \quad \dots\dots\dots ④
\end{aligned}$$

This  $Tch(\tau_1)$  value becomes  $Tch(\text{start})$ . If the avalanche energy ( $EAS = P_6 \cdot t_6$ ) is within the value derated from the guaranteed  $EAS$  value at the temperature, there is no problem as far as the avalanche energy is concerned.



## Avalanche energy capability measuring method

Fig. 1



$$EAS = \frac{1}{2} \cdot L \cdot I_{LP}^2 \cdot \frac{V_{(BR)DSS}}{V_{(BR)DSS} - V_{DD}}$$

## Switching time measuring method

Fig. 2

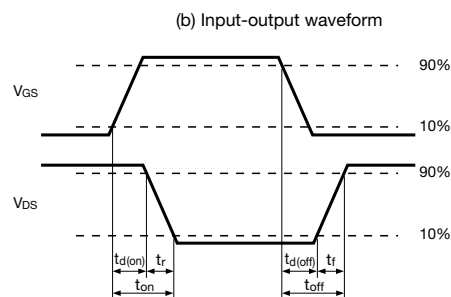
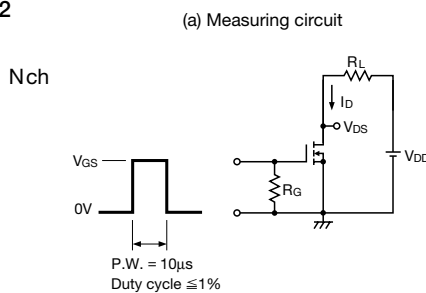
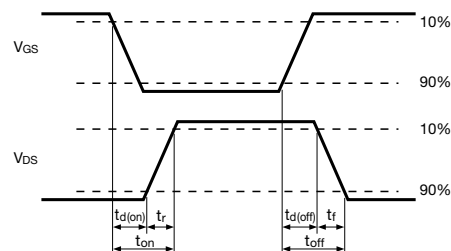
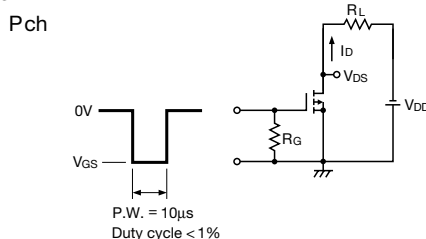


Fig. 3



# Product index by part number

| Parameter<br>Part Number | Absolute maximum ratings |                       |                                                 |                         | Electrical Characteristics (Ta=25°C)                     |                                   | Package | Page |
|--------------------------|--------------------------|-----------------------|-------------------------------------------------|-------------------------|----------------------------------------------------------|-----------------------------------|---------|------|
|                          | V <sub>DSS</sub><br>(V)  | I <sub>D</sub><br>(A) | P <sub>D</sub><br>(T <sub>C</sub> =25°C)<br>(W) | E <sub>AS</sub><br>(mJ) | R <sub>DS(ON)</sub> max<br>(V <sub>GS</sub> =10V)<br>(Ω) | C <sub>iss</sub><br>(typ)<br>(pF) |         |      |
| ○ 2SK1177                | 500                      | 2.5                   | 30                                              | 200                     | 3.0                                                      | 350                               | FM20    | 8    |
| ○ 2SK1178                | 500                      | 4                     | 35                                              | 260                     | 1.5                                                      | 610                               | FM20    | 9    |
| ○ 2SK1179                | 500                      | 8.5                   | 85                                              | 400                     | 0.85                                                     | 1300                              | FM100   | 10   |
| ○ 2SK1180                | 500                      | 10                    | 85                                              | 500                     | 0.6                                                      | 1800                              | FM100   | 11   |
| ○ 2SK1181                | 500                      | 13                    | 85                                              | 660                     | 0.4                                                      | 2700                              | FM100   | 12   |
| 2SK1183                  | 200                      | 3                     | 25                                              | 36                      | 1.5                                                      | 140                               | FM20    | 13   |
| 2SK1184                  | 200                      | 5                     | 30                                              | 67                      | 0.8                                                      | 260                               | FM20    | 14   |
| 2SK1185                  | 100                      | 5                     | 25                                              | 16                      | 0.54                                                     | 180                               | FM20    | 15   |
| 2SK1186                  | 100                      | 9                     | 30                                              | 32                      | 0.27                                                     | 350                               | FM20    | 16   |
| 2SK1187                  | 100                      | 12                    | 35                                              | 58                      | 0.16                                                     | 650                               | FM20    | 17   |
| 2SK1188                  | 60                       | 10                    | 25                                              | 2.1                     | 0.2                                                      | 300                               | FM20    | 18   |
| 2SK1189                  | 60                       | 15                    | 30                                              | 6.2                     | 0.1                                                      | 640                               | FM20    | 19   |
| 2SK1190                  | 60                       | 22                    | 35                                              | 17                      | 0.05                                                     | 1300                              | FM20    | 20   |
| 2SK1191                  | 60                       | 30                    | 40                                              | 38                      | 0.028                                                    | 2500                              | FM20    | 21   |
| 2SK1192                  | 60                       | 40                    | 90                                              | 38                      | 0.028                                                    | 2500                              | FM100   | 22   |
| 2SK1712                  | 60                       | 15                    | 30                                              | 6.2                     | 0.1                                                      | 820                               | FM20    | 23   |
| 2SK2207                  | 900                      | 3                     | 35                                              | 280                     | 5.0                                                      | 630                               | FM20    | 24   |
| 2SK2208                  | 900                      | 5                     | 75                                              | 400                     | 3.0                                                      | 1000                              | FM100   | 25   |
| * 2SK2419                | 60                       | 22                    | 35                                              | 17                      | 0.037                                                    | 1300                              | FM20    | 26   |
| 2SK2420                  | 60                       | 30                    | 40                                              | 38                      | 0.028                                                    | 2200                              | FM20    | 27   |
| 2SK2421                  | 60                       | 40                    | 40                                              | 60                      | 0.02                                                     | 2400                              | FM20    | 28   |
| 2SK2701                  | 450                      | 7                     | 35                                              | 130                     | 1.1                                                      | 720                               | FM20    | 29   |
| 2SK2702                  | 450                      | 10                    | 35                                              | 300                     | 0.8                                                      | 1000                              | FM20    | 30   |
| 2SK2703                  | 450                      | 10                    | 75                                              | 300                     | 0.8                                                      | 1000                              | FM100   | 31   |
| 2SK2704                  | 450                      | 13                    | 40                                              | 400                     | 0.57                                                     | 1300                              | FM20    | 32   |
| 2SK2705                  | 450                      | 13                    | 75                                              | 400                     | 0.57                                                     | 1300                              | FM100   | 33   |
| 2SK2706                  | 450                      | 18                    | 85                                              | 700                     | 0.3                                                      | 2500                              | FM100   | 34   |
| 2SK2707                  | 600                      | 4.5                   | 35                                              | 50                      | 1.85                                                     | 560                               | FM20    | 35   |
| 2SK2708                  | 600                      | 7                     | 40                                              | 150                     | 1.1                                                      | 950                               | FM20    | 36   |
| 2SK2709                  | 600                      | 8.5                   | 85                                              | 300                     | 0.85                                                     | 1200                              | FM100   | 37   |
| 2SK2710                  | 600                      | 12                    | 85                                              | 400                     | 0.55                                                     | 1900                              | FM100   | 38   |
| 2SK2778                  | 100                      | 12                    | 30                                              | 70                      | 0.175                                                    | 740                               | FM20    | 39   |
| 2SK2779                  | 100                      | 20                    | 35                                              | 200                     | 0.08                                                     | 1630                              | FM20    | 40   |
| 2SK2803                  | 450                      | 3                     | 30                                              | 30                      | 2.8                                                      | 340                               | FM20    | 41   |
| 2SK2804                  | 450                      | 5                     | 35                                              | 90                      | 1.5                                                      | 580                               | FM20    | 42   |
| 2SK2805                  | 450                      | 15                    | 80                                              | 550                     | 0.38                                                     | 2100                              | FM100   | 43   |
| 2SK2848                  | 600                      | 2                     | 30                                              | 10                      | 3.8                                                      | 290                               | FM20    | 44   |
| * 2SJ424                 | -60                      | 5                     | 25                                              | —                       | 0.5                                                      | 270                               | FM20    | 45   |
| 2SJ425                   | -60                      | 8                     | 30                                              | —                       | 0.28                                                     | 580                               | FM20    | 46   |

\* : Under development

○ : UL recognized parts are available (File No. 117753). Each UL recognized parts is marked with a ①, following its product number.

# Selection Guide

## ●Nch MOS FET

| V <sub>DSS</sub><br>(V) | I <sub>D</sub><br>(A) | R <sub>DS(ON)</sub><br>(Ω) max | Part Number    | Package | Page |
|-------------------------|-----------------------|--------------------------------|----------------|---------|------|
| 60                      | 10                    | 0.2                            | <b>2SK1188</b> | FM20    | 18   |
|                         | 15                    | 0.1                            | <b>2SK1189</b> | FM20    | 19   |
|                         | * 15                  | 0.1                            | <b>2SK1712</b> | FM20    | 23   |
|                         | 22                    | 50mΩ                           | <b>2SK1190</b> | FM20    | 20   |
|                         | 22                    | 37mΩ                           | <b>2SK2419</b> | FM20    | 26   |
|                         | 30                    | 28mΩ                           | <b>2SK1191</b> | FM20    | 21   |
|                         | 30                    | 28mΩ                           | <b>2SK2420</b> | FM20    | 27   |
|                         | 40                    | 28mΩ                           | <b>2SK1192</b> | FM100   | 22   |
|                         | 40                    | 20mΩ                           | <b>2SK2421</b> | FM20    | 28   |
| 100                     | 5                     | 0.54                           | <b>2SK1185</b> | FM20    | 15   |
|                         | 9                     | 0.27                           | <b>2SK1186</b> | FM20    | 16   |
|                         | 12                    | 0.16                           | <b>2SK1187</b> | FM20    | 17   |
|                         | * 12                  | 0.175                          | <b>2SK2778</b> | FM20    | 39   |
|                         | * 20                  | 80mΩ                           | <b>2SK2779</b> | FM20    | 40   |
| 200                     | 3                     | 1.5                            | <b>2SK1183</b> | FM20    | 13   |
|                         | 5                     | 0.8                            | <b>2SK1184</b> | FM20    | 14   |
| 450                     | 3                     | 2.8                            | <b>2SK2803</b> | FM20    | 41   |
|                         | 5                     | 1.5                            | <b>2SK2804</b> | FM20    | 42   |
|                         | 7                     | 1.1                            | <b>2SK2701</b> | FM20    | 29   |
|                         | 10                    | 0.8                            | <b>2SK2702</b> | FM20    | 30   |
|                         | 10                    | 0.8                            | <b>2SK2703</b> | FM100   | 31   |
|                         | 13                    | 0.57                           | <b>2SK2704</b> | FM20    | 32   |
|                         | 13                    | 0.57                           | <b>2SK2705</b> | FM100   | 33   |
|                         | 15                    | 0.38                           | <b>2SK2805</b> | FM100   | 43   |
|                         | 18                    | 0.3                            | <b>2SK2706</b> | FM100   | 34   |
| 500                     | 2.5                   | 3                              | <b>2SK1177</b> | FM20    | 8    |
|                         | 4                     | 1.5                            | <b>2SK1178</b> | FM20    | 9    |
|                         | 8.5                   | 0.85                           | <b>2SK1179</b> | FM100   | 10   |
|                         | 10                    | 0.6                            | <b>2SK1180</b> | FM100   | 11   |
|                         | 13                    | 0.4                            | <b>2SK1181</b> | FM100   | 12   |
| 600                     | 2                     | 3.8                            | <b>2SK2848</b> | FM20    | 44   |
|                         | 4.5                   | 1.85                           | <b>2SK2707</b> | FM20    | 35   |
|                         | 7                     | 1.1                            | <b>2SK2708</b> | FM20    | 36   |
|                         | 8.5                   | 0.85                           | <b>2SK2709</b> | FM100   | 37   |
|                         | 12                    | 0.55                           | <b>2SK2710</b> | FM100   | 38   |
| 900                     | 3                     | 5                              | <b>2SK2207</b> | FM20    | 24   |
|                         | 5                     | 3                              | <b>2SK2208</b> | FM100   | 25   |

※: Logic drive

## ●Pch MOS FET

| V <sub>DSS</sub><br>(V) | I <sub>D</sub><br>(A) | R <sub>DS(ON)</sub><br>(Ω) max | Part Number   | Package | Page |
|-------------------------|-----------------------|--------------------------------|---------------|---------|------|
| -60                     | 5                     | 0.5                            | <b>2SJ424</b> | FM20    | 45   |
|                         | 8                     | 0.28                           | <b>2SJ425</b> | FM20    | 46   |

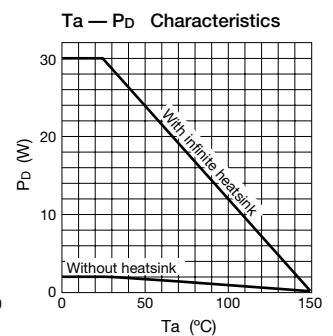
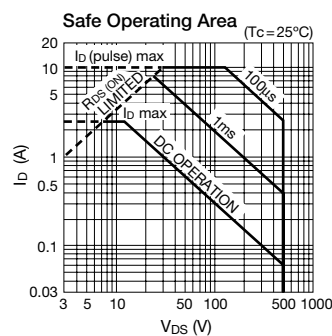
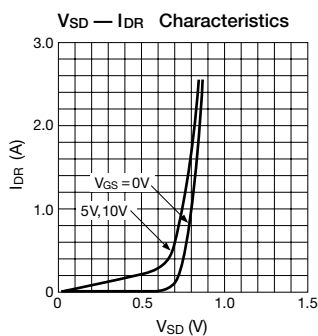
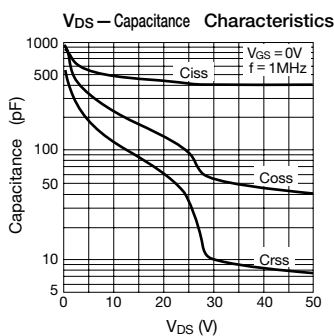
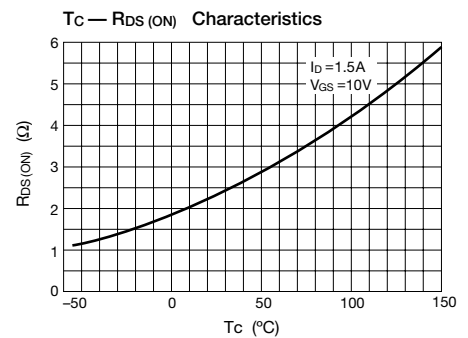
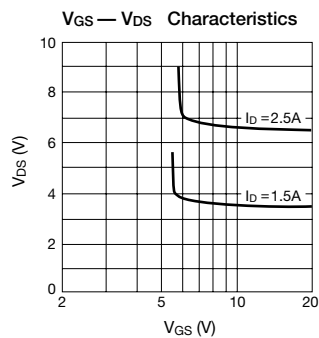
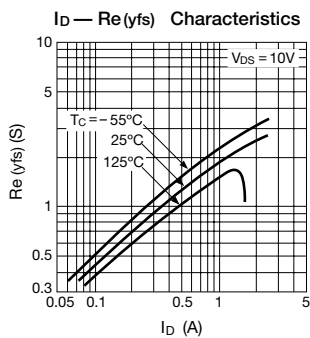
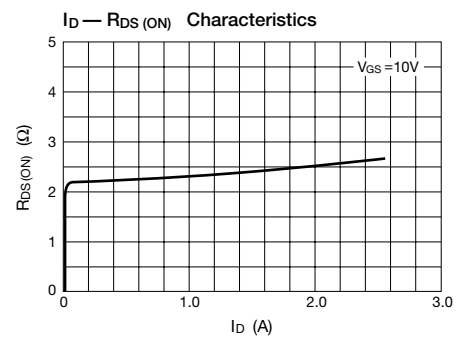
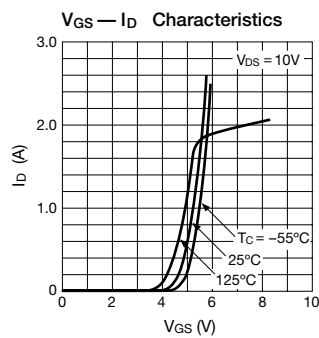
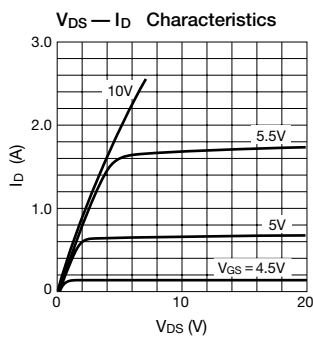
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol        | Ratings                                      | Unit             |
|---------------|----------------------------------------------|------------------|
| $V_{DSS}$     | 500                                          | V                |
| $V_{GSS}$     | $\pm 20$                                     | V                |
| $I_D$         | $\pm 2.5$                                    | A                |
| $I_D$ (pulse) | $\pm 10$ ( $T_{ch} \leq 150^\circ\text{C}$ ) | A                |
| $P_D$         | 30 ( $T_c = 25^\circ\text{C}$ )              | W                |
| $E_{AS}^*$    | 200                                          | mJ               |
| $T_{ch}$      | 150                                          | $^\circ\text{C}$ |
| $T_{stg}$     | -55 to +150                                  | $^\circ\text{C}$ |

\*:  $V_{DD} = 50\text{V}$ ,  $L = 60\text{mH}$ ,  $I_L = 2.5\text{A}$ , unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |     |           | Unit          | Conditions                                                                                           |
|----------------|---------|-----|-----------|---------------|------------------------------------------------------------------------------------------------------|
|                | min     | typ | max       |               |                                                                                                      |
| $V_{(BR) DSS}$ | 500     |     |           | V             | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                                                        |
| $I_{GSS}$      |         |     | $\pm 500$ | nA            | $V_{GS} = \pm 20\text{V}$                                                                            |
| $I_{DSS}$      |         |     | 250       | $\mu\text{A}$ | $V_{DS} = 500\text{V}$ , $V_{GS} = 0\text{V}$                                                        |
| $V_{TH}$       | 2.0     |     | 4.0       | V             | $V_{DS} = 10\text{V}$ , $I_D = 250\mu\text{A}$                                                       |
| $R_{e (yfs)}$  | 1.5     | 2.3 |           | S             | $V_{DS} = 10\text{V}$ , $I_D = 1.4\text{A}$                                                          |
| $R_{DS (on)}$  |         | 2.6 | 3.0       | $\Omega$      | $V_{GS} = 10\text{V}$ , $I_D = 1.4\text{A}$                                                          |
| $C_{iss}$      |         | 350 |           | pF            | $V_{DS} = 25\text{V}$ , $f = 1.0\text{MHz}$ ,<br>$V_{GS} = 0\text{V}$                                |
| $C_{oss}$      |         | 54  |           | pF            |                                                                                                      |
| $t_{on}$       |         | 50  |           | ns            | $I_D = 1.4\text{A}$ , $V_{DD} = 250\text{V}$ ,<br>$V_{GS} = 10\text{V}$ ,<br>See Figure 2 on Page 5. |
| $t_{off}$      |         | 140 |           | ns            |                                                                                                      |



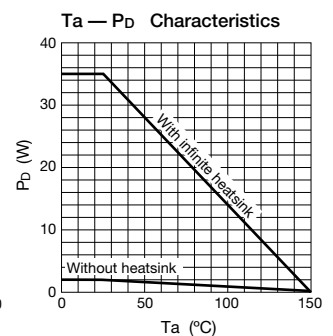
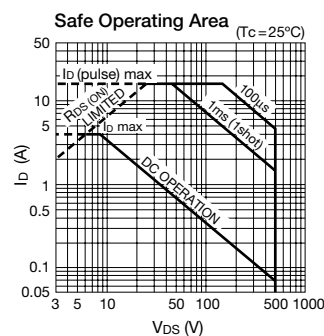
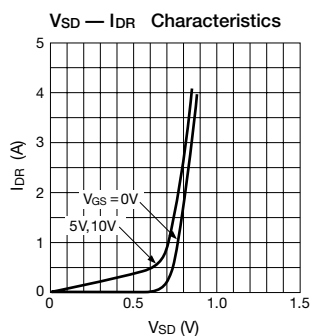
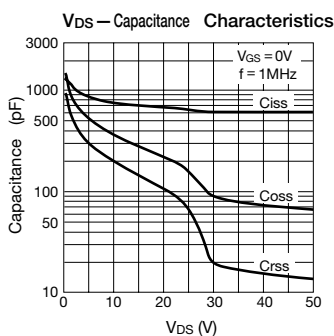
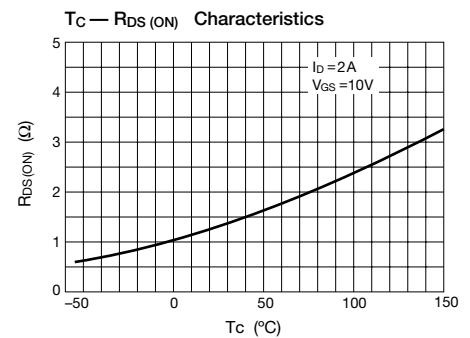
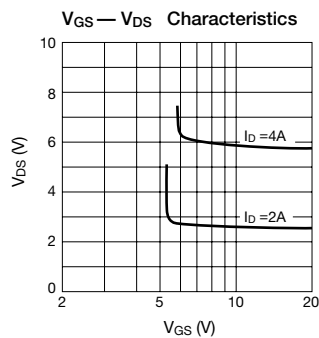
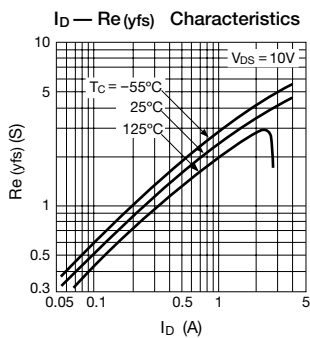
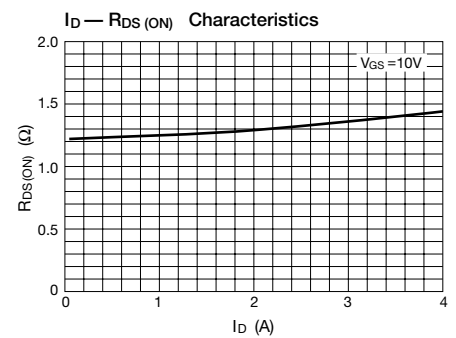
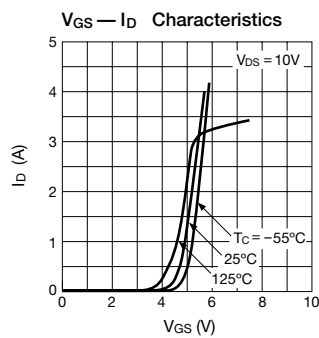
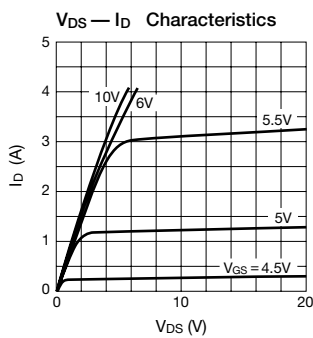
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol        | Ratings                                      | Unit             |
|---------------|----------------------------------------------|------------------|
| $V_{DS}$      | 500                                          | V                |
| $V_{GS}$      | $\pm 20$                                     | V                |
| $I_D$         | $\pm 4.0$                                    | A                |
| $I_D$ (pulse) | $\pm 16$ ( $T_{ch} \leq 150^\circ\text{C}$ ) | A                |
| $P_D$         | 35 ( $T_c = 25^\circ\text{C}$ )              | W                |
| $E_{AS}^*$    | 260                                          | mJ               |
| $T_{ch}$      | 150                                          | $^\circ\text{C}$ |
| $T_{stg}$     | -55 to +150                                  | $^\circ\text{C}$ |

\*:  $V_{DD} = 50\text{V}$ ,  $L = 28\text{mH}$ ,  $I_L = 4.0\text{A}$ , unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |     |           | Unit          | Conditions                                                                                           |
|----------------|---------|-----|-----------|---------------|------------------------------------------------------------------------------------------------------|
|                | min     | typ | max       |               |                                                                                                      |
| $V_{(BR) DSS}$ | 500     |     |           | V             | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                                                        |
| $I_{GSS}$      |         |     | $\pm 500$ | nA            | $V_{GS} = \pm 20\text{V}$                                                                            |
| $I_{DSS}$      |         |     | 250       | $\mu\text{A}$ | $V_{DS} = 500\text{V}$ , $V_{GS} = 0\text{V}$                                                        |
| $V_{TH}$       | 2.0     |     | 4.0       | V             | $V_{DS} = 10\text{V}$ , $I_D = 250\mu\text{A}$                                                       |
| $R_e$ (yfs)    | 2.4     | 3.7 |           | S             | $V_{DS} = 10\text{V}$ , $I_D = 2.0\text{A}$                                                          |
| $R_{DS(on)}$   |         | 1.3 | 1.5       | $\Omega$      | $V_{GS} = 10\text{V}$ , $I_D = 2.0\text{A}$                                                          |
| $C_{iss}$      |         | 610 |           | pF            | $V_{DS} = 25\text{V}$ , $f = 1.0\text{MHz}$ ,<br>$V_{GS} = 0\text{V}$                                |
| $C_{oss}$      |         | 91  |           | pF            |                                                                                                      |
| $t_{on}$       |         | 50  |           | ns            | $I_D = 2.0\text{A}$ , $V_{DD} = 250\text{V}$ ,<br>$V_{GS} = 10\text{V}$ ,<br>See Figure 2 on Page 5. |
| $t_{off}$      |         | 120 |           | ns            |                                                                                                      |



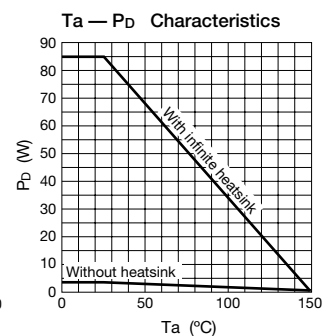
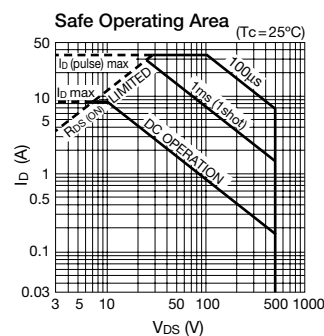
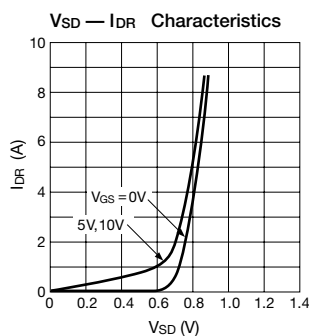
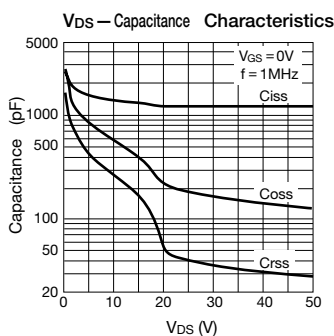
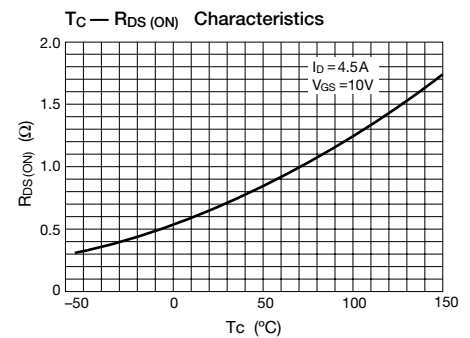
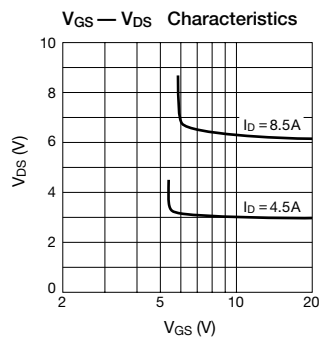
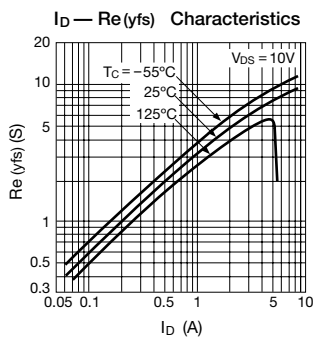
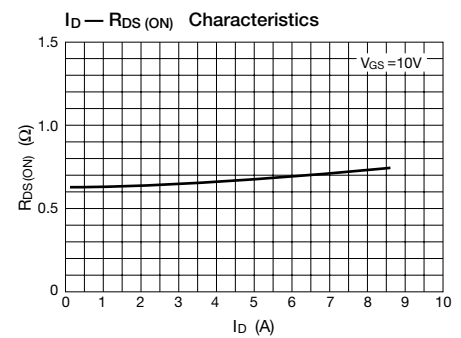
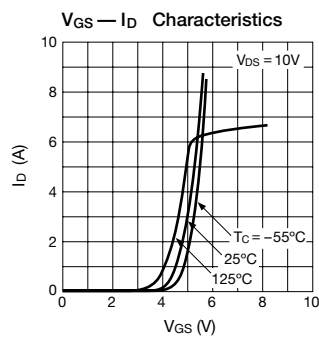
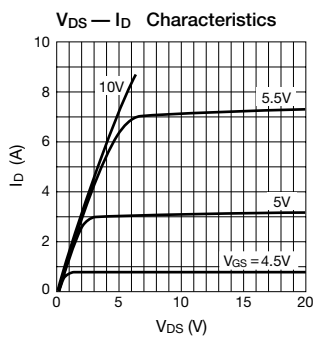
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol        | Ratings                                      | Unit             |
|---------------|----------------------------------------------|------------------|
| $V_{DS}$      | 500                                          | V                |
| $V_{GS}$      | $\pm 20$                                     | V                |
| $I_D$         | $\pm 8.5$                                    | A                |
| $I_D$ (pulse) | $\pm 34$ ( $T_{ch} \leq 150^\circ\text{C}$ ) | A                |
| $P_D$         | 85 ( $T_c = 25^\circ\text{C}$ )              | W                |
| $E_{AS}^*$    | 400                                          | mJ               |
| $T_{ch}$      | 150                                          | $^\circ\text{C}$ |
| $T_{stg}$     | -55 to +150                                  | $^\circ\text{C}$ |

\*:  $V_{DD} = 50V$ ,  $L = 10mH$ ,  $I_L = 8.5A$ , unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |      |           | Unit     | Conditions                                                                      |
|----------------|---------|------|-----------|----------|---------------------------------------------------------------------------------|
|                | min     | typ  | max       |          |                                                                                 |
| $V_{(BR) DSS}$ | 500     |      |           | V        | $I_D = 250\mu A$ , $V_{GS} = 0V$                                                |
| $I_{GSS}$      |         |      | $\pm 500$ | nA       | $V_{GS} = \pm 20V$                                                              |
| $I_{DSS}$      |         |      | 250       | $\mu A$  | $V_{DS} = 500V$ , $V_{GS} = 0V$                                                 |
| $V_{TH}$       | 2.0     |      | 4.0       | V        | $V_{DS} = 10V$ , $I_D = 250\mu A$                                               |
| $R_{e (yfs)}$  | 5.1     | 7.7  |           | S        | $V_{DS} = 10V$ , $I_D = 4.5A$                                                   |
| $R_{DS (on)}$  |         | 0.70 | 0.85      | $\Omega$ | $V_{GS} = 10V$ , $I_D = 4.5A$                                                   |
| $C_{iss}$      |         | 1300 |           | pF       | $V_{DS} = 25V$ , $f = 1.0MHz$ ,<br>$V_{GS} = 0V$                                |
| $C_{oss}$      |         | 180  |           | pF       |                                                                                 |
| $t_{on}$       |         | 60   |           | ns       | $I_D = 4.5A$ , $V_{DD} = 250V$ ,<br>$V_{GS} = 10V$ ,<br>See Figure 2 on Page 5. |
| $t_{off}$      |         | 110  |           | ns       |                                                                                 |



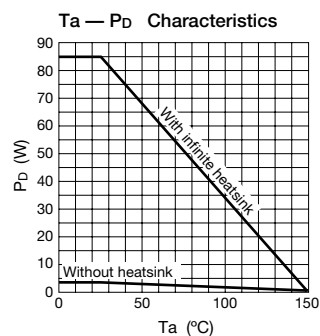
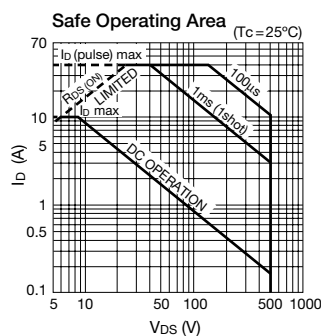
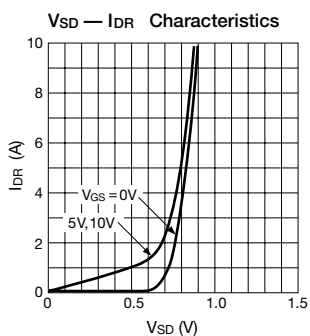
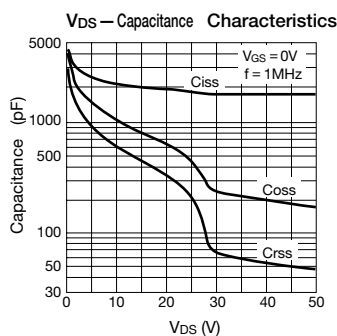
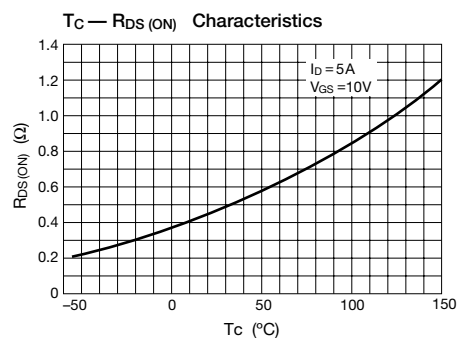
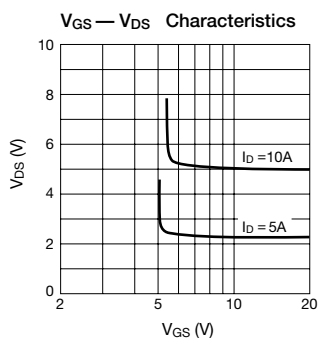
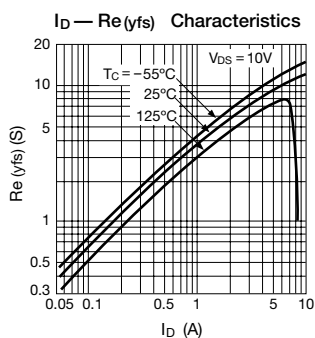
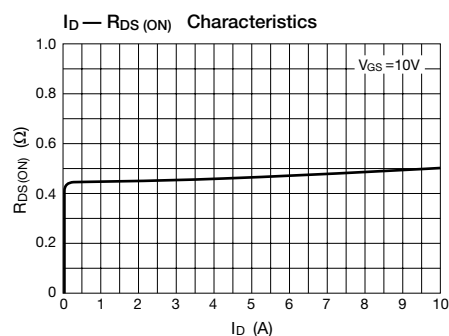
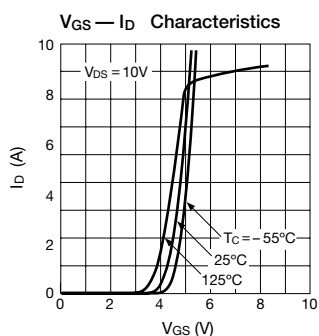
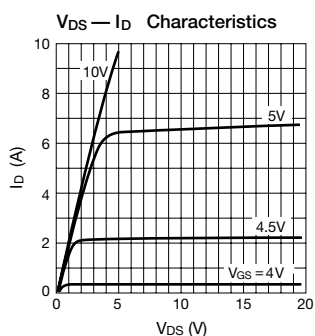
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol        | Ratings                                      | Unit             |
|---------------|----------------------------------------------|------------------|
| $V_{DSS}$     | 500                                          | V                |
| $V_{GSS}$     | $\pm 20$                                     | V                |
| $I_D$         | $\pm 10$                                     | A                |
| $I_D$ (pulse) | $\pm 40$ ( $T_{ch} \leq 150^\circ\text{C}$ ) | A                |
| $P_D$         | 85 ( $T_c = 25^\circ\text{C}$ )              | W                |
| $E_{AS}^*$    | 500                                          | mJ               |
| $T_{ch}$      | 150                                          | $^\circ\text{C}$ |
| $T_{stg}$     | -55 to +150                                  | $^\circ\text{C}$ |

\*:  $V_{DD} = 50\text{V}$ ,  $L = 9\text{mH}$ ,  $I_L = 10\text{A}$ , unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |      |           | Unit          | Conditions                                                                                         |
|----------------|---------|------|-----------|---------------|----------------------------------------------------------------------------------------------------|
|                | min     | typ  | max       |               |                                                                                                    |
| $V_{(BR) DSS}$ | 500     |      |           | V             | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                                                      |
| $I_{GSS}$      |         |      | $\pm 500$ | nA            | $V_{GS} = \pm 20\text{V}$                                                                          |
| $I_{DSS}$      |         |      | 250       | $\mu\text{A}$ | $V_{DS} = 500\text{V}$ , $V_{GS} = 0\text{V}$                                                      |
| $V_{TH}$       | 2.0     |      | 4.0       | V             | $V_{DS} = 10\text{V}$ , $I_D = 250\mu\text{A}$                                                     |
| $R_{e (yfs)}$  | 6.1     | 9.2  |           | S             | $V_{DS} = 10\text{V}$ , $I_D = 5.0\text{A}$                                                        |
| $R_{DS (on)}$  |         | 0.5  | 0.6       | $\Omega$      | $V_{GS} = 10\text{V}$ , $I_D = 5.0\text{A}$                                                        |
| $C_{iss}$      |         | 1800 |           | pF            | $V_{DS} = 25\text{V}$ , $f = 1.0\text{MHz}$ ,<br>$V_{GS} = 0\text{V}$                              |
| $C_{oss}$      |         | 250  |           | pF            |                                                                                                    |
| $t_{on}$       |         | 60   |           | ns            | $I_D = 5\text{A}$ , $V_{DD} = 250\text{V}$ ,<br>$V_{GS} = 10\text{V}$ ,<br>See Figure 2 on Page 5. |
| $t_{off}$      |         | 140  |           | ns            |                                                                                                    |



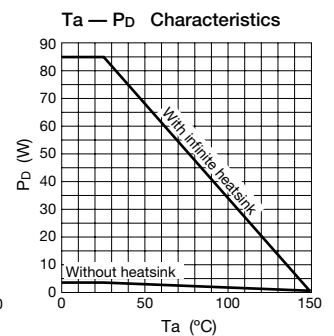
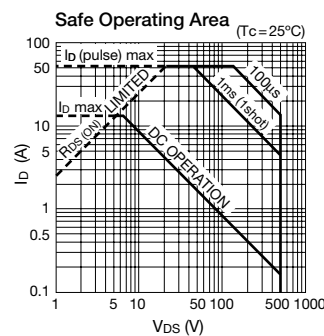
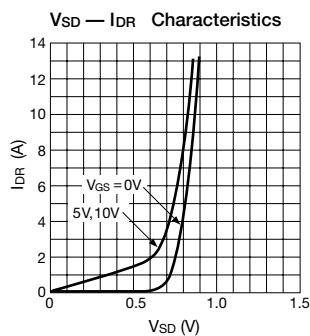
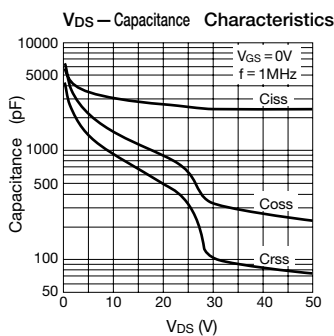
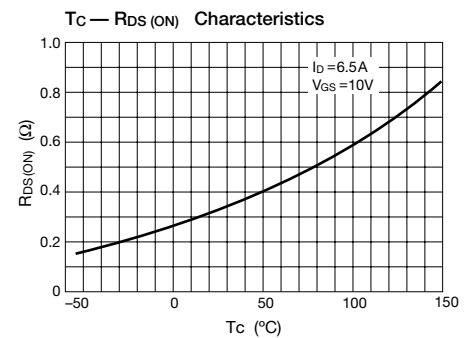
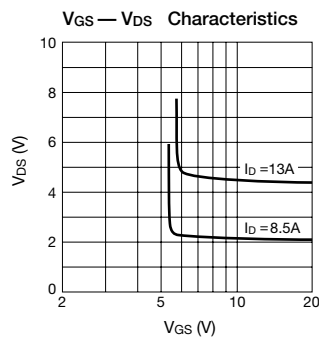
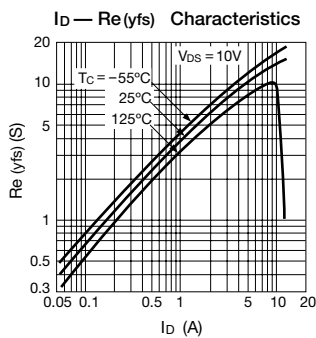
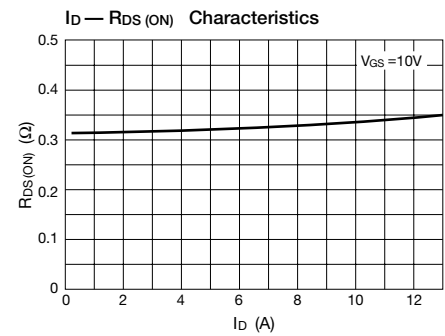
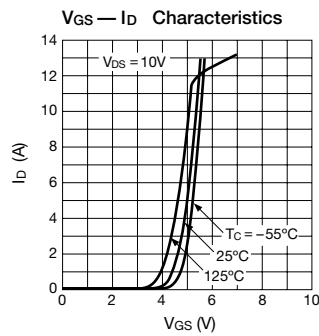
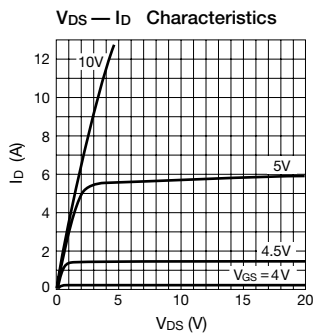
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol                 | Ratings                       | Unit |
|------------------------|-------------------------------|------|
| V <sub>DSS</sub>       | 500                           | V    |
| V <sub>GSS</sub>       | ±20                           | V    |
| I <sub>D</sub>         | ±13                           | A    |
| I <sub>D</sub> (pulse) | ±52 (T <sub>ch</sub> ≤ 150°C) | A    |
| P <sub>D</sub>         | 85 (T <sub>c</sub> = 25°C)    | W    |
| E <sub>AS</sub> *      | 660                           | mJ   |
| T <sub>ch</sub>        | 150                           | °C   |
| T <sub>stg</sub>       | -55 to +150                   | °C   |

\*: V<sub>DD</sub> = 50V, L = 7mH, I<sub>L</sub> = 13A, unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                    |
|-----------------------|---------|------|------|------|-----------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                               |
| V <sub>(BR)</sub> DSS | 500     |      |      | V    | I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V                                                  |
| I <sub>GSS</sub>      |         |      | ±500 | nA   | V <sub>GS</sub> = ±20V                                                                        |
| I <sub>bss</sub>      |         |      | 250  | μA   | V <sub>DS</sub> = 500V, V <sub>GS</sub> = 0V                                                  |
| V <sub>TH</sub>       | 2.0     |      | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 250μA                                                 |
| R <sub>e</sub> (yfs)  | 8.5     | 13   |      | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 6.5A                                                  |
| R <sub>DS</sub> (on)  |         | 0.35 | 0.4  | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 6.5A                                                  |
| C <sub>iss</sub>      |         | 2700 |      | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                       |
| C <sub>oss</sub>      |         | 350  |      | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                       |
| t <sub>on</sub>       |         | 65   |      | ns   | I <sub>D</sub> = 6.5A, V <sub>DD</sub> = 250V, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>off</sub>      |         | 180  |      | ns   |                                                                                               |



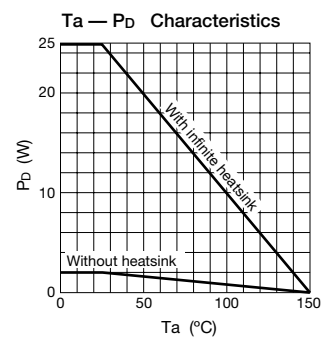
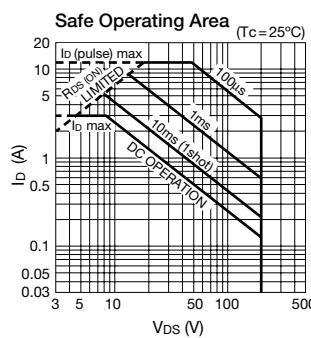
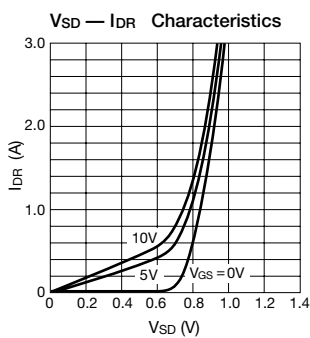
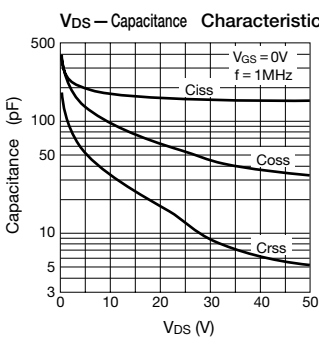
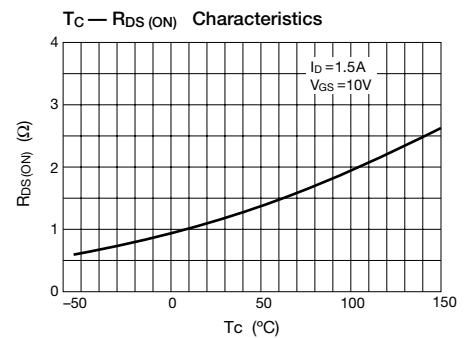
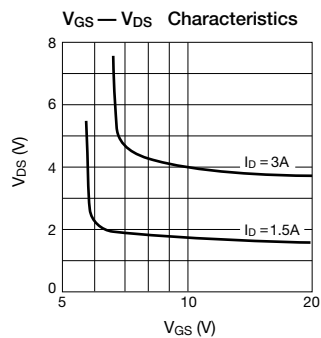
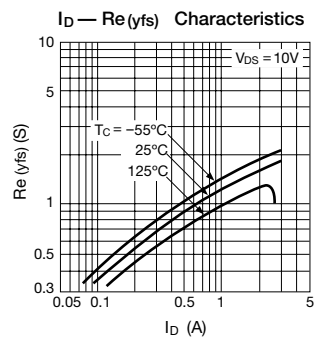
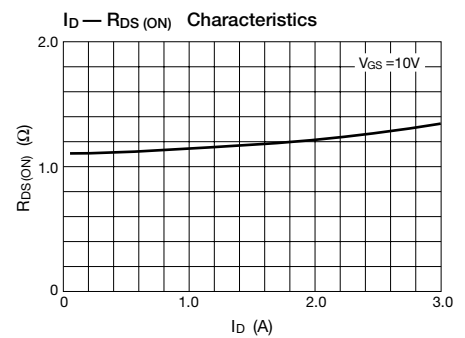
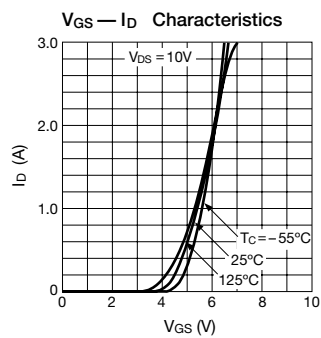
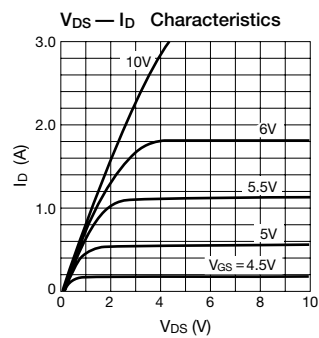
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol                 | Ratings                       | Unit |
|------------------------|-------------------------------|------|
| V <sub>DSS</sub>       | 200                           | V    |
| V <sub>GSS</sub>       | ±20                           | V    |
| I <sub>D</sub>         | ±3                            | A    |
| I <sub>D</sub> (pulse) | ±12 (T <sub>ch</sub> ≤ 150°C) | A    |
| P <sub>D</sub>         | 25 (T <sub>c</sub> = 25°C)    | W    |
| E <sub>AS</sub> *      | 30                            | mJ   |
| T <sub>ch</sub>        | 150                           | °C   |
| T <sub>stg</sub>       | -55 to +150                   | °C   |

\*: V<sub>DD</sub> = 50V, L = 6mH, I<sub>L</sub> = 3.0A, unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |     |      | Unit | Conditions                                                                                    |
|-----------------------|---------|-----|------|------|-----------------------------------------------------------------------------------------------|
|                       | min     | typ | max  |      |                                                                                               |
| V <sub>(BR) DSS</sub> | 200     |     |      | V    | I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V                                                  |
| I <sub>GSS</sub>      |         |     | ±500 | nA   | V <sub>GS</sub> = ±20V                                                                        |
| I <sub>bss</sub>      |         |     | 250  | μA   | V <sub>DS</sub> = 200V, V <sub>GS</sub> = 0V                                                  |
| V <sub>TH</sub>       | 2.0     |     | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 250μA                                                 |
| R <sub>e</sub> (yfs)  | 0.8     | 1.2 |      | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 1.5A                                                  |
| R <sub>DS(on)</sub>   |         | 1.2 | 1.5  | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 1.5A                                                  |
| C <sub>iss</sub>      |         | 140 |      | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                       |
| C <sub>oss</sub>      |         | 42  |      | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                       |
| t <sub>on</sub>       |         | 35  |      | ns   | I <sub>D</sub> = 1.5A, V <sub>DD</sub> = 100V, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>off</sub>      |         | 50  |      | ns   |                                                                                               |



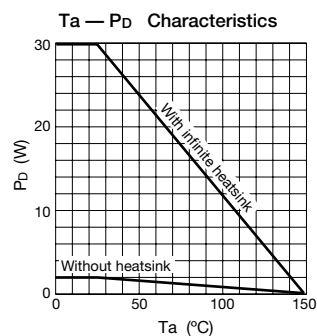
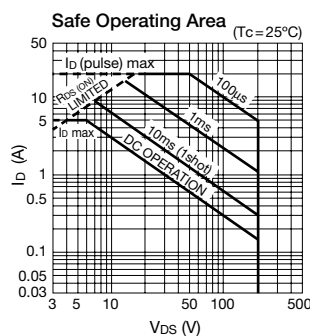
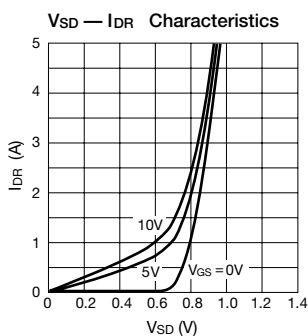
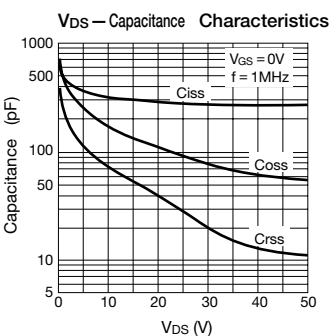
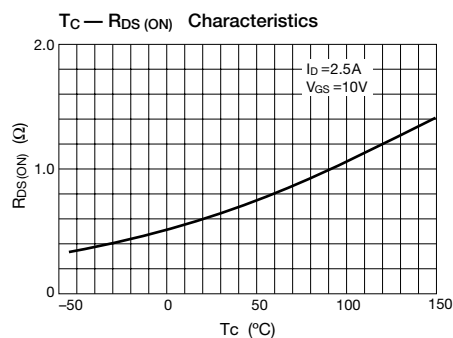
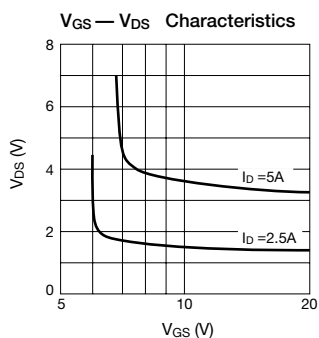
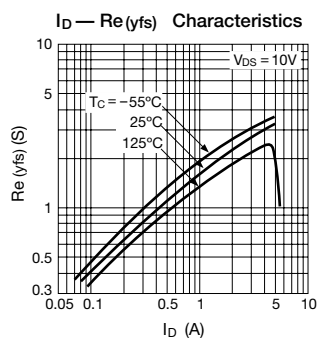
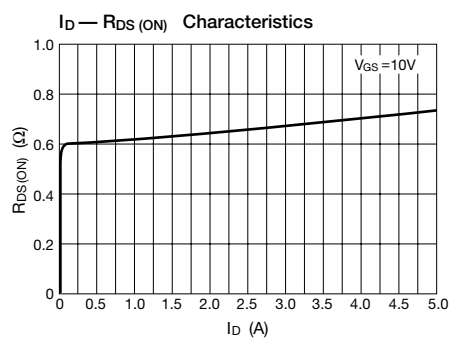
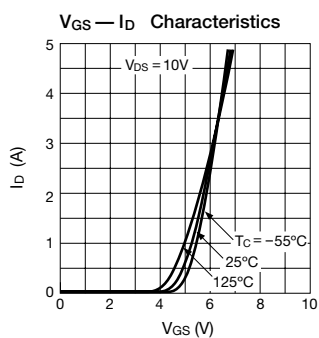
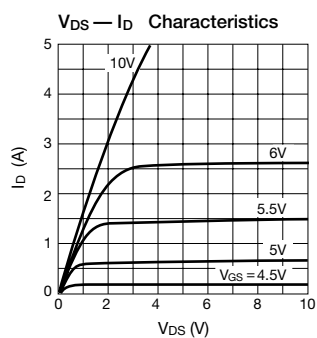
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol        | Ratings                                      | Unit             |
|---------------|----------------------------------------------|------------------|
| $V_{DS}$      | 200                                          | V                |
| $V_{GS}$      | $\pm 20$                                     | V                |
| $I_D$         | $\pm 5$                                      | A                |
| $I_D$ (pulse) | $\pm 20$ ( $T_{ch} \leq 150^\circ\text{C}$ ) | A                |
| $P_D$         | 30 ( $T_c = 25^\circ\text{C}$ )              | W                |
| $E_{AS}^*$    | 67                                           | mJ               |
| $T_{ch}$      | 150                                          | $^\circ\text{C}$ |
| $T_{stg}$     | -55 to +150                                  | $^\circ\text{C}$ |

\*:  $V_{DD} = 50\text{V}$ ,  $L = 4\text{mH}$ ,  $I_L = 5.0\text{A}$ , unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |     |           | Unit          | Conditions                                                                                           |
|----------------|---------|-----|-----------|---------------|------------------------------------------------------------------------------------------------------|
|                | min     | typ | max       |               |                                                                                                      |
| $V_{(BR) DSS}$ | 200     |     |           | V             | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                                                        |
| $I_{GSS}$      |         |     | $\pm 500$ | nA            | $V_{GS} = \pm 20\text{V}$                                                                            |
| $I_{DSS}$      |         |     | 250       | $\mu\text{A}$ | $V_{DS} = 200\text{V}$ , $V_{GS} = 0\text{V}$                                                        |
| $V_{TH}$       | 2.0     |     | 4.0       | V             | $V_{DS} = 10\text{V}$ , $I_D = 250\mu\text{A}$                                                       |
| $R_{e (yfs)}$  | 1.3     | 2.5 |           | S             | $V_{DS} = 10\text{V}$ , $I_D = 2.5\text{A}$                                                          |
| $R_{DS (on)}$  |         | 0.5 | 0.8       | $\Omega$      | $V_{GS} = 10\text{V}$ , $I_D = 2.5\text{A}$                                                          |
| $C_{iss}$      |         | 260 |           | pF            | $V_{DS} = 25\text{V}$ , $f = 1.0\text{MHz}$ ,<br>$V_{GS} = 0\text{V}$                                |
| $C_{oss}$      |         | 100 |           | pF            |                                                                                                      |
| $t_{on}$       |         | 50  |           | ns            | $I_D = 2.5\text{A}$ , $V_{DD} = 100\text{V}$ ,<br>$V_{GS} = 10\text{V}$ ,<br>See Figure 2 on Page 5. |
| $t_{off}$      |         | 60  |           | ns            |                                                                                                      |



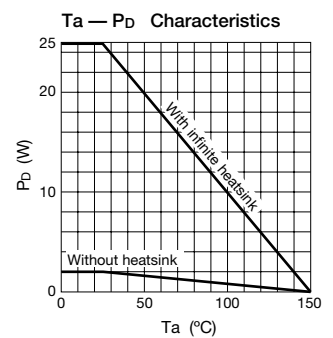
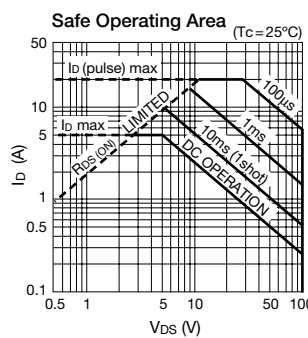
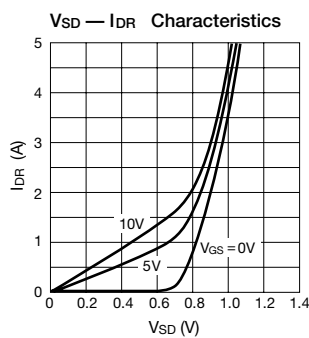
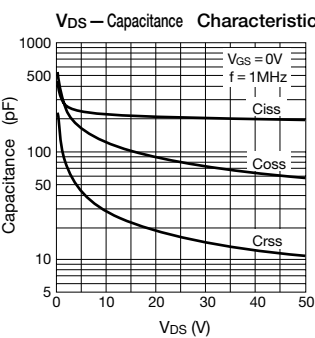
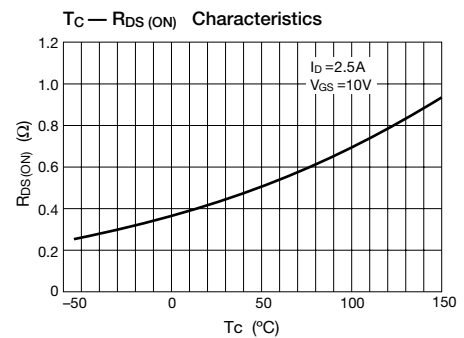
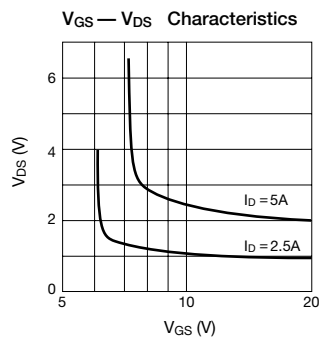
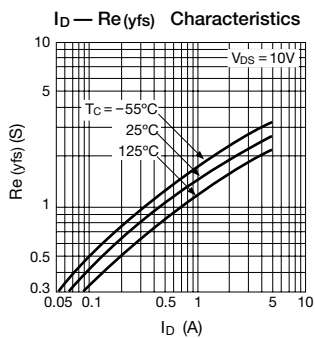
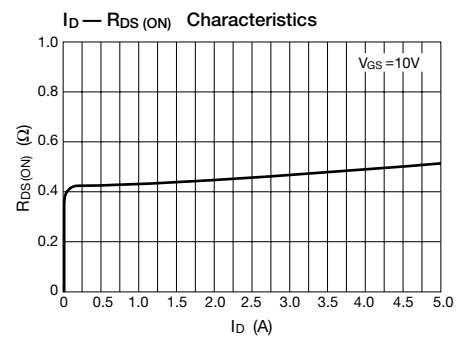
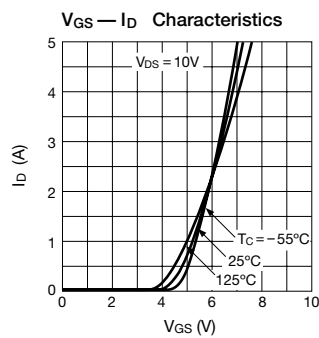
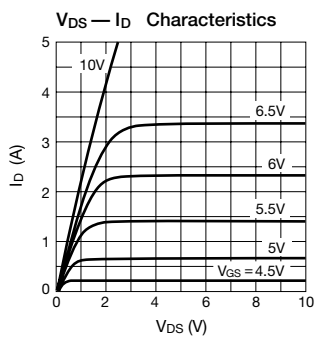
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol        | Ratings                                      | Unit             |
|---------------|----------------------------------------------|------------------|
| $V_{DS}$      | 100                                          | V                |
| $V_{GS}$      | $\pm 20$                                     | V                |
| $I_D$         | $\pm 5$                                      | A                |
| $I_D$ (pulse) | $\pm 20$ ( $T_{ch} \leq 150^\circ\text{C}$ ) | A                |
| $P_D$         | 25 ( $T_c = 25^\circ\text{C}$ )              | W                |
| $E_{AS}^*$    | 16                                           | mJ               |
| $T_{ch}$      | 150                                          | $^\circ\text{C}$ |
| $T_{stg}$     | -55 to +150                                  | $^\circ\text{C}$ |

\*:  $V_{DD} = 25\text{V}$ ,  $L = 1\text{mH}$ ,  $I_L = 5.0\text{A}$ , unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |      |           | Unit          | Conditions                                                                                          |
|----------------|---------|------|-----------|---------------|-----------------------------------------------------------------------------------------------------|
|                | min     | typ  | max       |               |                                                                                                     |
| $V_{(BR) DSS}$ | 100     |      |           | V             | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                                                       |
| $I_{GSS}$      |         |      | $\pm 500$ | nA            | $V_{GS} = \pm 20\text{V}$                                                                           |
| $I_{DSS}$      |         |      | 250       | $\mu\text{A}$ | $V_{DS} = 100\text{V}$ , $V_{GS} = 0\text{V}$                                                       |
| $V_{TH}$       | 2.0     |      | 4.0       | V             | $V_{DS} = 10\text{V}$ , $I_D = 250\mu\text{A}$                                                      |
| $R_{e (yfs)}$  | 1.5     | 1.7  |           | S             | $V_{DS} = 10\text{V}$ , $I_D = 2.5\text{A}$                                                         |
| $R_{DS (on)}$  |         | 0.41 | 0.54      | $\Omega$      | $V_{GS} = 10\text{V}$ , $I_D = 2.5\text{A}$                                                         |
| $C_{iss}$      |         | 180  |           | pF            | $V_{DS} = 25\text{V}$ , $f = 1.0\text{MHz}$ ,<br>$V_{GS} = 0\text{V}$                               |
| $C_{oss}$      |         | 82   |           | pF            |                                                                                                     |
| $t_{on}$       |         | 40   |           | ns            | $I_D = 2.5\text{A}$ , $V_{DD} = 50\text{V}$ ,<br>$V_{GS} = 10\text{V}$ ,<br>See Figure 2 on Page 5. |
| $t_{off}$      |         | 40   |           | ns            |                                                                                                     |



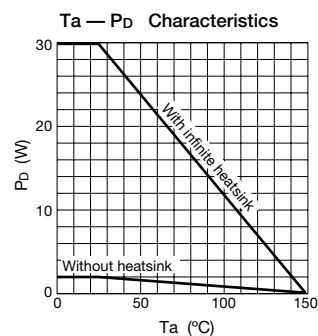
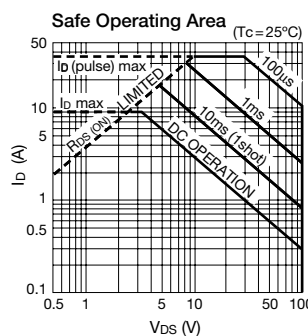
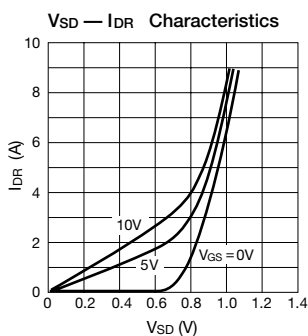
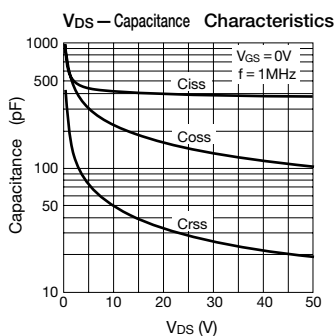
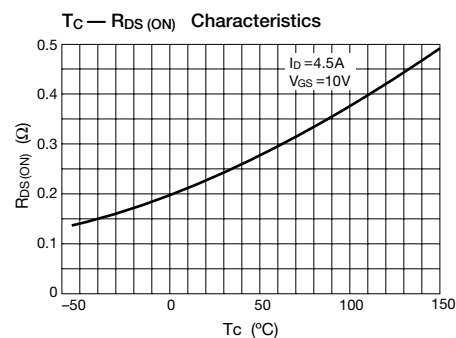
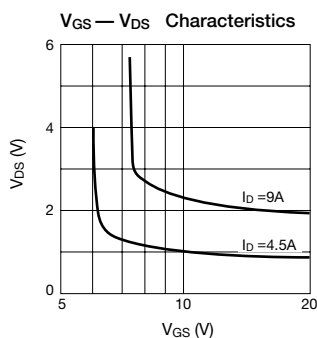
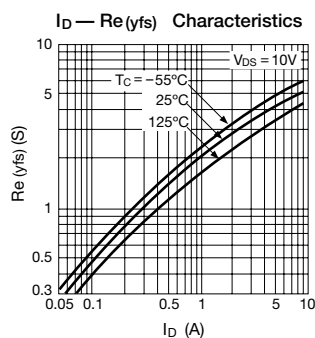
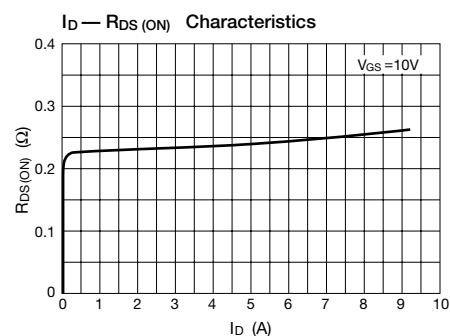
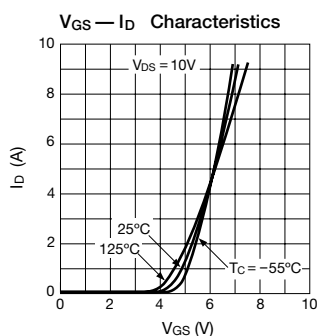
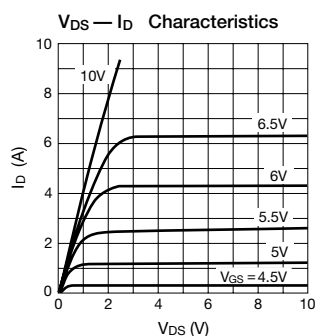
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol        | Ratings                                      | Unit             |
|---------------|----------------------------------------------|------------------|
| $V_{DS}$      | 100                                          | V                |
| $V_{GS}$      | $\pm 20$                                     | V                |
| $I_D$         | $\pm 9$                                      | A                |
| $I_D$ (pulse) | $\pm 36$ ( $T_{ch} \leq 150^\circ\text{C}$ ) | A                |
| $P_D$         | 30 ( $T_c = 25^\circ\text{C}$ )              | W                |
| $E_{AS}^*$    | 32                                           | mJ               |
| $T_{ch}$      | 150                                          | $^\circ\text{C}$ |
| $T_{stg}$     | -55 to +150                                  | $^\circ\text{C}$ |

\*:  $V_{DD} = 25\text{V}$ ,  $L = 600\mu\text{H}$ ,  $I_L = 9.0\text{A}$ , unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |      |           | Unit          | Conditions                                                                                          |
|----------------|---------|------|-----------|---------------|-----------------------------------------------------------------------------------------------------|
|                | min     | typ  | max       |               |                                                                                                     |
| $V_{(BR) DSS}$ | 100     |      |           | V             | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                                                       |
| $I_{GSS}$      |         |      | $\pm 500$ | nA            | $V_{GS} = \pm 20\text{V}$                                                                           |
| $I_{DSS}$      |         |      | 250       | $\mu\text{A}$ | $V_{DS} = 100\text{V}$ , $V_{GS} = 0\text{V}$                                                       |
| $V_{TH}$       | 2.0     |      | 4.0       | V             | $V_{DS} = 10\text{V}$ , $I_D = 250\mu\text{A}$                                                      |
| $R_{e (yfs)}$  | 2.4     | 3.7  |           | S             | $V_{DS} = 10\text{V}$ , $I_D = 4.5\text{A}$                                                         |
| $R_{DS (on)}$  |         | 0.24 | 0.27      | $\Omega$      | $V_{GS} = 10\text{V}$ , $I_D = 4.5\text{A}$                                                         |
| $C_{iss}$      |         | 350  |           | pF            | $V_{DS} = 25\text{V}$ , $f = 1.0\text{MHz}$ ,<br>$V_{GS} = 0\text{V}$                               |
| $C_{oss}$      |         | 130  |           | pF            |                                                                                                     |
| $t_{on}$       |         | 60   |           | ns            | $I_D = 4.5\text{A}$ , $V_{DD} = 50\text{V}$ ,<br>$V_{GS} = 10\text{V}$ ,<br>See Figure 2 on Page 5. |
| $t_{off}$      |         | 40   |           | ns            |                                                                                                     |



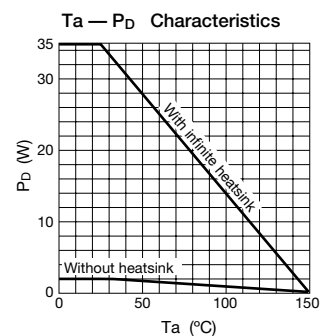
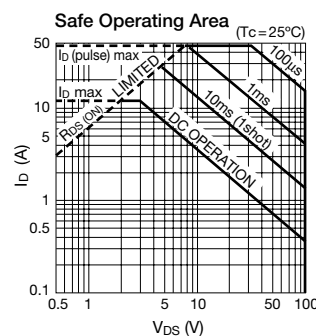
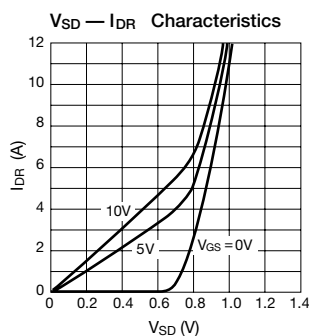
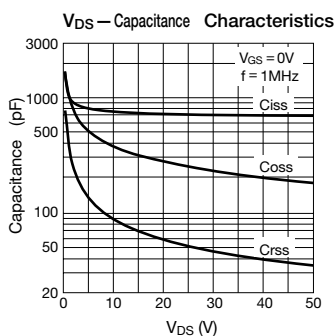
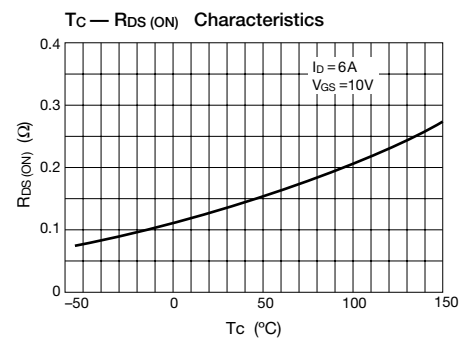
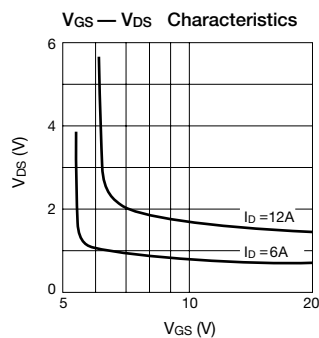
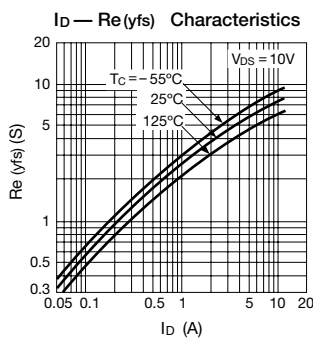
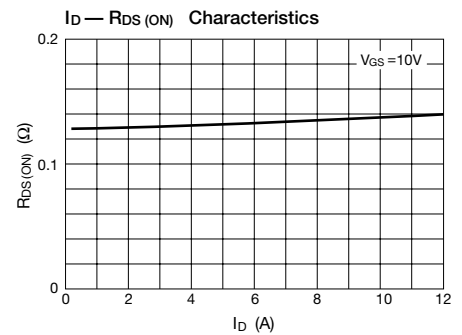
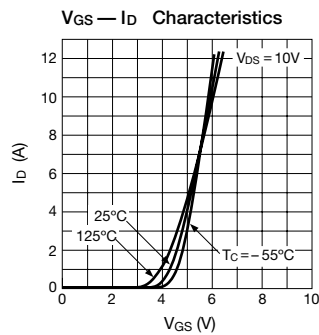
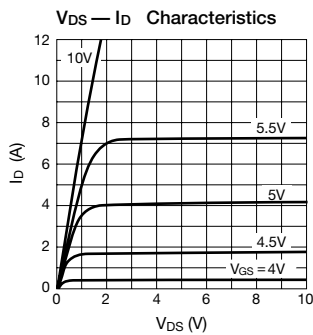
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol        | Ratings                                      | Unit             |
|---------------|----------------------------------------------|------------------|
| $V_{DS}$      | 100                                          | V                |
| $V_{GS}$      | $\pm 20$                                     | V                |
| $I_D$         | $\pm 12$                                     | A                |
| $I_D$ (pulse) | $\pm 48$ ( $T_{ch} \leq 150^\circ\text{C}$ ) | A                |
| $P_D$         | 35 ( $T_c = 25^\circ\text{C}$ )              | W                |
| EAS *         | 58                                           | mJ               |
| $T_{ch}$      | 150                                          | $^\circ\text{C}$ |
| $T_{stg}$     | -55 to +150                                  | $^\circ\text{C}$ |

\*:  $V_{DD} = 25\text{V}$ ,  $L = 600\mu\text{H}$ ,  $I_L = 12\text{A}$ , unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |      |           | Unit          | Conditions                                                                                        |
|----------------|---------|------|-----------|---------------|---------------------------------------------------------------------------------------------------|
|                | min     | typ  | max       |               |                                                                                                   |
| $V_{(BR) DSS}$ | 100     |      |           | V             | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                                                     |
| $I_{GSS}$      |         |      | $\pm 500$ | nA            | $V_{GS} = \pm 20\text{V}$                                                                         |
| $I_{DSS}$      |         |      | 250       | $\mu\text{A}$ | $V_{DS} = 100\text{V}$ , $V_{GS} = 0\text{V}$                                                     |
| $V_{TH}$       | 2.0     |      | 4.0       | V             | $V_{DS} = 10\text{V}$ , $I_D = 250\mu\text{A}$                                                    |
| $R_e$ (yfs)    | 4.4     | 6.5  |           | S             | $V_{DS} = 10\text{V}$ , $I_D = 6.0\text{A}$                                                       |
| $R_{DS(on)}$   |         | 0.12 | 0.16      | $\Omega$      | $V_{GS} = 10\text{V}$ , $I_D = 6.0\text{A}$                                                       |
| $C_{iss}$      |         | 650  |           | pF            | $V_{DS} = 25\text{V}$ , $f = 1.0\text{MHz}$ ,<br>$V_{GS} = 0\text{V}$                             |
| $C_{oss}$      |         | 240  |           | pF            |                                                                                                   |
| $t_{on}$       |         | 70   |           | ns            | $I_D = 6\text{A}$ , $V_{DD} = 50\text{V}$ ,<br>$V_{GS} = 10\text{V}$ ,<br>See Figure 2 on Page 5. |
| $t_{off}$      |         | 55   |           | ns            |                                                                                                   |



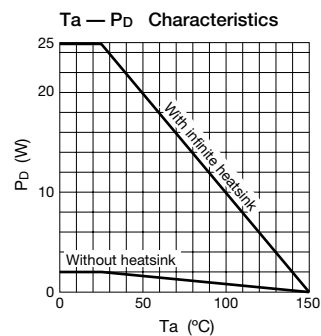
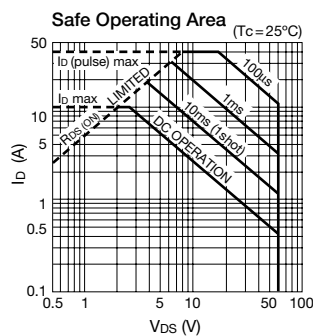
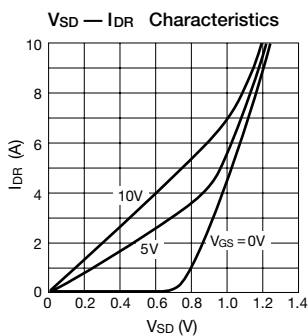
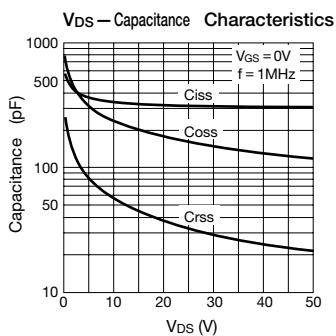
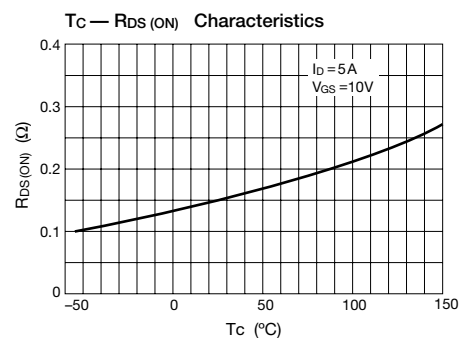
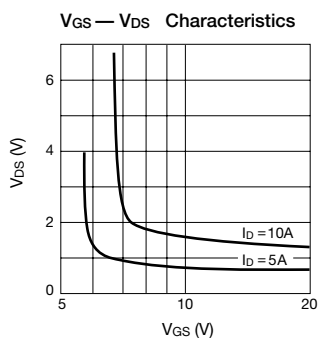
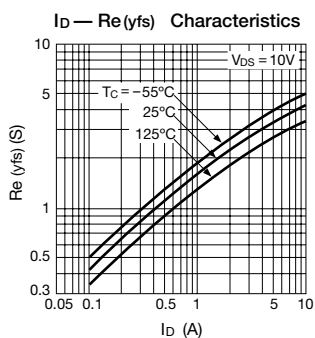
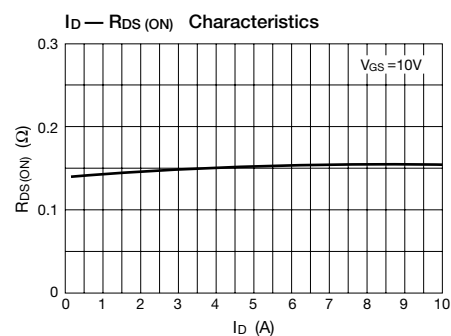
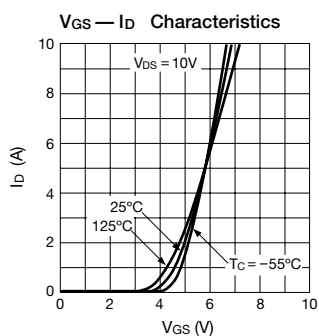
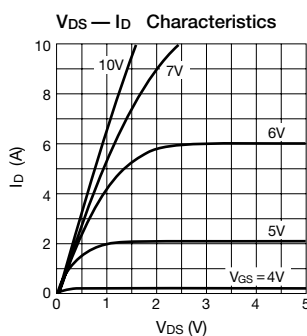
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol                 | Ratings                       | Unit |
|------------------------|-------------------------------|------|
| V <sub>DSS</sub>       | 60                            | V    |
| V <sub>GSS</sub>       | ±20                           | V    |
| I <sub>D</sub>         | ±10                           | A    |
| I <sub>D</sub> (pulse) | ±40 (T <sub>ch</sub> ≤ 150°C) | A    |
| P <sub>D</sub>         | 25 (T <sub>c</sub> = 25°C)    | W    |
| E <sub>AS</sub> *      | 2.1                           | mJ   |
| T <sub>ch</sub>        | 150                           | °C   |
| T <sub>stg</sub>       | -55 to +150                   | °C   |

\*: V<sub>DD</sub> = 25V, L = 50μH, I<sub>L</sub> = 7.0A, unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                 |
|-----------------------|---------|------|------|------|--------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                            |
| V <sub>(BR) DSS</sub> | 60      |      |      | V    | I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V                                               |
| I <sub>GSS</sub>      |         |      | ±500 | nA   | V <sub>GS</sub> = ±20V                                                                     |
| I <sub>DSS</sub>      |         |      | 250  | μA   | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V                                                |
| V <sub>TH</sub>       | 2.0     |      | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 250μA                                              |
| R <sub>e</sub> (yfs)  | 2.2     | 3.3  |      | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 5.0A                                               |
| R <sub>DS(on)</sub>   |         | 0.15 | 0.2  | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 5.0A                                               |
| C <sub>iss</sub>      |         | 300  |      | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                    |
| C <sub>oss</sub>      |         | 160  |      | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                    |
| t <sub>on</sub>       |         | 35   |      | ns   | I <sub>D</sub> = 5A, V <sub>DD</sub> = 30V, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>off</sub>      |         | 35   |      | ns   |                                                                                            |



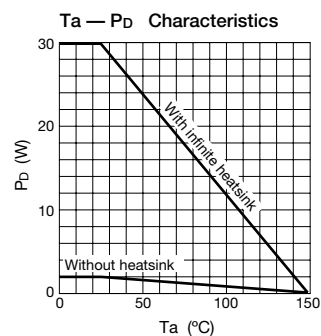
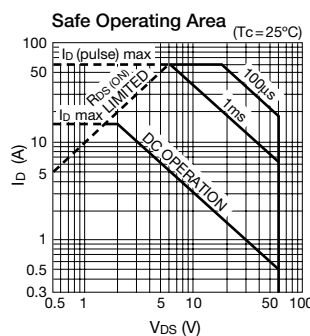
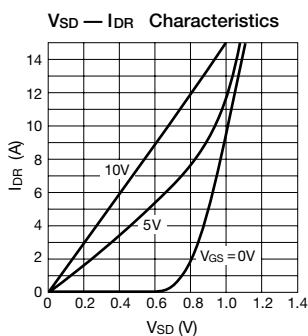
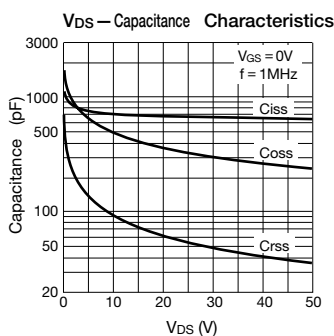
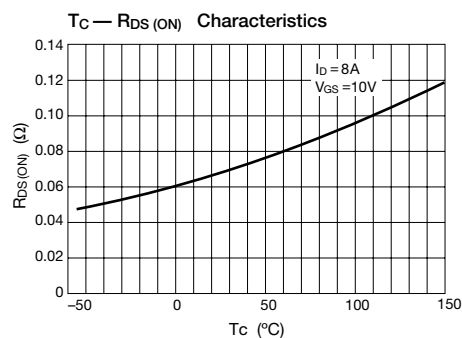
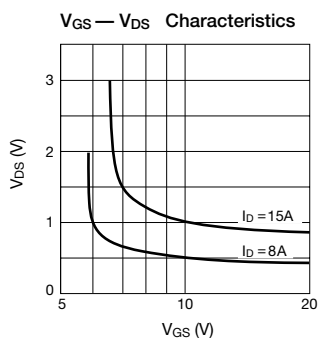
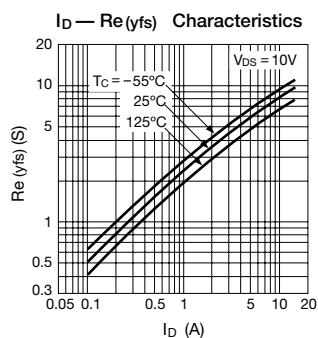
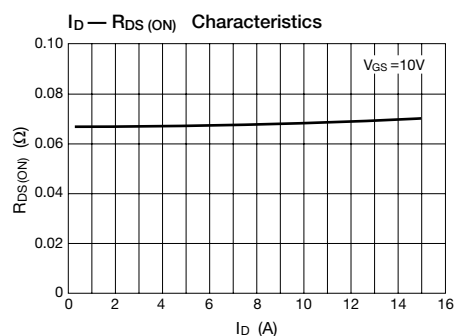
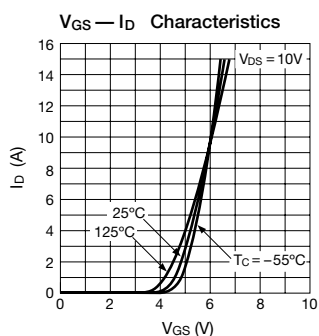
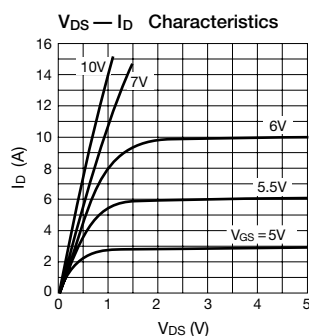
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol        | Ratings                                      | Unit             |
|---------------|----------------------------------------------|------------------|
| $V_{DSS}$     | 60                                           | V                |
| $V_{GSS}$     | $\pm 20$                                     | V                |
| $I_D$         | $\pm 15$                                     | A                |
| $I_D$ (pulse) | $\pm 60$ ( $T_{ch} \leq 150^\circ\text{C}$ ) | A                |
| $P_D$         | 30 ( $T_c = 25^\circ\text{C}$ )              | W                |
| $E_{AS}^*$    | 6.2                                          | mJ               |
| $T_{ch}$      | 150                                          | $^\circ\text{C}$ |
| $T_{stg}$     | -55 to +150                                  | $^\circ\text{C}$ |

\*:  $V_{DD} = 25\text{V}$ ,  $L = 50\mu\text{H}$ ,  $I_L = 12\text{A}$ , unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |      |           | Unit          | Conditions                                                                                        |
|----------------|---------|------|-----------|---------------|---------------------------------------------------------------------------------------------------|
|                | min     | typ  | max       |               |                                                                                                   |
| $V_{(BR) DSS}$ | 60      |      |           | V             | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                                                     |
| $I_{GSS}$      |         |      | $\pm 500$ | nA            | $V_{GS} = \pm 20\text{V}$                                                                         |
| $I_{DSS}$      |         |      | 250       | $\mu\text{A}$ | $V_{DS} = 60\text{V}$ , $V_{GS} = 0\text{V}$                                                      |
| $V_{TH}$       | 2.0     |      | 4.0       | V             | $V_{DS} = 10\text{V}$ , $I_D = 250\mu\text{A}$                                                    |
| $R_e$ (yfs)    | 4.2     | 6.2  |           | S             | $V_{DS} = 10\text{V}$ , $I_D = 8.0\text{A}$                                                       |
| $R_{DS(on)}$   |         | 0.07 | 0.1       | $\Omega$      | $V_{GS} = 10\text{V}$ , $I_D = 8.0\text{A}$                                                       |
| $C_{iss}$      |         | 640  |           | pF            | $V_{DS} = 25\text{V}$ , $f = 1.0\text{MHz}$ ,<br>$V_{GS} = 0\text{V}$                             |
| $C_{oss}$      |         | 350  |           | pF            |                                                                                                   |
| $t_{on}$       |         | 110  |           | ns            | $I_D = 8\text{A}$ , $V_{DD} = 30\text{V}$ ,<br>$V_{GS} = 10\text{V}$ ,<br>See Figure 2 on Page 5. |
| $t_{off}$      |         | 45   |           | ns            |                                                                                                   |



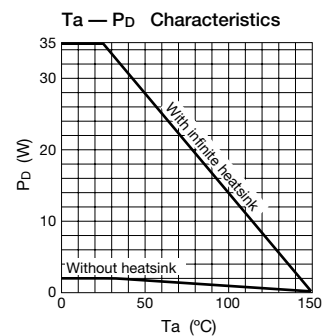
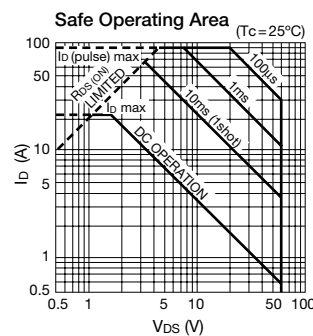
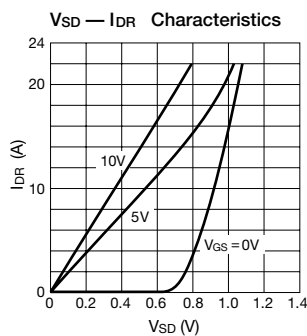
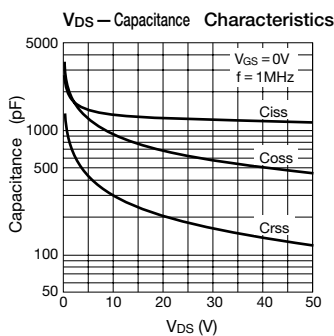
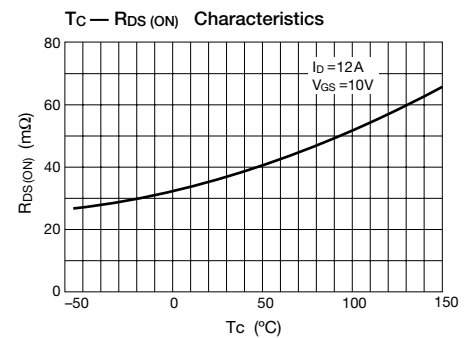
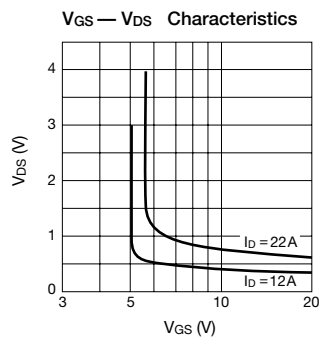
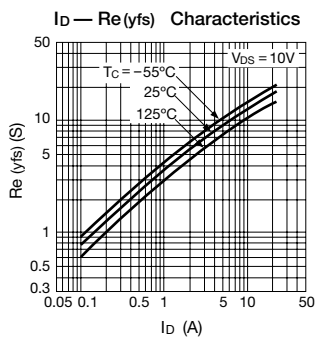
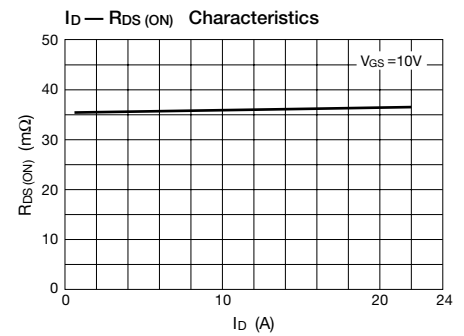
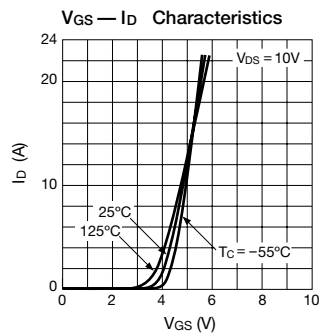
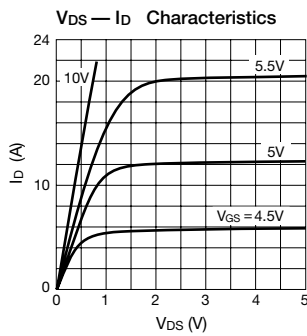
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol        | Ratings                                      | Unit             |
|---------------|----------------------------------------------|------------------|
| $V_{DS}$      | 60                                           | V                |
| $V_{GS}$      | $\pm 20$                                     | V                |
| $I_D$         | $\pm 22$                                     | A                |
| $I_D$ (pulse) | $\pm 88$ ( $T_{ch} \leq 150^\circ\text{C}$ ) | A                |
| $P_D$         | 35 ( $T_c = 25^\circ\text{C}$ )              | W                |
| $E_{AS}^*$    | 17                                           | mJ               |
| $T_{ch}$      | 150                                          | $^\circ\text{C}$ |
| $T_{stg}$     | -55 to +150                                  | $^\circ\text{C}$ |

\*:  $V_{DD} = 25\text{V}$ ,  $L = 50\mu\text{H}$ ,  $I_L = 20\text{A}$ , unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |      |           | Unit          | Conditions                                                                                         |
|----------------|---------|------|-----------|---------------|----------------------------------------------------------------------------------------------------|
|                | min     | typ  | max       |               |                                                                                                    |
| $V_{(BR) DSS}$ | 60      |      |           | V             | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                                                      |
| $I_{GSS}$      |         |      | $\pm 500$ | nA            | $V_{GS} = \pm 20\text{V}$                                                                          |
| $I_{DSS}$      |         |      | 250       | $\mu\text{A}$ | $V_{DS} = 60\text{V}$ , $V_{GS} = 0\text{V}$                                                       |
| $V_{TH}$       | 2.0     |      | 4.0       | V             | $V_{DS} = 10\text{V}$ , $I_D = 250\mu\text{A}$                                                     |
| $R_e$ (yfs)    | 7.3     | 11   |           | S             | $V_{DS} = 10\text{V}$ , $I_D = 12\text{A}$                                                         |
| $R_{DS(on)}$   |         | 0.04 | 0.05      | $\Omega$      | $V_{GS} = 10\text{V}$ , $I_D = 12\text{A}$                                                         |
| $C_{iss}$      |         | 1300 |           | pF            | $V_{DS} = 25\text{V}$ , $f = 1.0\text{MHz}$ ,<br>$V_{GS} = 0\text{V}$                              |
| $C_{oss}$      |         | 650  |           | pF            |                                                                                                    |
| $t_{on}$       |         | 130  |           | ns            | $I_D = 12\text{A}$ , $V_{DD} = 30\text{V}$ ,<br>$V_{GS} = 10\text{V}$ ,<br>See Figure 2 on Page 5. |
| $t_{off}$      |         | 60   |           | ns            |                                                                                                    |



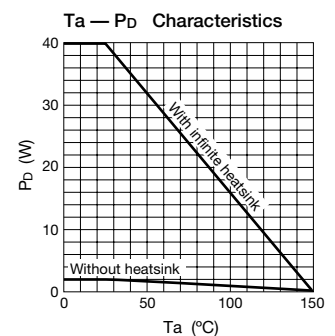
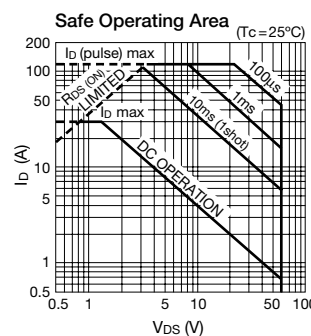
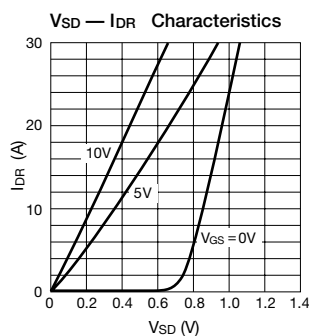
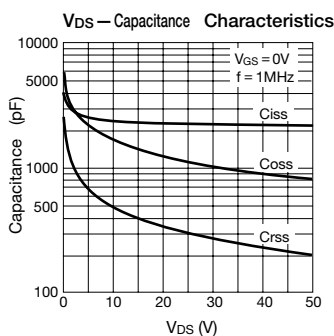
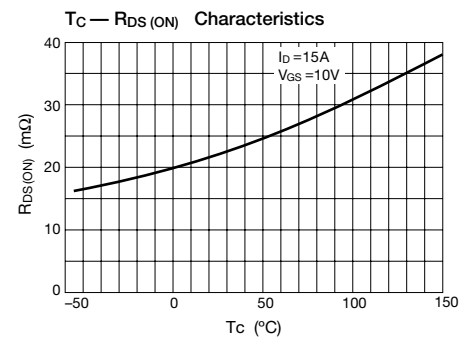
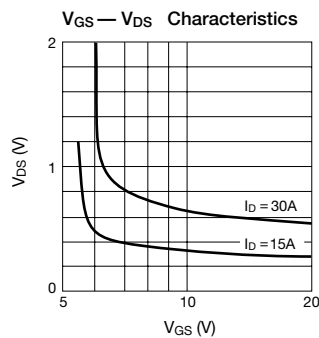
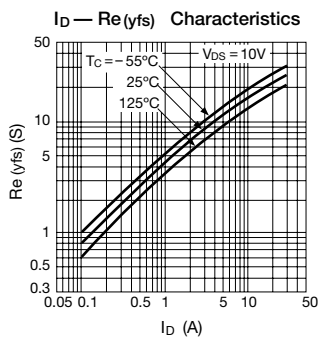
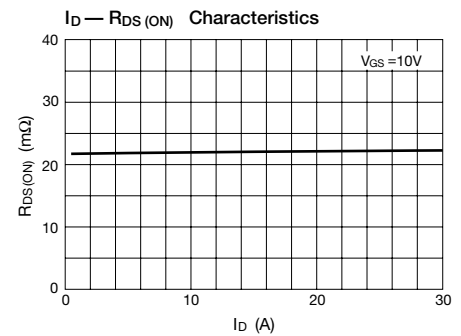
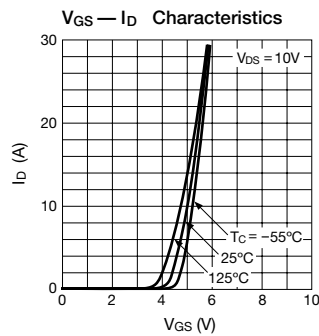
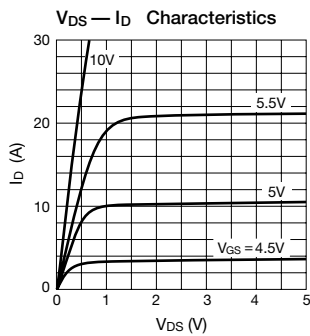
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol                 | Ratings                        | Unit |
|------------------------|--------------------------------|------|
| V <sub>DSS</sub>       | 60                             | V    |
| V <sub>GSS</sub>       | ±20                            | V    |
| I <sub>D</sub>         | ±30                            | A    |
| I <sub>D</sub> (pulse) | ±120 (T <sub>ch</sub> ≤ 150°C) | A    |
| P <sub>D</sub>         | 40 (T <sub>c</sub> = 25°C)     | W    |
| E <sub>AS</sub> *      | 38                             | mJ   |
| T <sub>ch</sub>        | 150                            | °C   |
| T <sub>stg</sub>       | -55 to +150                    | °C   |

\*: V<sub>DD</sub> = 25V, L = 50μH, I<sub>L</sub> = 30A, unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |       |       | Unit | Conditions                                                                                  |
|-----------------------|---------|-------|-------|------|---------------------------------------------------------------------------------------------|
|                       | min     | typ   | max   |      |                                                                                             |
| V <sub>(BR)</sub> DSS | 60      |       |       | V    | I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V                                                |
| I <sub>GSS</sub>      |         |       | ±500  | nA   | V <sub>GS</sub> = ±20V                                                                      |
| I <sub>DSS</sub>      |         |       | 250   | μA   | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V                                                 |
| V <sub>TH</sub>       | 2.0     |       | 4.0   | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 250μA                                               |
| R <sub>e</sub> (yfs)  | 13      | 20    |       | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 15A                                                 |
| R <sub>DS</sub> (on)  |         | 0.021 | 0.028 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 15A                                                 |
| C <sub>iss</sub>      |         | 2500  |       | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                     |
| C <sub>oss</sub>      |         | 1200  |       | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                     |
| t <sub>on</sub>       |         | 180   |       | ns   | I <sub>D</sub> = 15A, V <sub>DD</sub> = 30V, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>off</sub>      |         | 120   |       | ns   |                                                                                             |



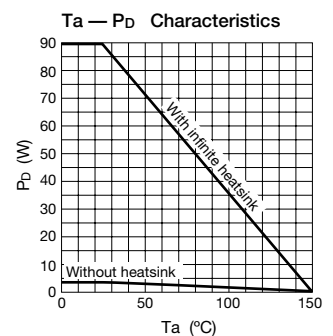
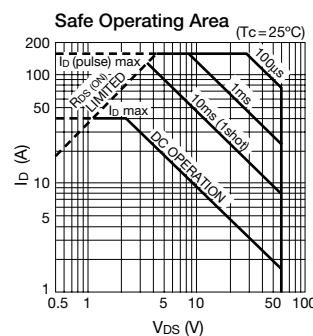
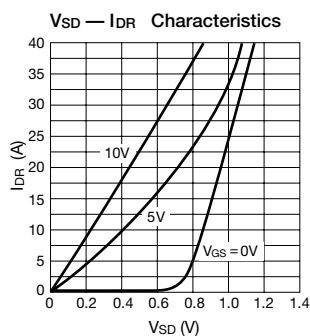
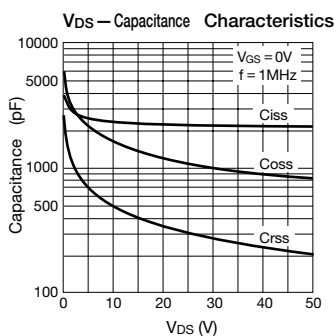
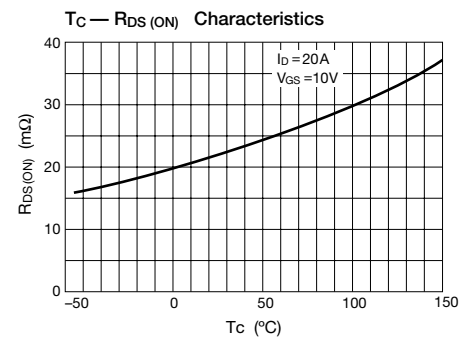
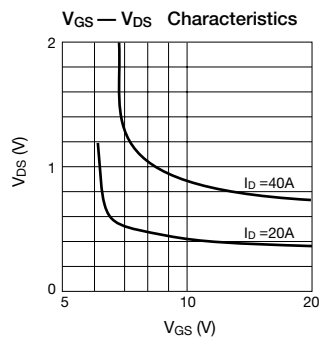
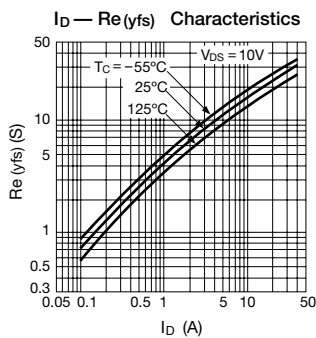
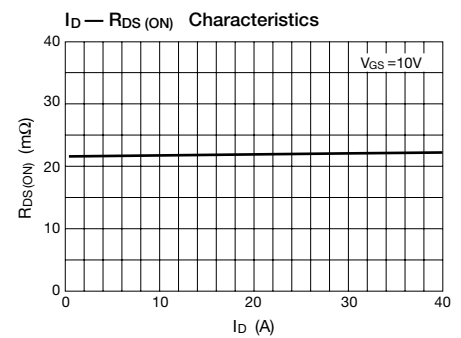
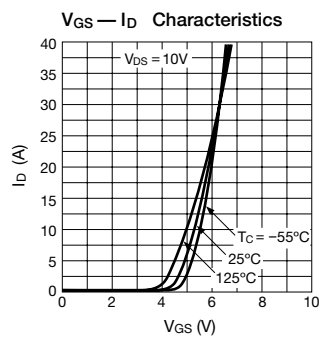
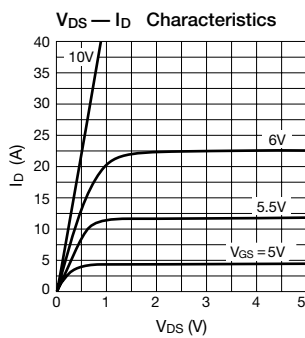
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol                 | Ratings                        | Unit |
|------------------------|--------------------------------|------|
| V <sub>DSS</sub>       | 60                             | V    |
| V <sub>GSS</sub>       | ±20                            | V    |
| I <sub>D</sub>         | ±40                            | A    |
| I <sub>D</sub> (pulse) | ±160 (T <sub>ch</sub> ≤ 150°C) | A    |
| P <sub>D</sub>         | 90 (T <sub>c</sub> = 25°C)     | W    |
| E <sub>AS</sub> *      | 38                             | mJ   |
| T <sub>ch</sub>        | 150                            | °C   |
| T <sub>stg</sub>       | -55 to +150                    | °C   |

\*: V<sub>DD</sub> = 25V, L = 50μH, I<sub>L</sub> = 30A, unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |       |       | Unit | Conditions                                                                                  |
|-----------------------|---------|-------|-------|------|---------------------------------------------------------------------------------------------|
|                       | min     | typ   | max   |      |                                                                                             |
| V <sub>(BR)</sub> DSS | 60      |       |       | V    | I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V                                                |
| I <sub>GSS</sub>      |         |       | ±500  | nA   | V <sub>GS</sub> = ±20V                                                                      |
| I <sub>DSS</sub>      |         |       | 250   | μA   | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V                                                 |
| V <sub>TH</sub>       | 2.0     |       | 4.0   | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 250μA                                               |
| R <sub>e</sub> (yfs)  | 13      | 20    |       | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 20A                                                 |
| R <sub>DS</sub> (on)  |         | 0.021 | 0.028 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A                                                 |
| C <sub>iss</sub>      |         | 2500  |       | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                     |
| C <sub>oss</sub>      |         | 1200  |       | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                     |
| t <sub>on</sub>       |         | 260   |       | ns   | I <sub>D</sub> = 20A, V <sub>DD</sub> = 30V, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>off</sub>      |         | 120   |       | ns   |                                                                                             |



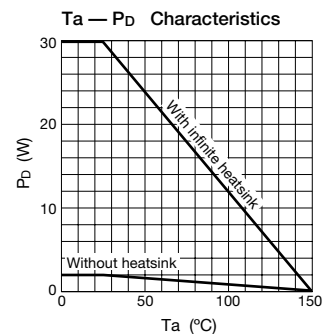
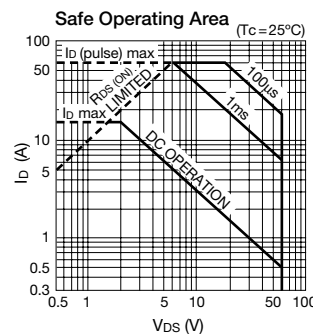
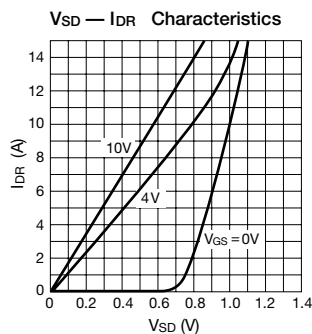
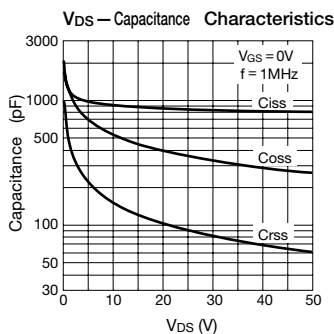
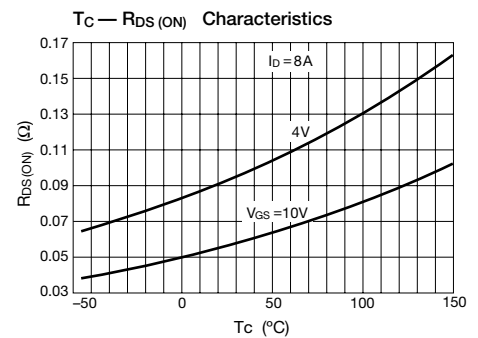
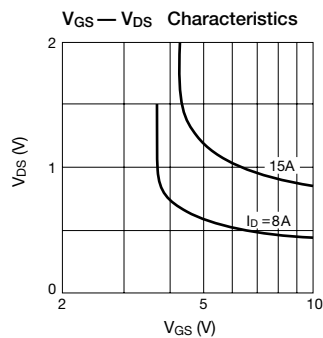
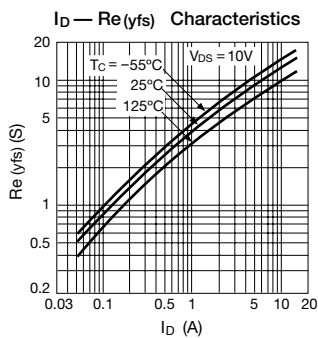
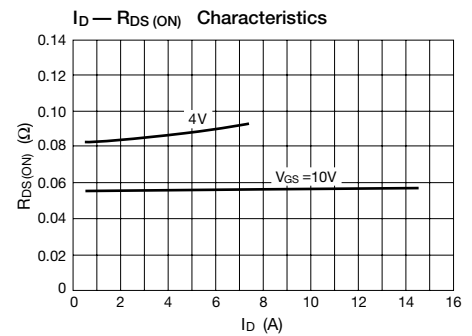
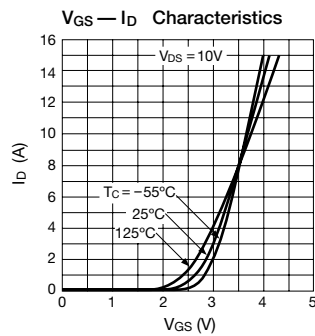
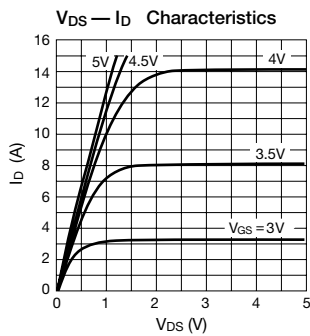
### Absolute Maximum Ratings (Ta = 25°C)

| Symbol                 | Ratings                       | Unit |
|------------------------|-------------------------------|------|
| V <sub>DSS</sub>       | 60                            | V    |
| V <sub>GSS</sub>       | ±10                           | V    |
| I <sub>D</sub>         | ±15                           | A    |
| I <sub>D</sub> (pulse) | ±60 (T <sub>ch</sub> ≤ 150°C) | A    |
| P <sub>D</sub>         | 30 (T <sub>c</sub> = 25°C)    | W    |
| E <sub>AS</sub> *      | 6.2                           | mJ   |
| T <sub>ch</sub>        | 150                           | °C   |
| T <sub>stg</sub>       | -55 to +150                   | °C   |

\*: V<sub>DD</sub> = 25V, L = 50μH, I<sub>L</sub> = 12A, unclamped,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                       |
|-----------------------|---------|------|------|------|--------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                                  |
| V <sub>(BR)</sub> DSS | 60      |      |      | V    | I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V                                                     |
| I <sub>GSS</sub>      |         |      | ±500 | nA   | V <sub>GS</sub> = ±10V                                                                           |
| I <sub>DSS</sub>      |         |      | 250  | μA   | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V                                                      |
| V <sub>TH</sub>       | 1.0     |      | 2.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 250μA                                                    |
| Re (yfs)              | 5.6     | 8.4  |      | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 8.0A                                                     |
| R <sub>DS</sub> (on)  |         | 0.12 | 0.14 | Ω    | V <sub>GS</sub> = 4V, I <sub>D</sub> = 8.0A                                                      |
|                       |         | 0.07 | 0.1  | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 8.0A                                                     |
| Ciss                  |         | 820  |      | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz,<br>V <sub>GS</sub> = 0V                                       |
| Coss                  |         | 360  |      | pF   |                                                                                                  |
| t <sub>on</sub>       |         | 100  |      | ns   | I <sub>D</sub> = 8A, V <sub>DD</sub> = 30V,<br>V <sub>GS</sub> = 10V,<br>See Figure 2 on Page 5. |
| t <sub>off</sub>      |         | 75   |      | ns   |                                                                                                  |



### Absolute Maximum Ratings (Ta = 25°C)

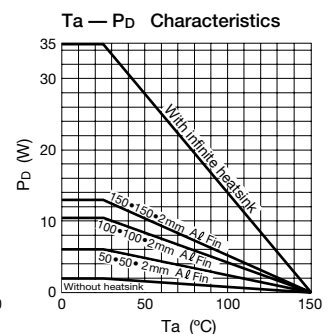
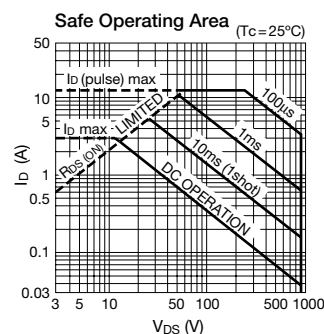
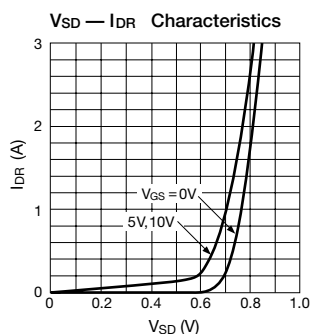
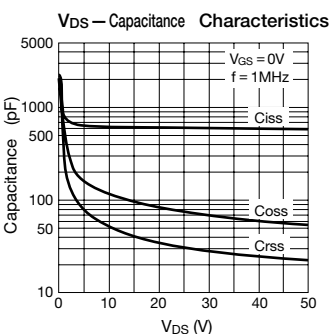
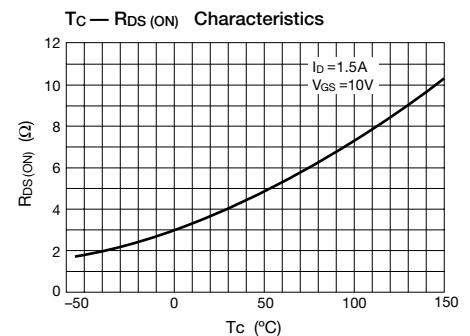
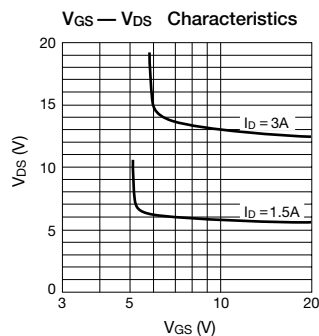
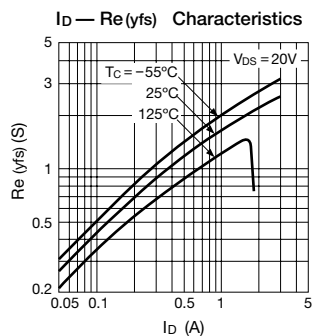
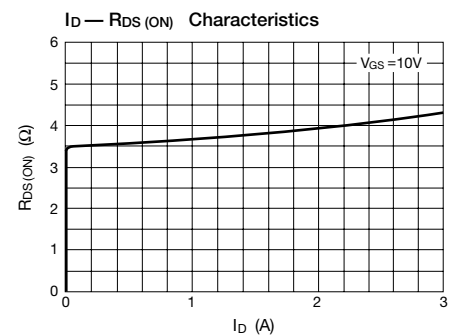
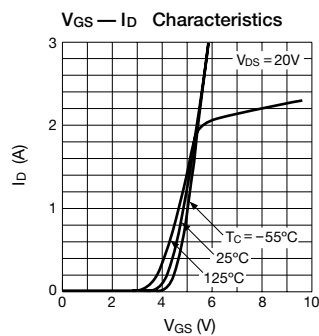
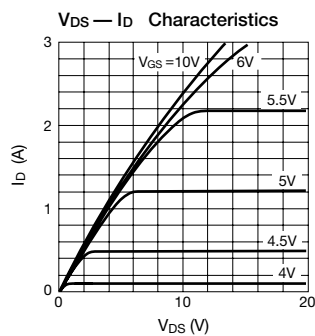
| Symbol           | Ratings        | Unit |
|------------------|----------------|------|
| $V_{DS}$         | 900            | V    |
| $V_{GS}$         | $\pm 30$       | V    |
| $I_D$            | $\pm 3$        | A    |
| $I_D$ (pulse) *1 | $\pm 12$       | A    |
| $P_D$            | 35 (Tc = 25°C) | W    |
| $E_{AS}$ *2      | 280            | mJ   |
| $I_{AS}$         | 3              | A    |
| Tch              | 150            | °C   |
| Tstg             | -55 to +150    | °C   |

\*1:  $P_W \leq 100\mu s$ , duty cycle  $\leq 1\%$

\*2:  $V_{DD} = 50V$ ,  $L = 60mH$ ,  $I_L = 3A$ , unclamped,  $R_G = 50\Omega$ ,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |     |           | Unit     | Conditions                                                                                                |
|----------------|---------|-----|-----------|----------|-----------------------------------------------------------------------------------------------------------|
|                | min     | typ | max       |          |                                                                                                           |
| $V_{(BR) DSS}$ | 900     |     |           | V        | $I_D = 100\mu A$ , $V_{GS} = 0V$                                                                          |
| $I_{GSS}$      |         |     | $\pm 100$ | nA       | $V_{GS} = \pm 30V$                                                                                        |
| $I_{DSS}$      |         |     | 100       | $\mu A$  | $V_{DS} = 900V$ , $V_{GS} = 0V$                                                                           |
| $V_{TH}$       | 2.0     | 3.0 | 4.0       | V        | $V_{DS} = 10V$ , $I_D = 1mA$                                                                              |
| $R_e$ (yfs)    | 1.0     | 2.0 |           | S        | $V_{DS} = 20V$ , $I_D = 1.5A$                                                                             |
| $R_{DS(on)}$   |         | 3.8 | 5.0       | $\Omega$ | $V_{GS} = 10V$ , $I_D = 1.5A$                                                                             |
| $C_{iss}$      |         | 630 |           | pF       | $V_{DS} = 10V$ , $f = 1.0MHz$ ,<br>$V_{GS} = 0V$                                                          |
| $C_{oss}$      |         | 120 |           | pF       |                                                                                                           |
| $C_{rss}$      |         | 52  |           | pF       |                                                                                                           |
| $t_{on}$       |         | 55  |           | ns       | $I_D = 1.5A$ , $V_{DD} \approx 250V$ ,<br>$R_L = 167\Omega$ , $V_{GS} = 10V$ ,<br>See Figure 2 on Page 5. |
| $t_{off}$      |         | 165 |           | ns       |                                                                                                           |



### Absolute Maximum Ratings (Ta = 25°C)

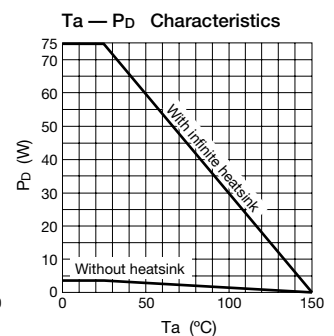
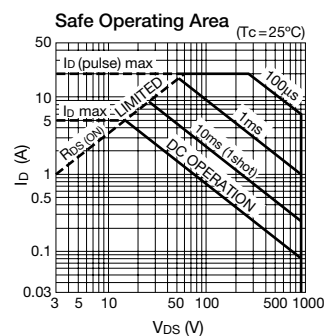
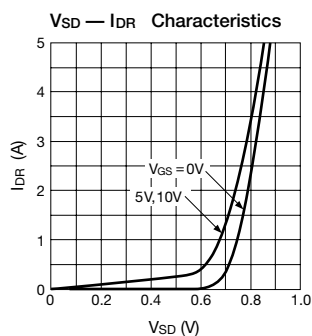
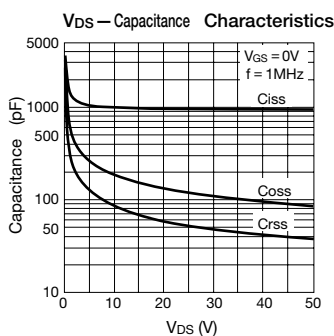
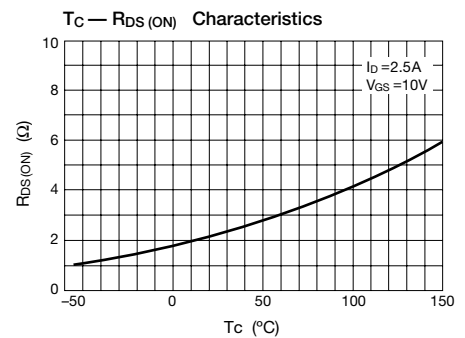
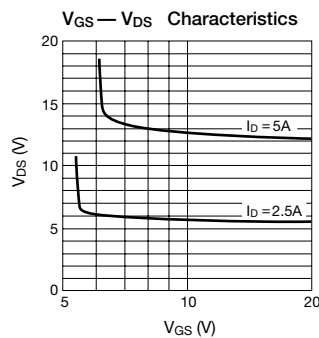
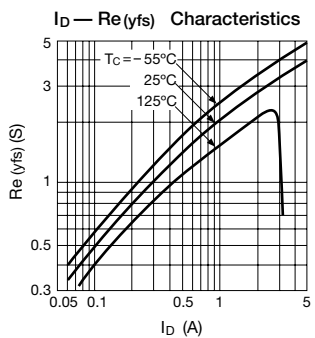
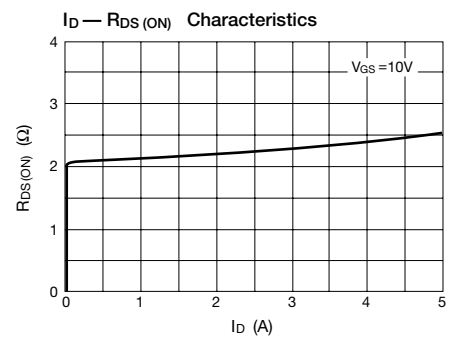
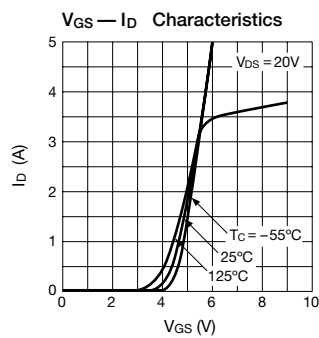
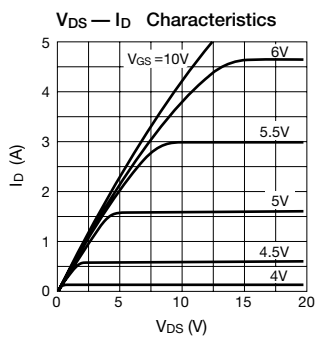
| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 900            | V    |
| V <sub>GSS</sub>          | ±30            | V    |
| I <sub>D</sub>            | ±5             | A    |
| I <sub>D</sub> (pulse) *1 | ±20            | A    |
| P <sub>D</sub>            | 75 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 400            | mJ   |
| I <sub>AS</sub>           | 5              | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1: Pw ≤ 100μs, duty cycle ≤ 1%

\*2: V<sub>DD</sub> = 50V, L = 30mH, I<sub>L</sub> = 5A, unclamped, R<sub>G</sub> = 50Ω, See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                                           |
|-----------------------|---------|------|------|------|----------------------------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                                                      |
| V <sub>(BR)</sub> DSS | 900     |      |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                                                                         |
| I <sub>GSS</sub>      |         |      | ±100 | nA   | V <sub>GS</sub> = ±30V                                                                                               |
| I <sub>DSS</sub>      |         |      | 100  | μA   | V <sub>DS</sub> = 900V, V <sub>GS</sub> = 0V                                                                         |
| V <sub>TH</sub>       | 2.0     | 3.0  | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 1mA                                                                          |
| Re (yfs)              | 2.0     | 3.0  |      | S    | V <sub>DS</sub> = 20V, I <sub>D</sub> = 2.5A                                                                         |
| R <sub>DS</sub> (on)  |         | 2.5  | 3.0  | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 2.5A                                                                         |
| Ciss                  |         | 1000 |      | pF   | V <sub>DS</sub> = 10V, f = 1.0MHz, V <sub>GS</sub> = 0V                                                              |
| Coss                  |         | 190  |      | pF   |                                                                                                                      |
| Crss                  |         | 90   |      | pF   |                                                                                                                      |
| ton                   |         | 60   |      | ns   | I <sub>D</sub> = 2.5A, V <sub>DD</sub> = 250V, R <sub>L</sub> = 100Ω, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| toff                  |         | 155  |      | ns   |                                                                                                                      |



# 2SK2419

External dimensions 1 ..... FM20

## Absolute Maximum Ratings (Ta = 25°C)

| Symbol                   | Ratings        | Unit |
|--------------------------|----------------|------|
| V <sub>DSS</sub>         | 60             | V    |
| V <sub>GSS</sub>         | ±20            | V    |
| I <sub>D</sub>           | ±22            | A    |
| I <sub>D</sub> (pulse) * | ±88            | A    |
| P <sub>D</sub>           | 30 (Tc = 25°C) | W    |
| E <sub>AS</sub>          |                | mJ   |
| T <sub>ch</sub>          | 150            | °C   |
| T <sub>stg</sub>         | -55 to +150    | °C   |

\*: P<sub>w</sub> ≤ 100μs, duty cycle ≤ 1%

## Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                         |
|-----------------------|---------|------|------|------|--------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                    |
| V <sub>(BR)</sub> DSS | 60      |      |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                       |
| I <sub>GSS</sub>      |         |      | ±100 | nA   | V <sub>GS</sub> = ±20V                                             |
| I <sub>DSS</sub>      |         |      | 100  | μA   | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V                        |
| V <sub>TH</sub>       | 2.0     |      | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 250μA                      |
| Re (yfs)              |         |      |      | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 12A                        |
| R <sub>DS</sub> (on)  |         |      | 37   | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 12A                        |
| C <sub>iss</sub>      |         | 1300 |      | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V            |
| C <sub>oss</sub>      |         |      |      | pF   |                                                                    |
| t <sub>on</sub>       |         |      |      | ns   | I <sub>D</sub> = 12A, V <sub>DD</sub> ≈ 30V, V <sub>GS</sub> = 10V |
| t <sub>off</sub>      |         |      |      | ns   |                                                                    |

### Absolute Maximum Ratings (Ta = 25°C)

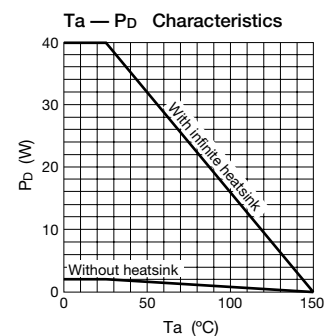
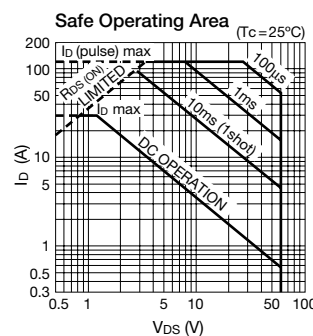
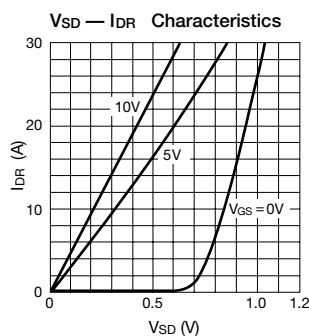
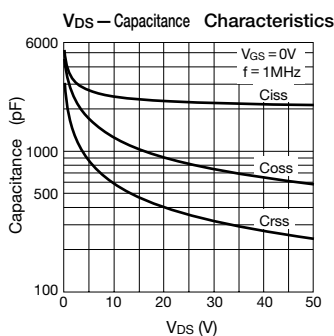
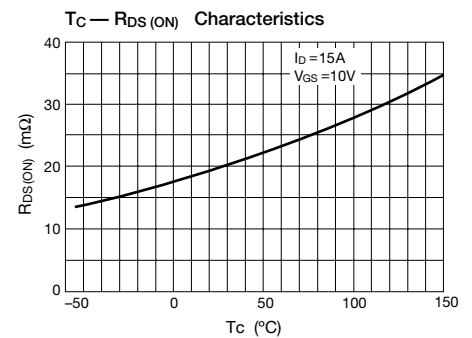
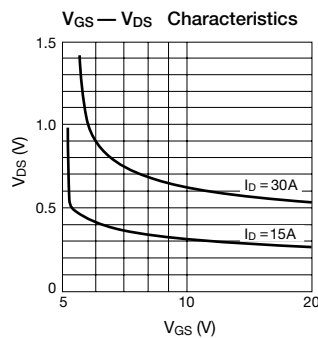
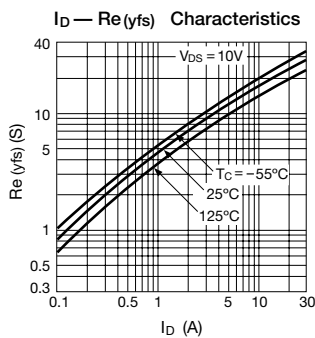
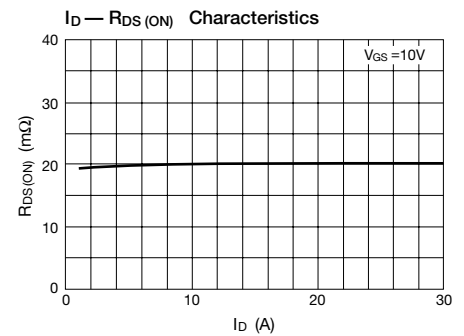
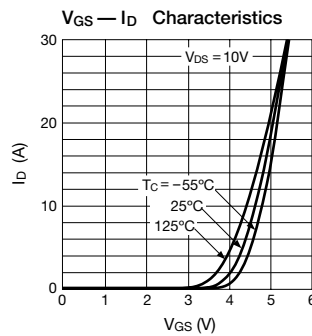
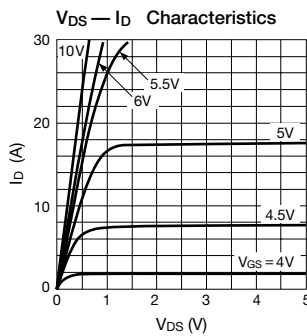
| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 60             | V    |
| V <sub>GSS</sub>          | ±20            | V    |
| I <sub>D</sub>            | ±30            | A    |
| I <sub>D</sub> (pulse) *1 | ±120           | A    |
| P <sub>D</sub>            | 40 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 38             | mJ   |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1: P<sub>W</sub> ≤ 100μs, duty cycle ≤ 1%

\*2: V<sub>DD</sub> = 50V, L = 50μH, I<sub>L</sub> = 30A, unclamped, R<sub>G</sub> = 50Ω, See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                                       |
|-----------------------|---------|------|------|------|------------------------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                                                  |
| V <sub>(BR)</sub> DSS | 60      |      |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                                                                     |
| I <sub>GSS</sub>      |         |      | ±100 | nA   | V <sub>GS</sub> = ±20V                                                                                           |
| I <sub>DSS</sub>      |         |      | 100  | μA   | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V                                                                      |
| V <sub>TH</sub>       | 2.0     |      | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 250μA                                                                    |
| Re (yfs)              | 13      | 20   |      | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 15A                                                                      |
| R <sub>DS</sub> (on)  |         | 21   | 28   | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 15A                                                                      |
| Ciss                  |         | 2200 |      | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                                          |
| Coss                  |         | 850  |      | pF   | V <sub>DS</sub> = 25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                                          |
| t <sub>on</sub>       |         | 210  |      | ns   | I <sub>D</sub> = 15A, V <sub>DD</sub> = 30V, R <sub>L</sub> = 2Ω, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>off</sub>      |         | 145  |      | ns   | I <sub>D</sub> = 15A, V <sub>DD</sub> = 30V, R <sub>L</sub> = 2Ω, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |



### Absolute Maximum Ratings (Ta = 25°C)

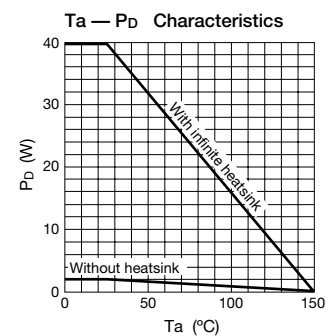
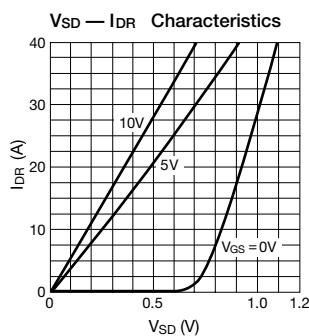
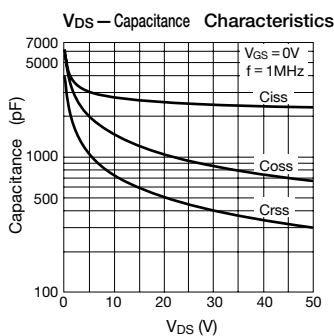
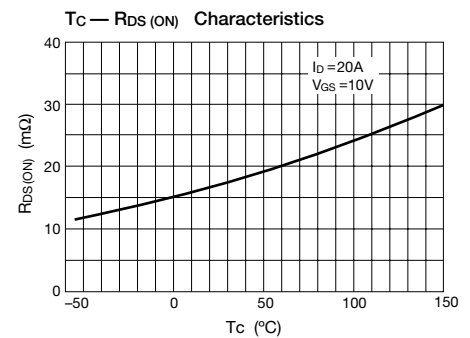
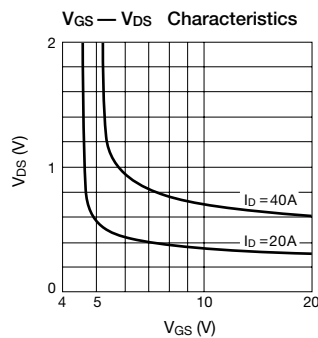
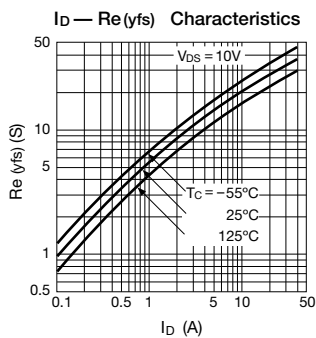
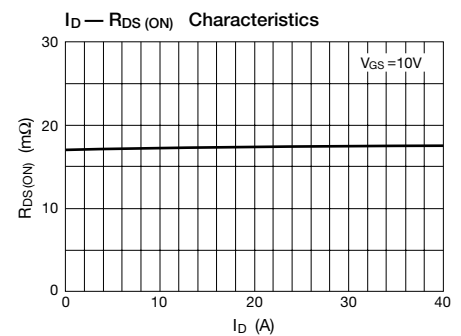
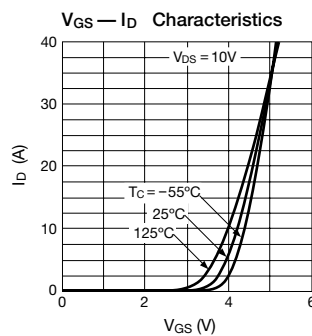
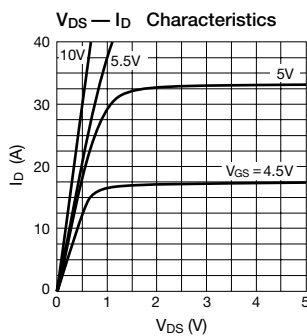
| Symbol           | Ratings        | Unit |
|------------------|----------------|------|
| $V_{DS}$         | 60             | V    |
| $V_{GS}$         | $\pm 20$       | V    |
| $I_D$            | $\pm 40$       | A    |
| $I_D$ (pulse) *1 | $\pm 160$      | A    |
| $P_D$            | 40 (Tc = 25°C) | W    |
| $E_{AS}$ *2      | 60             | mJ   |
| $I_{AS}$         | 40             | A    |
| Tch              | 150            | °C   |
| Tstg             | -55 to +150    | °C   |

\*1:  $P_W \leq 100\mu s$ , duty cycle  $\leq 1\%$

\*2:  $V_{DD} = 20V$ ,  $L = 50\mu H$ ,  $I_L = 40A$ , unclamped,  $R_G = 50\Omega$ , See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |      |           | Unit       | Conditions                                                                                        |
|----------------|---------|------|-----------|------------|---------------------------------------------------------------------------------------------------|
|                | min     | typ  | max       |            |                                                                                                   |
| $V_{(BR) DSS}$ | 60      |      |           | V          | $I_D = 100\mu A$ , $V_{GS} = 0V$                                                                  |
| $I_{GSS}$      |         |      | $\pm 100$ | nA         | $V_{GS} = \pm 20V$                                                                                |
| $I_{DSS}$      |         |      | 100       | $\mu A$    | $V_{DS} = 60V$ , $V_{GS} = 0V$                                                                    |
| $V_{TH}$       | 2.0     |      | 4.0       | V          | $V_{DS} = 10V$ , $I_D = 1mA$                                                                      |
| $R_e$ (yfs)    | 18      | 25   |           | S          | $V_{DS} = 10V$ , $I_D = 20A$                                                                      |
| $R_{DS(on)}$   |         | 17.5 | 20        | m $\Omega$ | $V_{GS} = 10V$ , $I_D = 20A$                                                                      |
| $C_{iss}$      |         | 2400 |           | pF         | $V_{DS} = 25V$ , $f = 1.0MHz$ , $V_{GS} = 0V$                                                     |
| $C_{oss}$      |         | 950  |           | pF         | $V_{DS} = 25V$ , $f = 1.0MHz$ , $V_{GS} = 0V$                                                     |
| $t_{on}$       |         | 400  |           | ns         | $I_D = 20A$ , $V_{DD} \approx 30V$ , $R_L = 1.5\Omega$ , $V_{GS} = 10V$ , See Figure 2 on Page 5. |
| $t_{off}$      |         | 195  |           | ns         | $I_D = 20A$ , $V_{DD} \approx 30V$ , $R_L = 1.5\Omega$ , $V_{GS} = 10V$ , See Figure 2 on Page 5. |



# 2SK2701

External dimensions 1 ..... FM20

## Absolute Maximum Ratings (Ta = 25°C)

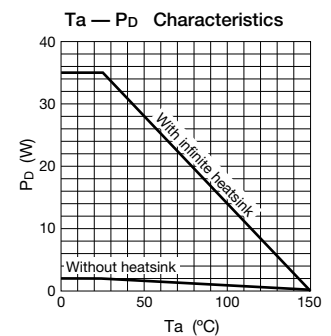
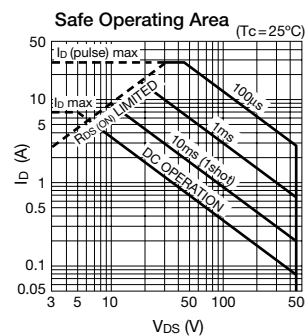
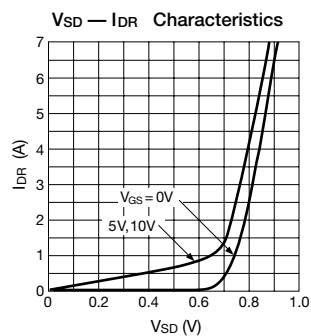
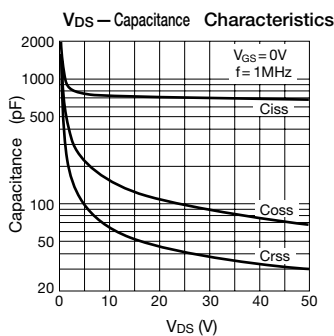
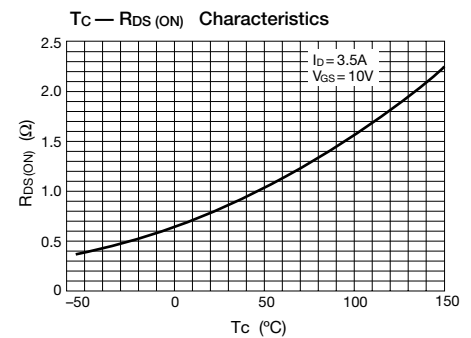
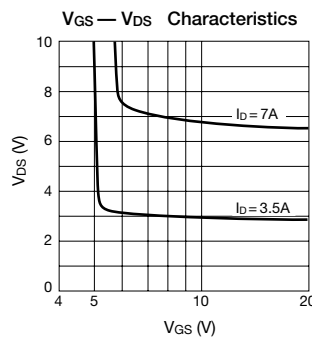
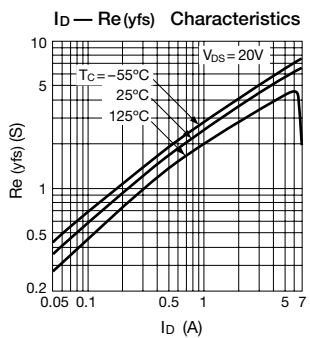
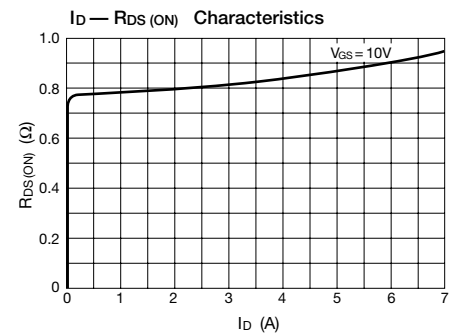
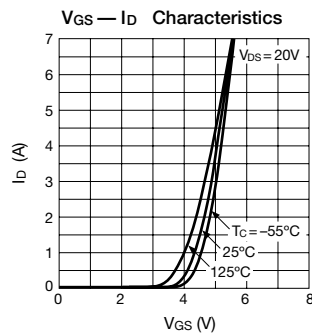
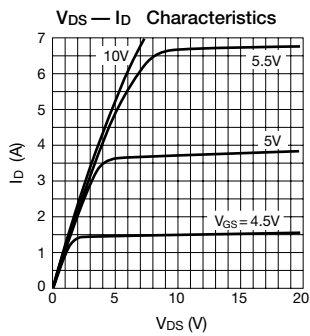
| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 450            | V    |
| V <sub>GSS</sub>          | ±30            | V    |
| I <sub>D</sub>            | ±7             | A    |
| I <sub>D</sub> (pulse) *1 | ±28            | A    |
| P <sub>D</sub>            | 35 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 130            | mJ   |
| I <sub>AS</sub>           | 7              | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1: P<sub>W</sub> ≤ 100μs, duty cycle ≤ 1%

\*2: V<sub>DD</sub> = 30V, L = 5mH, I<sub>L</sub> = 7A, unclamped, R<sub>G</sub> = 50Ω, See Figure 1 on Page 5.

## Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                                          |
|-----------------------|---------|------|------|------|---------------------------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                                                     |
| V <sub>(BR) DSS</sub> | 450     |      |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                                                                        |
| I <sub>GSS</sub>      |         |      | ±100 | nA   | V <sub>GS</sub> = ±30V                                                                                              |
| I <sub>DSS</sub>      |         |      | 100  | μA   | V <sub>DS</sub> = 450V, V <sub>GS</sub> = 0V                                                                        |
| V <sub>TH</sub>       | 2.0     | 3.0  | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 1mA                                                                         |
| Re (yfs)              | 3.5     | 5    |      | S    | V <sub>DS</sub> = 20V, I <sub>D</sub> = 3.5A                                                                        |
| R <sub>DS</sub> (on)  |         | 0.84 | 1.10 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 3.5A                                                                        |
| Ciss                  |         | 720  |      | pF   | V <sub>DS</sub> = 10V, f = 1.0MHz, V <sub>GS</sub> = 0V                                                             |
| Coss                  |         | 150  |      | pF   |                                                                                                                     |
| Crss                  |         | 65   |      | pF   |                                                                                                                     |
| t <sub>d</sub> (on)   |         | 25   |      | ns   | I <sub>D</sub> = 3.5A, V <sub>DD</sub> = 200V, R <sub>L</sub> = 57Ω, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>r</sub>        |         | 40   |      | ns   |                                                                                                                     |
| t <sub>d</sub> (off)  |         | 70   |      | ns   |                                                                                                                     |
| t <sub>f</sub>        |         | 50   |      | ns   |                                                                                                                     |
| V <sub>SD</sub>       |         | 1.0  | 1.5  | V    | I <sub>SD</sub> = 7A, V <sub>GS</sub> = 0V                                                                          |



### Absolute Maximum Ratings (Ta = 25°C)

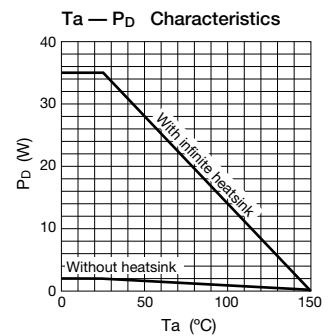
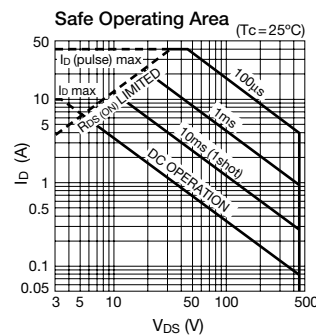
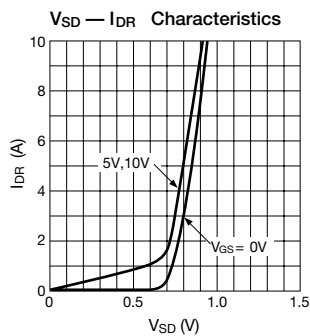
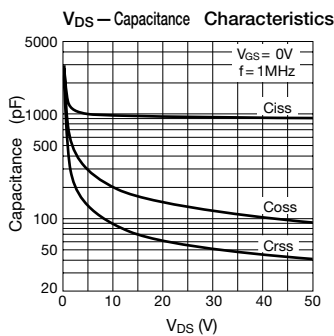
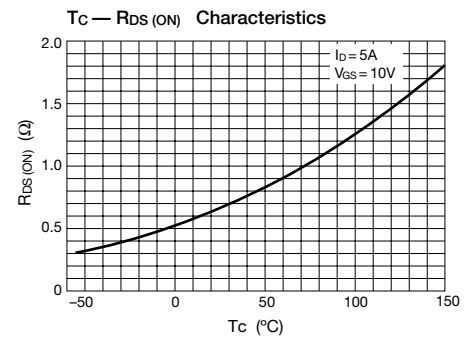
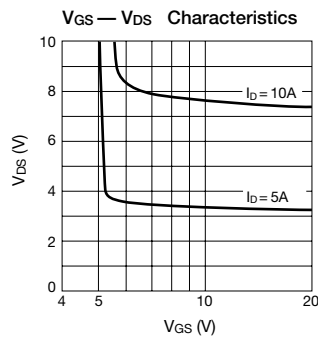
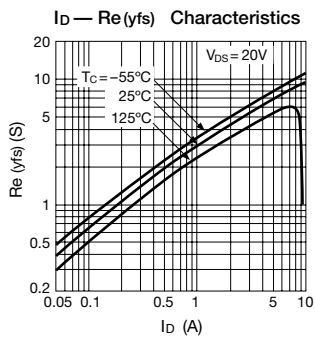
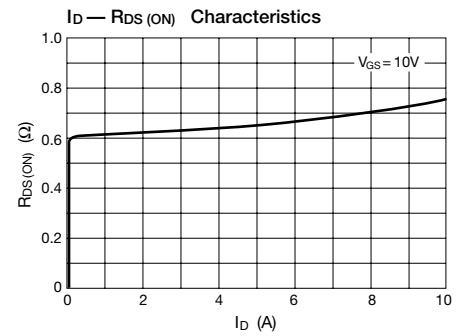
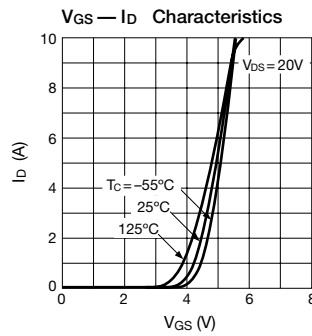
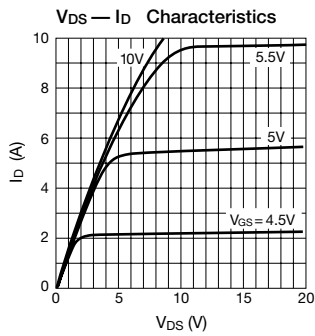
| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 450            | V    |
| V <sub>GSS</sub>          | ±30            | V    |
| I <sub>D</sub>            | ±10            | A    |
| I <sub>D</sub> (pulse) *1 | ±40            | A    |
| P <sub>D</sub>            | 35 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 300            | mJ   |
| I <sub>AS</sub>           | 10             | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1: P<sub>W</sub> ≤ 100μs, duty cycle ≤ 1%

\*2: V<sub>DD</sub> = 30V, L = 6mH, I<sub>L</sub> = 10A, unclamped, R<sub>G</sub> = 50Ω, See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                                        |
|-----------------------|---------|------|------|------|-------------------------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                                                   |
| V <sub>(BR)</sub> DSS | 450     |      |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                                                                      |
| I <sub>GSS</sub>      |         |      | ±100 | nA   | V <sub>GS</sub> = ±30V                                                                                            |
| I <sub>DSS</sub>      |         |      | 100  | μA   | V <sub>DS</sub> = 450V, V <sub>GS</sub> = 0V                                                                      |
| V <sub>TH</sub>       | 2.0     | 3.0  | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 1mA                                                                       |
| Re (yfs)              | 5       | 7    |      | S    | V <sub>DS</sub> = 20V, I <sub>D</sub> = 5A                                                                        |
| R <sub>DS</sub> (on)  |         | 0.66 | 0.80 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 5A                                                                        |
| Ciss                  |         | 1000 |      | pF   | V <sub>DS</sub> = 10V, f = 1.0MHz, V <sub>GS</sub> = 0V                                                           |
| Coss                  |         | 200  |      | pF   |                                                                                                                   |
| Crss                  |         | 95   |      | pF   |                                                                                                                   |
| t <sub>d</sub> (on)   |         | 25   |      | ns   |                                                                                                                   |
| t <sub>r</sub>        |         | 30   |      | ns   | I <sub>D</sub> = 5A, V <sub>DD</sub> = 200V, R <sub>L</sub> = 40Ω, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>d</sub> (off)  |         | 85   |      | ns   |                                                                                                                   |
| t <sub>f</sub>        |         | 45   |      | ns   |                                                                                                                   |
| V <sub>SD</sub>       |         | 1.0  | 1.5  | V    | I <sub>SD</sub> = 10A, V <sub>GS</sub> = 0V                                                                       |



# 2SK2703

External dimensions 2 ..... FM100

## Absolute Maximum Ratings (Ta = 25°C)

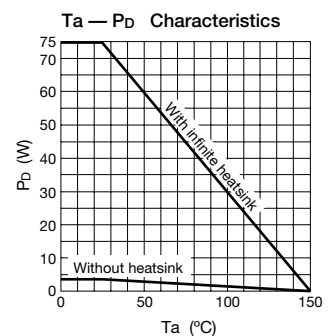
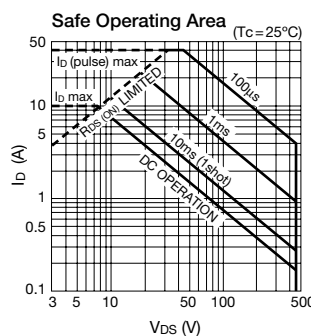
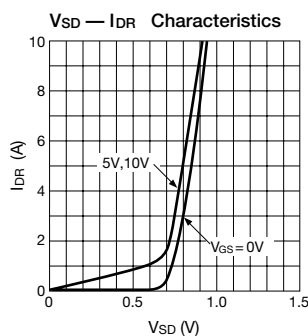
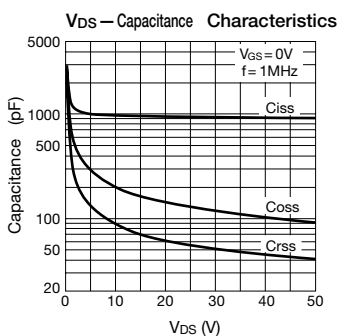
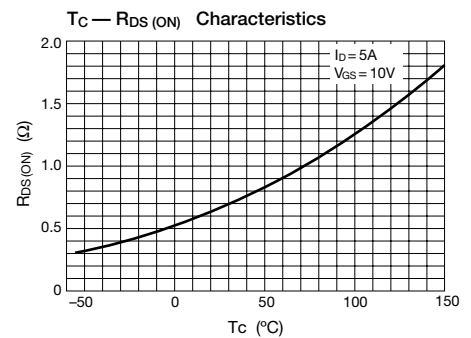
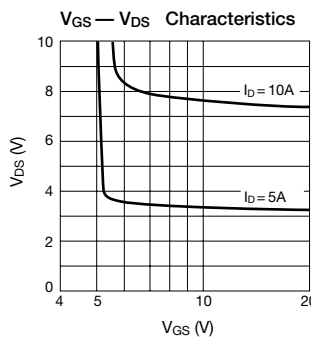
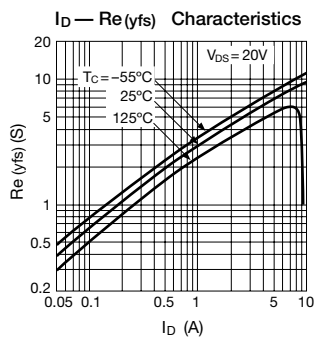
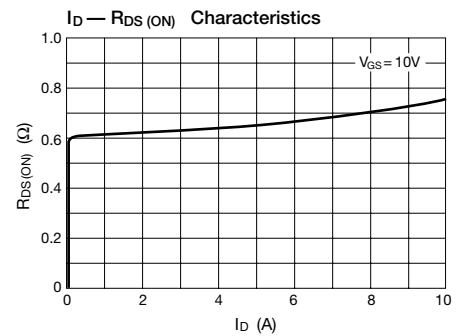
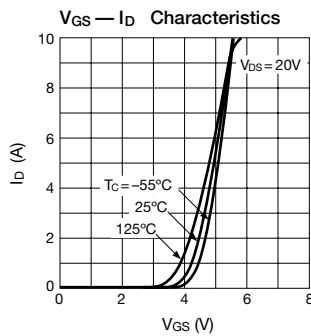
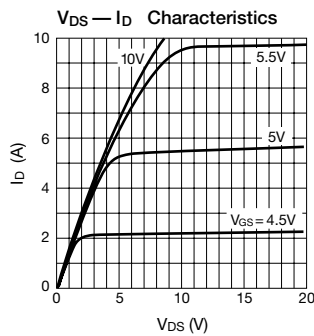
| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 450            | V    |
| V <sub>GSS</sub>          | ±30            | V    |
| I <sub>D</sub>            | ±10            | A    |
| I <sub>D</sub> (pulse) *1 | ±40            | A    |
| P <sub>D</sub>            | 75 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 300            | mJ   |
| I <sub>AS</sub>           | 10             | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1:  $PW \leq 100\mu s$ , duty cycle  $\leq 1\%$

\*2:  $V_{DD} = 30V$ ,  $L = 6mH$ ,  $I_L = 10A$ , unclamped,  $R_G = 50\Omega$ , See Figure 1 on Page 5.

## Electrical Characteristics (Ta = 25°C)

| Symbol               | Ratings |      |      | Unit     | Conditions                                                                                 |
|----------------------|---------|------|------|----------|--------------------------------------------------------------------------------------------|
|                      | min     | typ  | max  |          |                                                                                            |
| V(BR) DSS            | 450     |      |      | V        | $I_D = 100\mu A$ , $V_{GS} = 0V$                                                           |
| I <sub>GSS</sub>     |         |      | ±100 | nA       | $V_{GS} = \pm 30V$                                                                         |
| I <sub>DSS</sub>     |         |      | 100  | $\mu A$  | $V_{DS} = 450V$ , $V_{GS} = 0V$                                                            |
| V <sub>TH</sub>      | 2.0     | 3.0  | 4.0  | V        | $V_{DS} = 10V$ , $I_D = 1mA$                                                               |
| Re (yfs)             | 5       | 7    |      | S        | $V_{DS} = 20V$ , $I_D = 5A$                                                                |
| R <sub>DS</sub> (on) |         | 0.66 | 0.80 | $\Omega$ | $V_{GS} = 10V$ , $I_D = 5A$                                                                |
| Ciss                 |         | 1000 |      | pF       | $V_{DS} = 10V$ , $f = 1.0MHz$ , $V_{GS} = 0V$                                              |
| Coss                 |         | 200  |      | pF       |                                                                                            |
| Crss                 |         | 95   |      | pF       |                                                                                            |
| t <sub>d</sub> (on)  |         | 25   |      | ns       | $I_D = 5A$ , $V_{DD} = 200V$ , $R_L = 40\Omega$ , $V_{GS} = 10V$ , See Figure 2 on Page 5. |
| t <sub>r</sub>       |         | 30   |      | ns       |                                                                                            |
| t <sub>d</sub> (off) |         | 85   |      | ns       |                                                                                            |
| t <sub>f</sub>       |         | 45   |      | ns       |                                                                                            |
| V <sub>SD</sub>      |         | 1.0  | 1.5  | V        | $I_{SD} = 10A$ , $V_{GS} = 0V$                                                             |



### Absolute Maximum Ratings (Ta = 25°C)

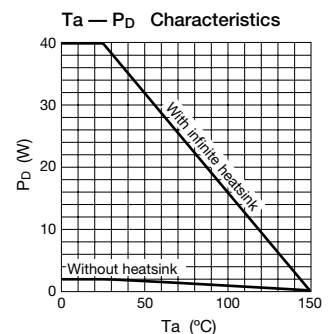
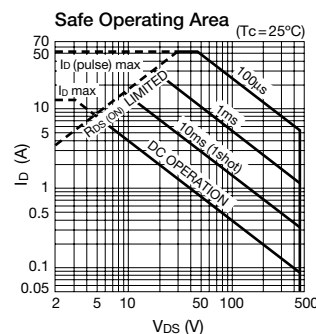
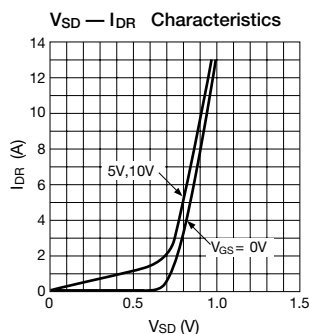
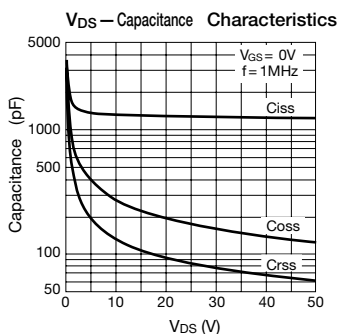
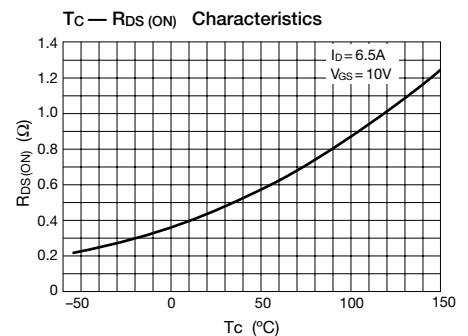
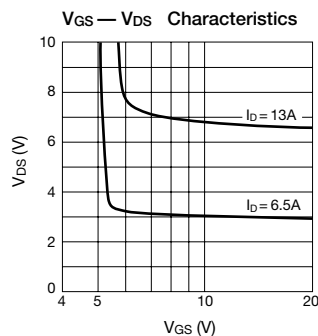
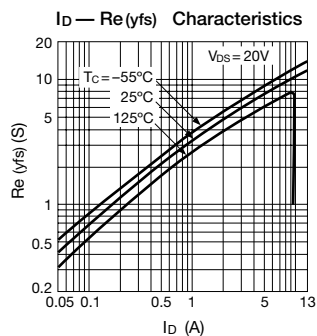
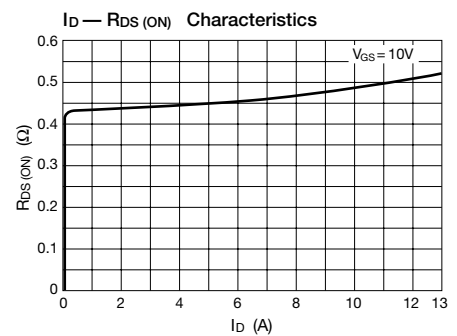
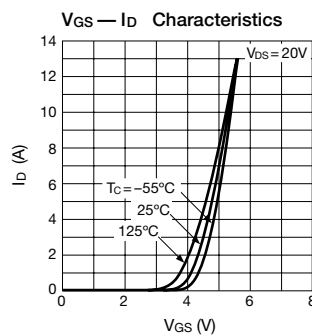
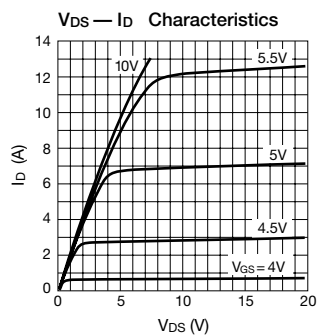
| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 450            | V    |
| V <sub>GSS</sub>          | ±30            | V    |
| I <sub>D</sub>            | ±13            | A    |
| I <sub>D</sub> (pulse) *1 | ±52            | A    |
| P <sub>D</sub>            | 40 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 400            | mJ   |
| I <sub>AS</sub>           | 13             | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1:  $PW \leq 100\mu s$ , duty cycle  $\leq 1\%$

\*2:  $V_{DD} = 30V$ ,  $L = 4.5mH$ ,  $I_L = 13A$ , unclamped,  $R_G = 50\Omega$ , See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit     | Conditions                                                                                         |
|-----------------------|---------|------|------|----------|----------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |          |                                                                                                    |
| V <sub>(BR)</sub> DSS | 450     |      |      | V        | $I_D = 100\mu A$ , $V_{GS} = 0V$                                                                   |
| I <sub>GSS</sub>      |         |      | ±100 | nA       | $V_{GS} = \pm 30V$                                                                                 |
| I <sub>DSS</sub>      |         |      | 100  | $\mu A$  | $V_{DS} = 450V$ , $V_{GS} = 0V$                                                                    |
| V <sub>TH</sub>       | 2.0     | 3.0  | 4.0  | V        | $V_{DS} = 10V$ , $I_D = 1mA$                                                                       |
| Re (yfs)              | 6.0     | 9.0  |      | S        | $V_{DS} = 20V$ , $I_D = 6.5A$                                                                      |
| R <sub>DS</sub> (on)  |         | 0.48 | 0.57 | $\Omega$ | $V_{GS} = 10V$ , $I_D = 6.5A$                                                                      |
| Ciss                  |         | 1300 |      | pF       | $V_{DS} = 10V$ , $f = 1.0MHz$ , $V_{GS} = 0V$                                                      |
| Coss                  |         | 280  |      | pF       |                                                                                                    |
| Crss                  |         | 130  |      | pF       |                                                                                                    |
| t <sub>d</sub> (on)   |         | 30   |      | ns       |                                                                                                    |
| t <sub>r</sub>        |         | 40   |      | ns       | $I_D = 6.5A$ , $V_{DD} \approx 200V$ , $R_L = 30\Omega$ , $V_{GS} = 10V$ , See Figure 2 on Page 5. |
| t <sub>d</sub> (off)  |         | 95   |      | ns       |                                                                                                    |
| t <sub>f</sub>        |         | 50   |      | ns       |                                                                                                    |
| V <sub>SD</sub>       |         | 1.0  | 1.5  | V        | $I_{SD} = 13A$ , $V_{GS} = 0V$                                                                     |



# 2SK2705

External dimensions 2 ..... FM100

## Absolute Maximum Ratings (Ta = 25°C)

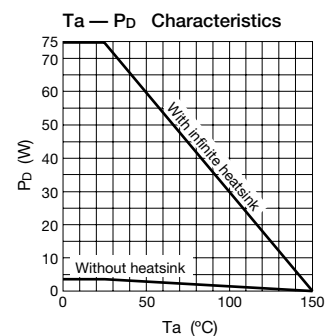
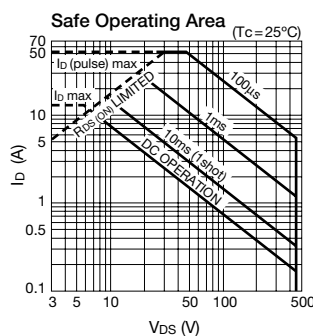
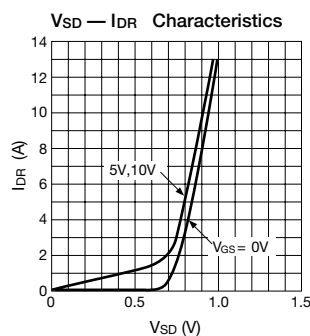
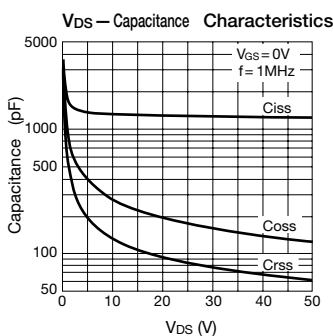
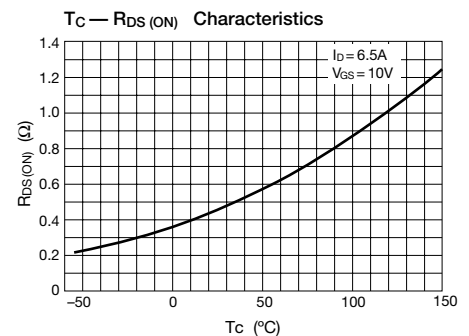
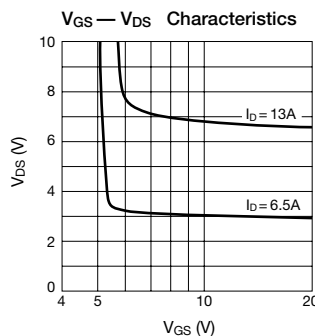
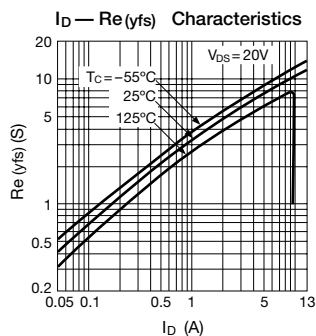
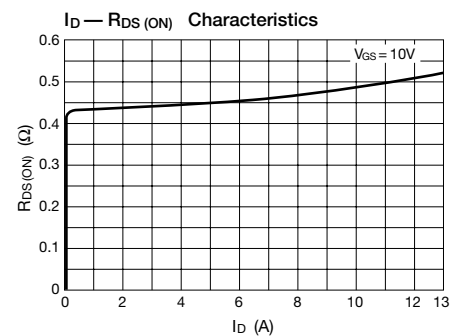
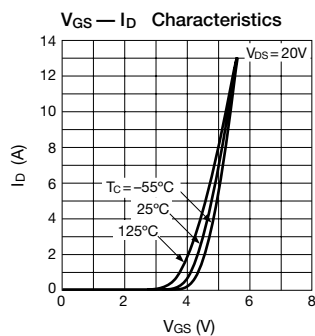
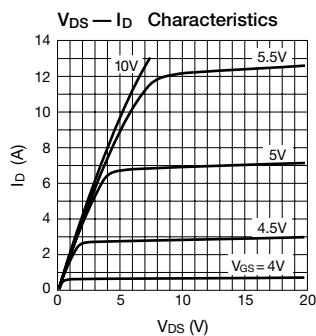
| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 450            | V    |
| V <sub>GSS</sub>          | ±30            | V    |
| I <sub>D</sub>            | ±13            | A    |
| I <sub>D</sub> (pulse) *1 | ±52            | A    |
| P <sub>D</sub>            | 75 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 400            | mJ   |
| I <sub>AS</sub>           | 13             | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1: Pw ≤ 100μs, duty cycle ≤ 1%

\*2: V<sub>DD</sub> = 30V, L = 4.5mH, I<sub>L</sub> = 13A, unclamped, R<sub>G</sub> = 50Ω, See Figure 1 on Page 5.

## Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                                          |
|-----------------------|---------|------|------|------|---------------------------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                                                     |
| V <sub>(BR)</sub> DSS | 450     |      |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                                                                        |
| I <sub>GSS</sub>      |         |      | ±100 | nA   | V <sub>GS</sub> = ±30V                                                                                              |
| I <sub>DSS</sub>      |         |      | 100  | μA   | V <sub>DS</sub> = 450V, V <sub>GS</sub> = 0V                                                                        |
| V <sub>TH</sub>       | 2.0     | 3.0  | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 1mA                                                                         |
| Re (yfs)              | 6.0     | 9.0  |      | S    | V <sub>DS</sub> = 20V, I <sub>D</sub> = 6.5A                                                                        |
| R <sub>DS</sub> (on)  |         | 0.48 | 0.57 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 6.5A                                                                        |
| Ciss                  |         | 1300 |      | pF   | V <sub>DS</sub> = 10V, f = 1.0MHz, V <sub>GS</sub> = 0V                                                             |
| Coss                  |         | 280  |      | pF   |                                                                                                                     |
| Crss                  |         | 130  |      | pF   |                                                                                                                     |
| t <sub>d</sub> (on)   |         | 30   |      | ns   | I <sub>D</sub> = 6.5A, V <sub>DD</sub> = 200V, R <sub>L</sub> = 30Ω, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>r</sub>        |         | 40   |      | ns   |                                                                                                                     |
| t <sub>d</sub> (off)  |         | 95   |      | ns   |                                                                                                                     |
| t <sub>f</sub>        |         | 50   |      | ns   |                                                                                                                     |
| V <sub>SD</sub>       |         | 1.0  | 1.5  | V    | I <sub>SD</sub> = 13A, V <sub>GS</sub> = 0V                                                                         |



# 2SK2706

External dimensions 2 ..... FM100

## Absolute Maximum Ratings (Ta = 25°C)

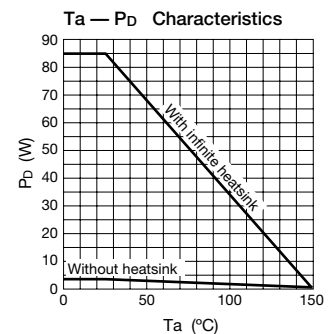
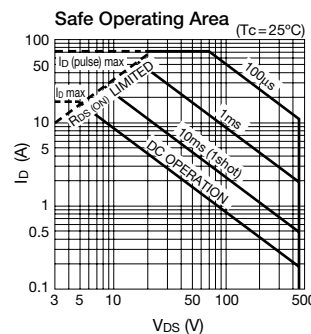
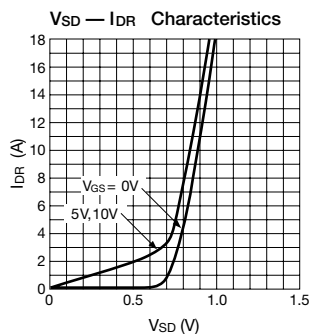
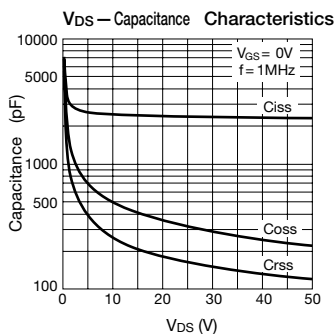
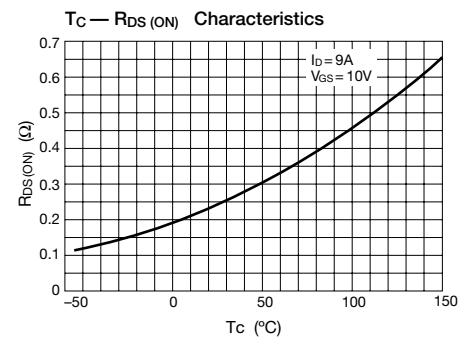
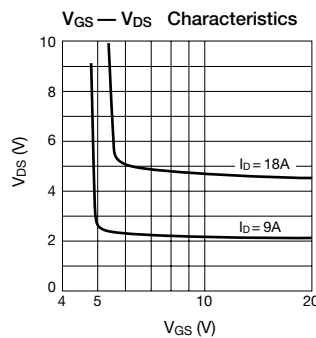
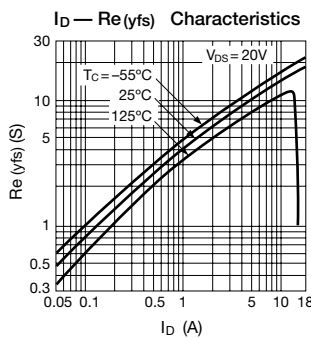
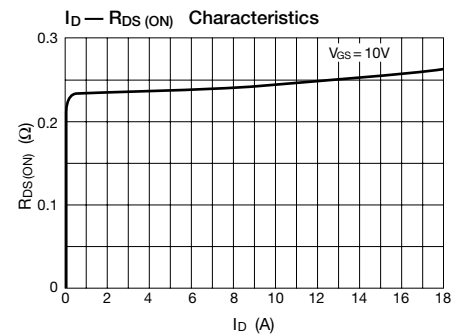
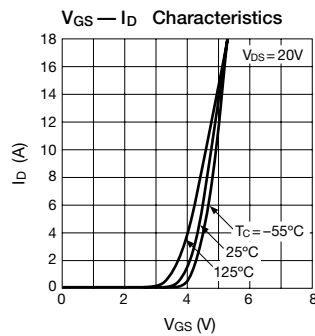
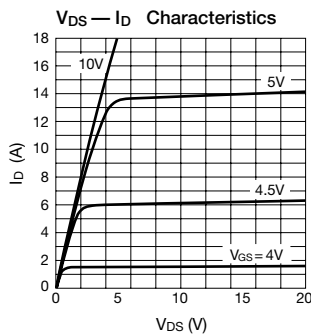
| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 450            | V    |
| V <sub>GSS</sub>          | ±30            | V    |
| I <sub>D</sub>            | ±18            | A    |
| I <sub>D</sub> (pulse) *1 | ±72            | A    |
| P <sub>D</sub>            | 85 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 700            | mJ   |
| I <sub>AS</sub>           | 18             | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1: Pw ≤ 100μs, duty cycle ≤ 1%

\*2: V<sub>DD</sub> = 30V, L = 4mH, I<sub>L</sub> = 18A, unclamped, R<sub>G</sub> = 50Ω, See Figure 1 on Page 5.

## Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                                        |
|-----------------------|---------|------|------|------|-------------------------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                                                   |
| V <sub>(BR) DSS</sub> | 450     |      |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                                                                      |
| I <sub>GSS</sub>      |         |      | ±100 | nA   | V <sub>GS</sub> = ±30V                                                                                            |
| I <sub>DSS</sub>      |         |      | 100  | μA   | V <sub>DS</sub> = 450V, V <sub>GS</sub> = 0V                                                                      |
| V <sub>TH</sub>       | 2.0     | 3.0  | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 1mA                                                                       |
| Re (yfs)              | 10      | 15   |      | S    | V <sub>DS</sub> = 20V, I <sub>D</sub> = 9A                                                                        |
| R <sub>DS</sub> (on)  |         | 0.24 | 0.30 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 9A                                                                        |
| C <sub>iss</sub>      |         | 2500 |      | pF   | V <sub>DS</sub> = 10V, f = 1.0MHz, V <sub>GS</sub> = 0V                                                           |
| C <sub>oss</sub>      |         | 500  |      | pF   |                                                                                                                   |
| C <sub>rss</sub>      |         | 260  |      | pF   |                                                                                                                   |
| t <sub>d</sub> (on)   |         | 40   |      | ns   | I <sub>D</sub> = 9A, V <sub>DD</sub> = 200V, R <sub>L</sub> = 22Ω, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>r</sub>        |         | 60   |      | ns   |                                                                                                                   |
| t <sub>d</sub> (off)  |         | 170  |      | ns   |                                                                                                                   |
| t <sub>f</sub>        |         | 85   |      | ns   |                                                                                                                   |
| V <sub>SD</sub>       |         | 1.0  | 1.5  | V    | I <sub>SD</sub> = 18A, V <sub>GS</sub> = 0V                                                                       |



### Absolute Maximum Ratings (Ta = 25°C)

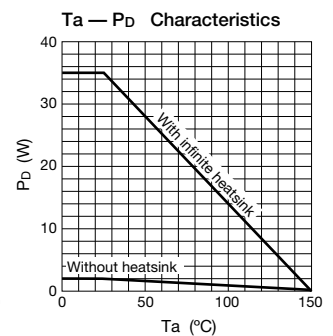
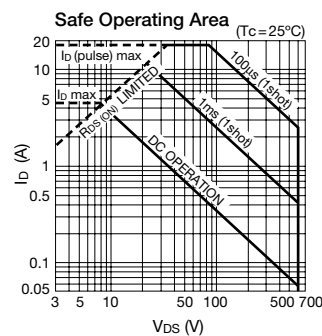
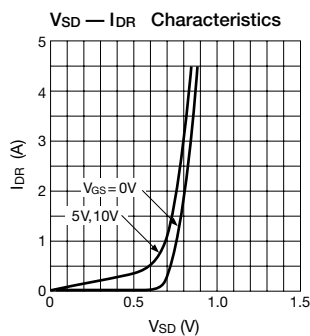
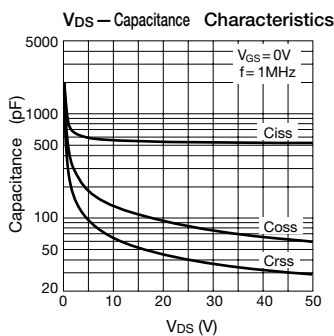
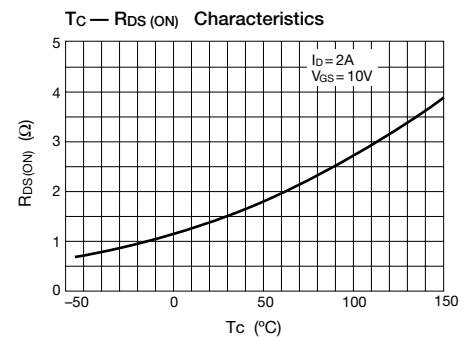
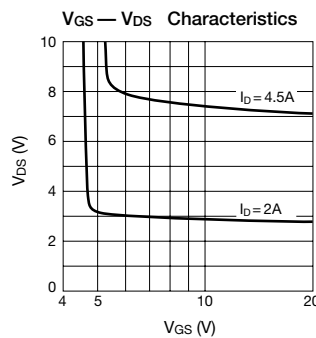
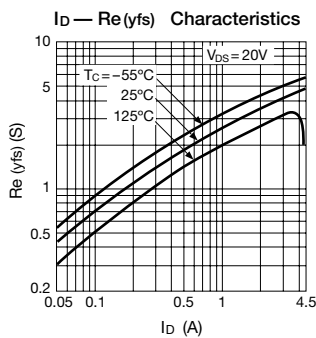
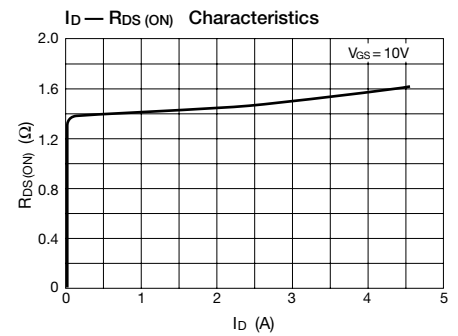
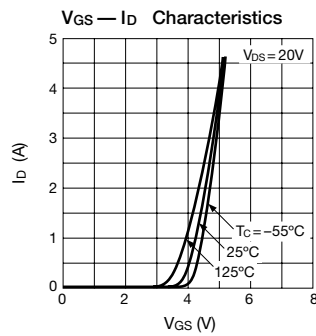
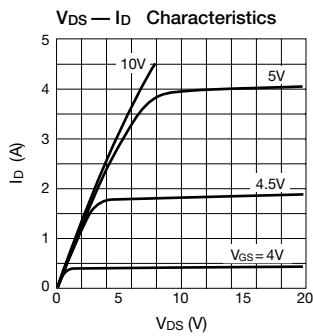
| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 600            | V    |
| V <sub>GSS</sub>          | ±30            | V    |
| I <sub>D</sub>            | ±4.5           | A    |
| I <sub>D</sub> (pulse) *1 | ±18            | A    |
| P <sub>D</sub>            | 35 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 50             | mJ   |
| I <sub>AS</sub>           | 4.5            | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1: P<sub>w</sub> ≤ 100μs, duty cycle ≤ 1%

\*2: V<sub>DD</sub> = 30V, L = 5mH, I<sub>L</sub> = 4.5A, unclamped, R<sub>G</sub> = 50Ω, See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                                         |
|-----------------------|---------|------|------|------|--------------------------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                                                    |
| V <sub>(BR) DSS</sub> | 600     |      |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                                                                       |
| I <sub>GSS</sub>      |         |      | ±100 | nA   | V <sub>GS</sub> = ±30V                                                                                             |
| I <sub>DSS</sub>      |         |      | 100  | μA   | V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V                                                                       |
| V <sub>TH</sub>       | 2.0     | 3.0  | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 1mA                                                                        |
| Re (yfs)              | 2.4     | 3.5  |      | S    | V <sub>DS</sub> = 20V, I <sub>D</sub> = 2A                                                                         |
| R <sub>DS</sub> (on)  |         | 1.45 | 1.85 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 2A                                                                         |
| C <sub>iss</sub>      |         | 560  |      | pF   | V <sub>DS</sub> = 10V, f = 1.0MHz, V <sub>GS</sub> = 0V                                                            |
| C <sub>oss</sub>      |         | 130  |      | pF   |                                                                                                                    |
| C <sub>rss</sub>      |         | 65   |      | pF   |                                                                                                                    |
| t <sub>d</sub> (on)   |         | 20   |      | ns   | I <sub>D</sub> = 2A, V <sub>DD</sub> = 250V, R <sub>L</sub> = 125Ω, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>r</sub>        |         | 30   |      | ns   |                                                                                                                    |
| t <sub>d</sub> (off)  |         | 65   |      | ns   |                                                                                                                    |
| t <sub>f</sub>        |         | 90   |      | ns   |                                                                                                                    |
| V <sub>SD</sub>       |         | 0.9  | 1.5  | V    | I <sub>SD</sub> = 4.5A, V <sub>GS</sub> = 0V                                                                       |



### Absolute Maximum Ratings (Ta = 25°C)

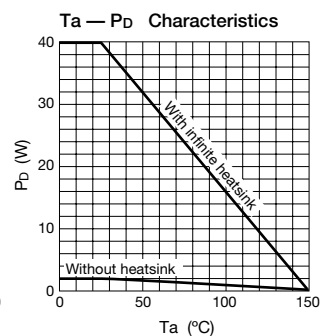
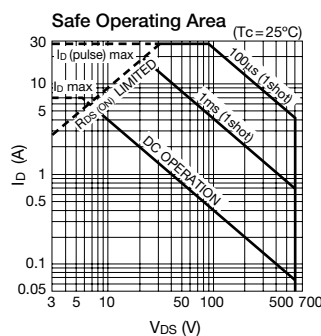
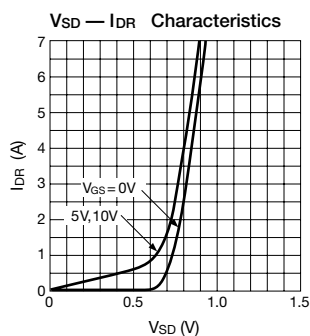
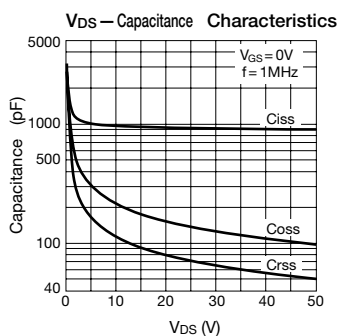
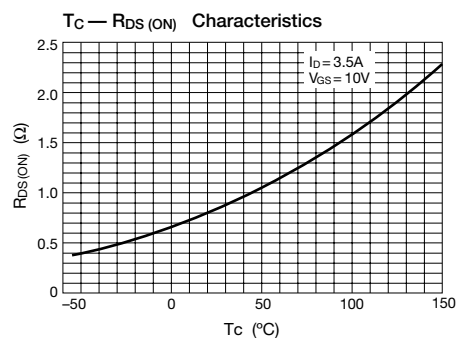
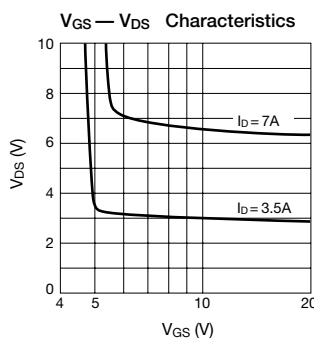
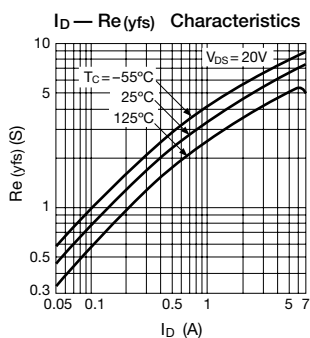
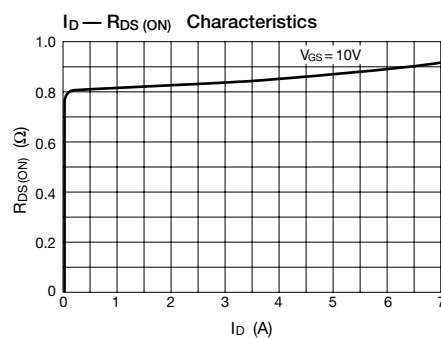
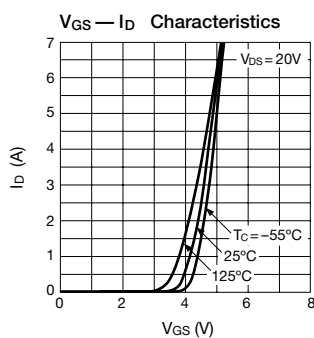
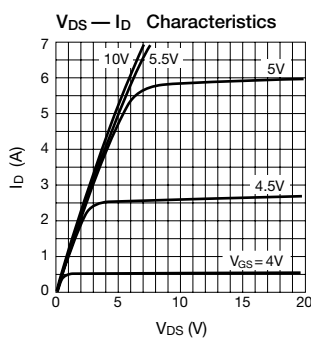
| Symbol           | Ratings        | Unit |
|------------------|----------------|------|
| $V_{DS}$         | 600            | V    |
| $V_{GS}$         | $\pm 30$       | V    |
| $I_D$            | $\pm 7$        | A    |
| $I_D$ (pulse) *1 | $\pm 28$       | A    |
| $P_D$            | 40 (Tc = 25°C) | W    |
| $E_{AS}$ *2      | 150            | mJ   |
| $I_{AS}$         | 7              | A    |
| Tch              | 150            | °C   |
| Tstg             | -55 to +150    | °C   |

\*1:  $P_W \leq 100\mu s$ , duty cycle  $\leq 1\%$

\*2:  $V_{DD} = 30V$ ,  $L = 6mH$ ,  $I_L = 7A$ , unclamped,  $R_G = 50\Omega$ , See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |      |           | Unit     | Conditions                                                                                   |
|----------------|---------|------|-----------|----------|----------------------------------------------------------------------------------------------|
|                | min     | typ  | max       |          |                                                                                              |
| $V_{(BR) DSS}$ | 600     |      |           | V        | $I_D = 100\mu A$ , $V_{GS} = 0V$                                                             |
| $I_{GSS}$      |         |      | $\pm 100$ | nA       | $V_{GS} = \pm 30V$                                                                           |
| $I_{DSS}$      |         |      | 100       | $\mu A$  | $V_{DS} = 600V$ , $V_{GS} = 0V$                                                              |
| $V_{TH}$       | 2.0     | 3.0  | 4.0       | V        | $V_{DS} = 10V$ , $I_D = 1mA$                                                                 |
| $R_{e (yfs)}$  | 4.0     | 6.0  |           | S        | $V_{DS} = 20V$ , $I_D = 3.5A$                                                                |
| $R_{DS (on)}$  |         | 0.85 | 1.1       | $\Omega$ | $V_{GS} = 10V$ , $I_D = 3.5A$                                                                |
| $C_{iss}$      |         | 950  |           | pF       | $V_{DS} = 10V$ , $f = 1.0MHz$ , $V_{GS} = 0V$                                                |
| $C_{oss}$      |         | 220  |           | pF       |                                                                                              |
| $C_{rss}$      |         | 120  |           | pF       |                                                                                              |
| $t_d (on)$     |         | 30   |           | ns       | $I_D = 3.5A$ , $V_{DD} = 250V$ , $R_L = 71\Omega$ , $V_{GS} = 10V$ , See Figure 2 on Page 5. |
| $t_r$          |         | 27   |           | ns       |                                                                                              |
| $t_d (off)$    |         | 100  |           | ns       |                                                                                              |
| $t_f$          |         | 50   |           | ns       |                                                                                              |
| $V_{SD}$       |         | 0.9  | 1.5       | V        | $I_{SD} = 7A$ , $V_{GS} = 0V$                                                                |



### Absolute Maximum Ratings (Ta = 25°C)

| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 600            | V    |
| V <sub>GSS</sub>          | ±30            | V    |
| I <sub>D</sub>            | ±8.5           | A    |
| I <sub>D</sub> (pulse) *1 | ±34            | A    |
| P <sub>D</sub>            | 85 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 300            | mJ   |
| I <sub>AS</sub>           | 8.5            | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1: P<sub>w</sub> ≤ 100μs, duty cycle ≤ 1%

\*2: V<sub>DD</sub> = 30V, L = 8mH, I<sub>L</sub> = 8.5A, unclamped, R<sub>G</sub> = 50Ω, See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                                          |
|-----------------------|---------|------|------|------|---------------------------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                                                     |
| V <sub>(BR)</sub> DSS | 600     |      |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                                                                        |
| I <sub>GSS</sub>      |         |      | ±100 | nA   | V <sub>GS</sub> = ±30V                                                                                              |
| I <sub>DSS</sub>      |         |      | 100  | μA   | V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V                                                                        |
| V <sub>TH</sub>       | 2.0     | 3.0  | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 1mA                                                                         |
| Re (yfs)              | 5.0     | 7.0  |      | S    | V <sub>DS</sub> = 20V, I <sub>D</sub> = 4A                                                                          |
| R <sub>DS</sub> (on)  |         | 0.65 | 0.85 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 4A                                                                          |
| C <sub>iss</sub>      |         | 1200 |      | pF   | V <sub>DS</sub> = 10V, f = 1.0MHz, V <sub>GS</sub> = 0V                                                             |
| C <sub>oss</sub>      |         | 270  |      | pF   |                                                                                                                     |
| Cr <sub>ss</sub>      |         | 150  |      | pF   |                                                                                                                     |
| t <sub>d</sub> (on)   |         | 30   |      | ns   | I <sub>D</sub> = 4A, V <sub>DD</sub> = 250V, R <sub>L</sub> = 62.5Ω, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>r</sub>        |         | 40   |      | ns   |                                                                                                                     |
| t <sub>d</sub> (off)  |         | 110  |      | ns   |                                                                                                                     |
| t <sub>f</sub>        |         | 65   |      | ns   |                                                                                                                     |
| V <sub>SD</sub>       |         | 0.95 | 1.5  | V    | I <sub>SD</sub> = 8.5A, V <sub>GS</sub> = 0V                                                                        |

### Absolute Maximum Ratings (Ta = 25°C)

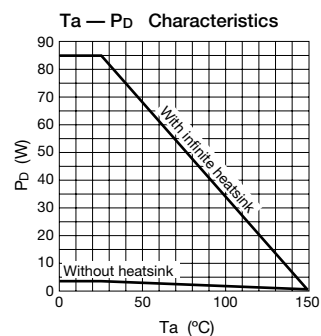
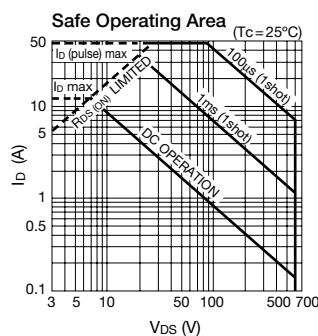
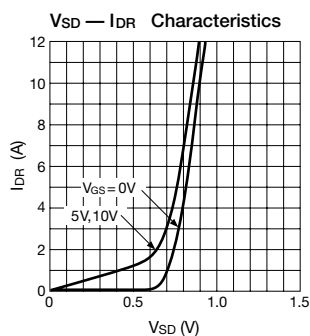
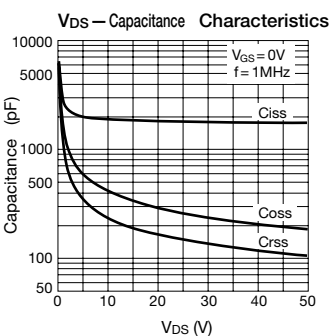
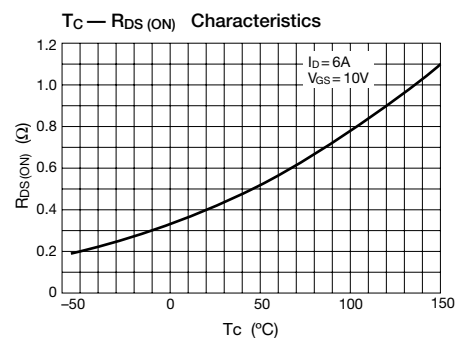
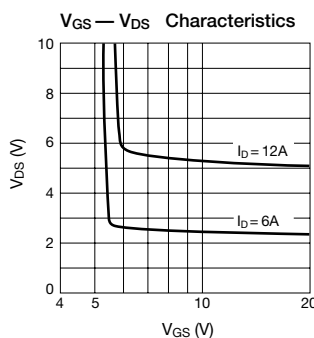
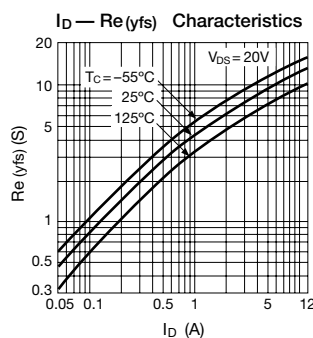
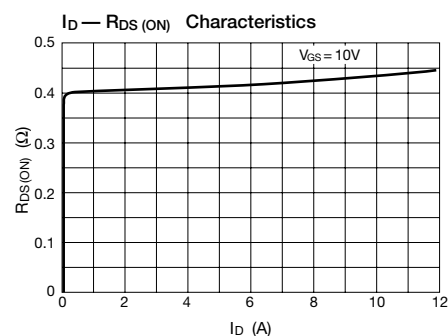
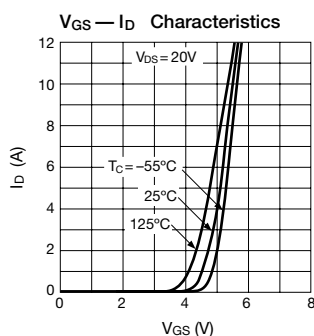
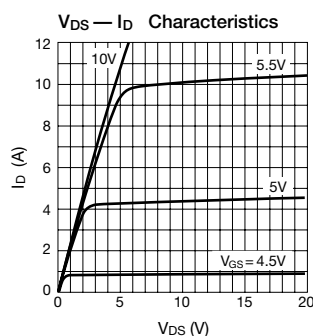
| Symbol           | Ratings        | Unit |
|------------------|----------------|------|
| $V_{DSS}$        | 600            | V    |
| $V_{GSS}$        | $\pm 30$       | V    |
| $I_D$            | $\pm 12$       | A    |
| $I_D$ (pulse) *1 | $\pm 48$       | A    |
| $P_D$            | 85 (Tc = 25°C) | W    |
| $E_{AS}$ *2      | 400            | mJ   |
| $I_{AS}$         | 12             | A    |
| Tch              | 150            | °C   |
| Tstg             | -55 to +150    | °C   |

\*1:  $P_W \leq 100\mu s$ , duty cycle  $\leq 1\%$

\*2:  $V_{DD} = 30V$ ,  $L = 5.5mH$ ,  $I_L = 12A$ , unclamped,  $R_G = 50\Omega$ ,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |      |           | Unit     | Conditions                                                                                         |
|----------------|---------|------|-----------|----------|----------------------------------------------------------------------------------------------------|
|                | min     | typ  | max       |          |                                                                                                    |
| $V_{(BR) DSS}$ | 600     |      |           | V        | $I_D = 100\mu A$ , $V_{GS} = 0V$                                                                   |
| $I_{GSS}$      |         |      | $\pm 100$ | nA       | $V_{GS} = \pm 30V$                                                                                 |
| $I_{DSS}$      |         |      | 100       | $\mu A$  | $V_{DS} = 600V$ , $V_{GS} = 0V$                                                                    |
| $V_{TH}$       | 2.0     | 3.0  | 4.0       | V        | $V_{DS} = 10V$ , $I_D = 1mA$                                                                       |
| $R_{e (yfs)}$  | 7.5     | 11   |           | S        | $V_{DS} = 20V$ , $I_D = 6A$                                                                        |
| $R_{DS (on)}$  |         | 0.42 | 0.55      | $\Omega$ | $V_{GS} = 10V$ , $I_D = 6A$                                                                        |
| $C_{iss}$      |         | 1900 |           | pF       | $V_{DS} = 10V$ , $f = 1.0MHz$ ,<br>$V_{GS} = 0V$                                                   |
| $C_{oss}$      |         | 410  |           | pF       |                                                                                                    |
| $C_{rss}$      |         | 240  |           | pF       |                                                                                                    |
| $t_d (on)$     |         | 35   |           | ns       | $I_D = 6A$ , $V_{DD} = 250V$ ,<br>$R_L = 20.8\Omega$ , $V_{GS} = 10V$ ,<br>See Figure 2 on Page 5. |
| $t_r$          |         | 45   |           | ns       |                                                                                                    |
| $t_d (off)$    |         | 160  |           | ns       |                                                                                                    |
| $t_f$          |         | 70   |           | ns       |                                                                                                    |
| $V_{SD}$       |         | 0.95 | 1.5       | V        | $I_{SD} = 12A$ , $V_{GS} = 0V$                                                                     |



### Absolute Maximum Ratings (Ta = 25°C)

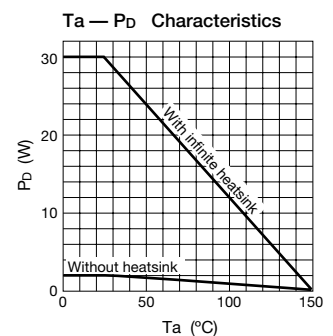
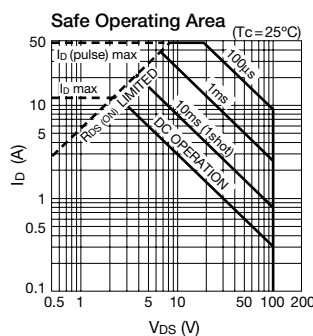
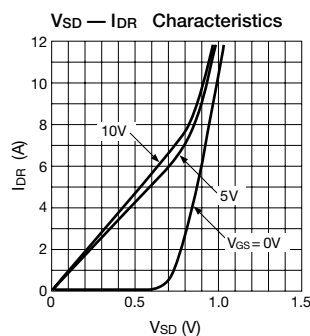
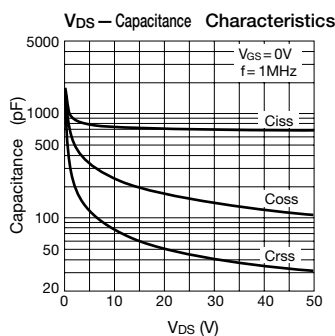
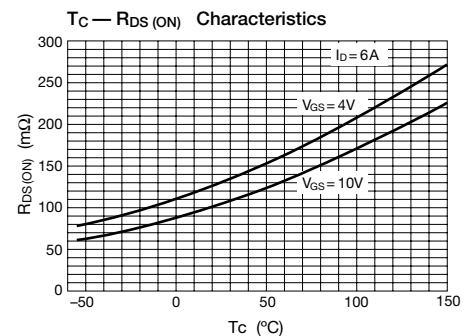
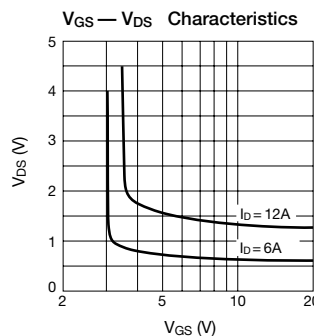
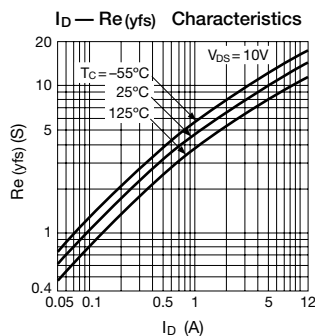
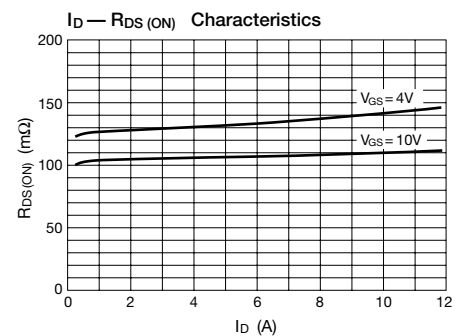
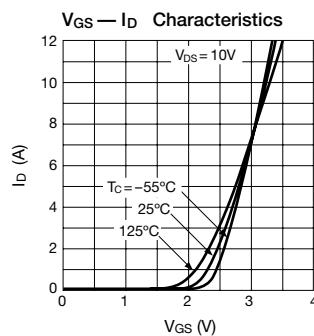
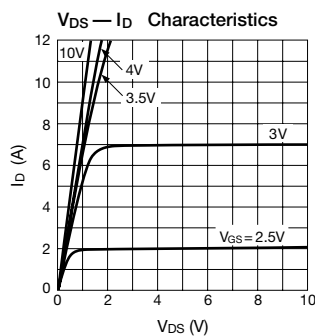
| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 100            | V    |
| V <sub>GSS</sub>          | ±20            | V    |
| I <sub>D</sub>            | ±12            | A    |
| I <sub>D</sub> (pulse) *1 | ±48            | A    |
| P <sub>D</sub>            | 30 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 70             | mJ   |
| I <sub>AS</sub>           | 12             | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1:  $PW \leq 100\mu s$ , duty cycle  $\leq 1\%$

\*2:  $V_{DD} = 25V$ ,  $L = 730\mu H$ ,  $I_L = 12A$ , unclamped,  $R_G = 50\Omega$ , See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |     |      | Unit       | Conditions                                                                                    |
|-----------------------|---------|-----|------|------------|-----------------------------------------------------------------------------------------------|
|                       | min     | typ | max  |            |                                                                                               |
| V <sub>(BR) DSS</sub> | 100     |     |      | V          | $I_D = 100\mu A$ , $V_{GS} = 0V$                                                              |
| I <sub>GSS</sub>      |         |     | ±100 | nA         | $V_{GS} = \pm 20V$                                                                            |
| I <sub>DSS</sub>      |         |     | 100  | $\mu A$    | $V_{DS} = 100V$ , $V_{GS} = 0V$                                                               |
| V <sub>TH</sub>       | 1.0     |     | 2.0  | V          | $V_{DS} = 10V$ , $I_D = 250\mu A$                                                             |
| Re (yfs)              | 7       | 11  |      | S          | $V_{DS} = 10V$ , $I_D = 6A$                                                                   |
| R <sub>DS (on)</sub>  |         | 105 | 175  | m $\Omega$ | $V_{GS} = 10V$ , $I_D = 6A$                                                                   |
|                       |         | 130 | 220  | m $\Omega$ | $V_{GS} = 4V$ , $I_D = 6A$                                                                    |
| C <sub>iss</sub>      |         | 740 |      | pF         | $V_{DS} = 10V$ , $f = 1.0MHz$ , $V_{GS} = 0V$                                                 |
| C <sub>oss</sub>      |         | 240 |      | pF         |                                                                                               |
| C <sub>rss</sub>      |         | 75  |      | pF         |                                                                                               |
| t <sub>d (on)</sub>   |         | 15  |      | ns         | $I_D = 6A$ , $V_{DD} \div 50V$ , $R_L = 8.3\Omega$ , $V_{GS} = 10V$ , See Figure 2 on Page 5. |
| t <sub>r</sub>        |         | 55  |      | ns         |                                                                                               |
| t <sub>d (off)</sub>  |         | 60  |      | ns         |                                                                                               |
| t <sub>f</sub>        |         | 20  |      | ns         |                                                                                               |
| V <sub>SD</sub>       |         | 1.0 | 1.5  | V          | $I_{SD} = 12A$ , $V_{GS} = 0V$                                                                |



### Absolute Maximum Ratings (Ta = 25°C)

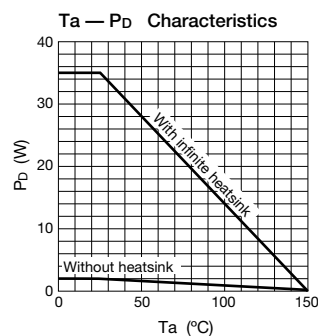
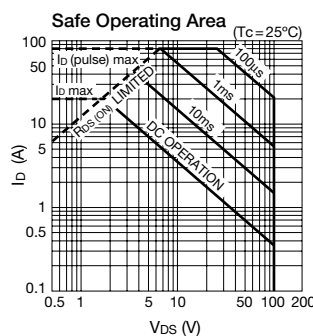
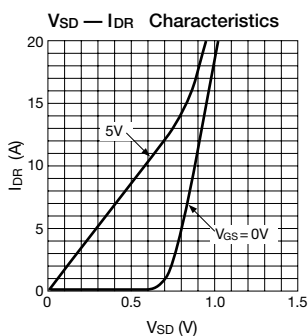
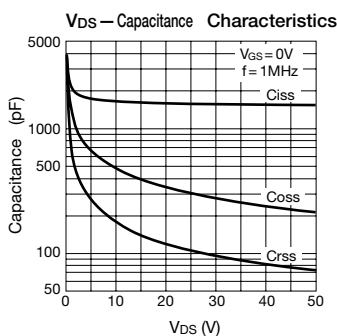
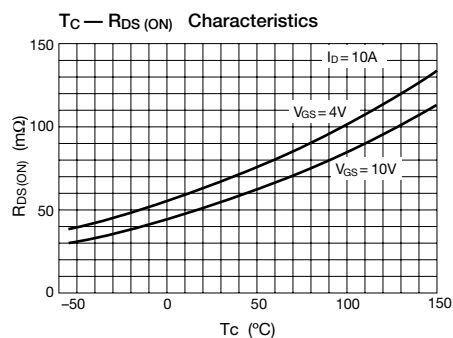
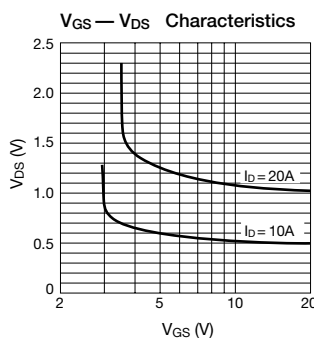
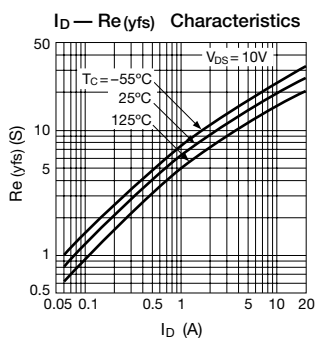
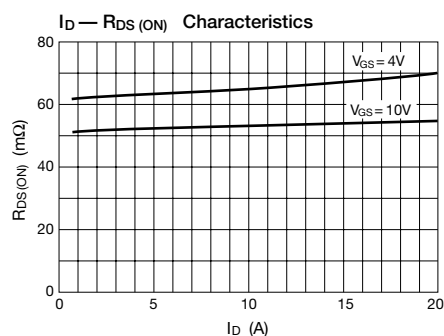
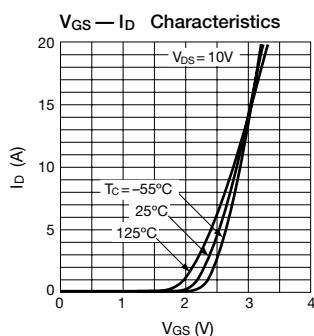
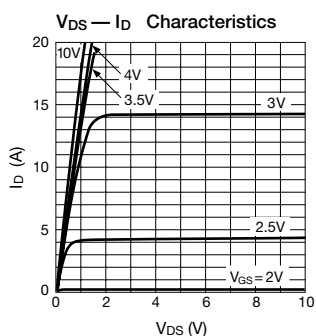
| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 100            | V    |
| V <sub>GSS</sub>          | ±20            | V    |
| I <sub>D</sub>            | ±20            | A    |
| I <sub>D</sub> (pulse) *1 | ±80            | A    |
| P <sub>D</sub>            | 35 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 200            | mJ   |
| I <sub>AS</sub>           | 20             | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1: P<sub>w</sub> ≤ 100μs, duty cycle ≤ 1%

\*2: V<sub>DD</sub> = 25V, L = 750μH, I<sub>L</sub> = 20A, unclamped, R<sub>G</sub> = 50Ω, See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                                       |
|-----------------------|---------|------|------|------|------------------------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                                                  |
| V <sub>(BR)</sub> DSS | 100     |      |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                                                                     |
| I <sub>GSS</sub>      |         |      | ±100 | nA   | V <sub>GS</sub> = ±20V                                                                                           |
| I <sub>DSS</sub>      |         |      | 100  | μA   | V <sub>DS</sub> = 100V, V <sub>GS</sub> = 0V                                                                     |
| V <sub>TH</sub>       | 1.0     |      | 2.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 250μA                                                                    |
| Re (yfs)              | 12      | 20   |      | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 10A                                                                      |
| R <sub>DS</sub> (on)  |         | 60   | 80   | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A                                                                      |
|                       |         | 75   | 95   | mΩ   | V <sub>GS</sub> = 4V, I <sub>D</sub> = 10A                                                                       |
| C <sub>iss</sub>      |         | 1630 |      | pF   | V <sub>DS</sub> = 10V, f = 1.0MHz, V <sub>GS</sub> = 0V                                                          |
| C <sub>oss</sub>      |         | 480  |      | pF   |                                                                                                                  |
| C <sub>rss</sub>      |         | 180  |      | pF   |                                                                                                                  |
| t <sub>d</sub> (on)   |         | 20   |      | ns   | I <sub>D</sub> = 10A, V <sub>DD</sub> = 50V, R <sub>L</sub> = 5Ω, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>r</sub>        |         | 90   |      | ns   |                                                                                                                  |
| t <sub>d</sub> (off)  |         | 120  |      | ns   |                                                                                                                  |
| t <sub>f</sub>        |         | 55   |      | ns   |                                                                                                                  |
| V <sub>SD</sub>       |         | 1.0  | 1.5  | V    | I <sub>SD</sub> = 20A, V <sub>GS</sub> = 0V                                                                      |



### Absolute Maximum Ratings (Ta = 25°C)

| Symbol                    | Ratings        | Unit |
|---------------------------|----------------|------|
| V <sub>DSS</sub>          | 450            | V    |
| V <sub>GSS</sub>          | ±30            | V    |
| I <sub>D</sub>            | ±3             | A    |
| I <sub>D</sub> (pulse) *1 | ±12            | A    |
| P <sub>D</sub>            | 30 (Tc = 25°C) | W    |
| E <sub>AS</sub> *2        | 30             | mJ   |
| I <sub>AS</sub>           | 3              | A    |
| T <sub>ch</sub>           | 150            | °C   |
| T <sub>stg</sub>          | -55 to +150    | °C   |

\*1: P<sub>w</sub> ≤ 100μs, duty cycle ≤ 1%

\*2: V<sub>DD</sub> = 30V, L = 6.3mH, I<sub>L</sub> = 3.0A, unclamped, R<sub>G</sub> = 50Ω, See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol               | Ratings |     |      | Unit | Conditions                                                                                                           |
|----------------------|---------|-----|------|------|----------------------------------------------------------------------------------------------------------------------|
|                      | min     | typ | max  |      |                                                                                                                      |
| V(BR) DSS            | 450     |     |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                                                                         |
| I <sub>GSS</sub>     |         |     | ±100 | nA   | V <sub>GS</sub> = ±30V                                                                                               |
| I <sub>DSS</sub>     |         |     | 100  | μA   | V <sub>DS</sub> = 450V, V <sub>GS</sub> = 0V                                                                         |
| V <sub>TH</sub>      | 2.0     |     | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 1mA                                                                          |
| Re (yfs)             | 1.5     | 2.1 |      | S    | V <sub>DS</sub> = 20V, I <sub>D</sub> = 1.5A                                                                         |
| R <sub>DS</sub> (on) |         | 2.1 | 2.8  | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 1.5A                                                                         |
| C <sub>iss</sub>     |         | 340 |      | pF   | V <sub>DS</sub> = 10V, f = 1.0MHz, V <sub>GS</sub> = 0V                                                              |
| C <sub>oss</sub>     |         | 75  |      | pF   |                                                                                                                      |
| C <sub>rss</sub>     |         | 26  |      | pF   |                                                                                                                      |
| t <sub>d</sub> (on)  |         | 18  |      | ns   | I <sub>D</sub> = 1.5A, V <sub>DD</sub> ≐ 200V, R <sub>L</sub> = 133Ω, V <sub>GS</sub> = 10V, See Figure 2 on Page 5. |
| t <sub>r</sub>       |         | 30  |      | ns   |                                                                                                                      |
| t <sub>d</sub> (off) |         | 45  |      | ns   |                                                                                                                      |
| t <sub>f</sub>       |         | 85  |      | ns   |                                                                                                                      |
| V <sub>SD</sub>      |         | 0.9 | 1.4  | V    | I <sub>SD</sub> = 3A, V <sub>GS</sub> = 0V                                                                           |

### Absolute Maximum Ratings (Ta = 25°C)

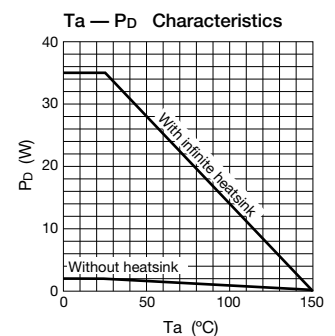
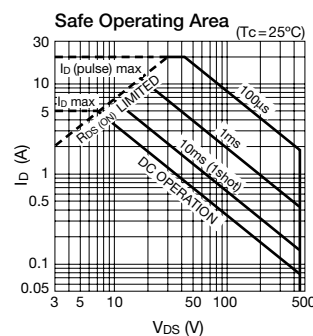
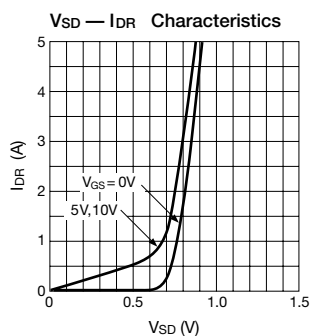
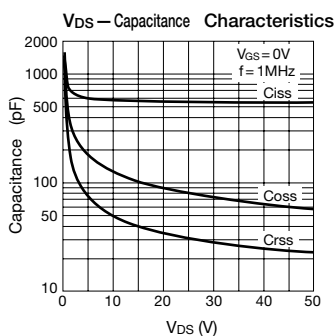
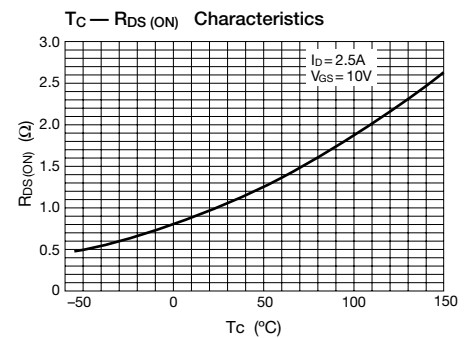
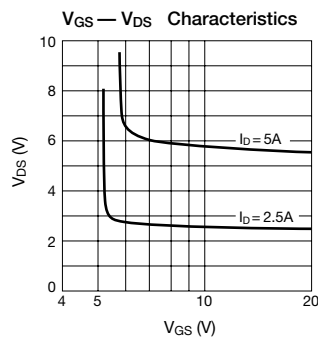
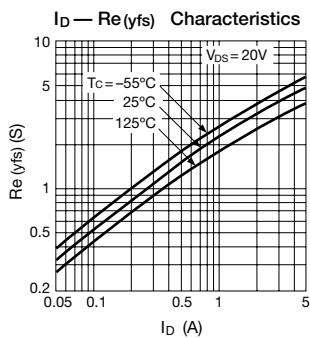
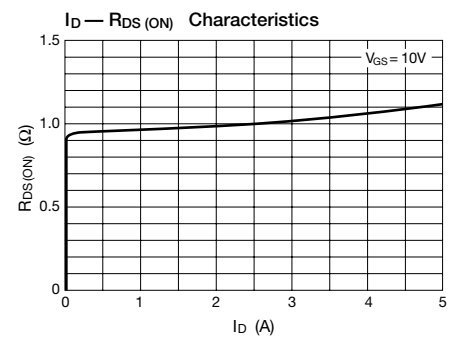
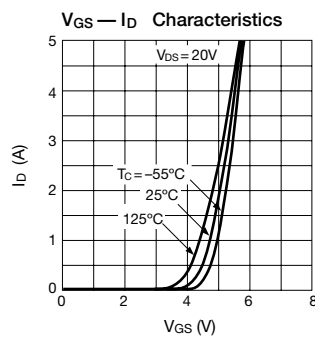
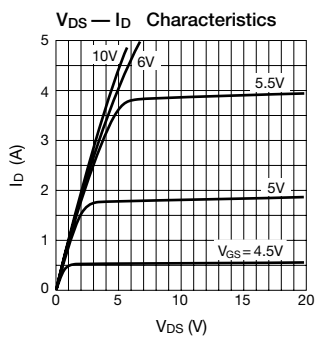
| Symbol           | Ratings        | Unit |
|------------------|----------------|------|
| $V_{DSS}$        | 450            | V    |
| $V_{GSS}$        | $\pm 30$       | V    |
| $I_D$            | $\pm 5$        | A    |
| $I_D$ (pulse) *1 | $\pm 20$       | A    |
| $P_D$            | 35 (Tc = 25°C) | W    |
| $E_{AS}$ *2      | 90             | mJ   |
| $I_{AS}$         | 5              | A    |
| Tch              | 150            | °C   |
| Tstg             | -55 to +150    | °C   |

\*1:  $P_W \leq 100\mu s$ , duty cycle  $\leq 1\%$

\*2:  $V_{DD} = 30V$ ,  $L = 6.7mH$ ,  $I_L = 5.0A$ , unclamped,  $R_G = 50\Omega$ , See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |     |           | Unit     | Conditions                                                                                         |
|----------------|---------|-----|-----------|----------|----------------------------------------------------------------------------------------------------|
|                | min     | typ | max       |          |                                                                                                    |
| $V_{(BR) DSS}$ | 450     |     |           | V        | $I_D = 100\mu A$ , $V_{GS} = 0V$                                                                   |
| $I_{GSS}$      |         |     | $\pm 100$ | nA       | $V_{GS} = \pm 30V$                                                                                 |
| $I_{DSS}$      |         |     | 100       | $\mu A$  | $V_{DS} = 450V$ , $V_{GS} = 0V$                                                                    |
| $V_{TH}$       | 2.0     |     | 4.0       | V        | $V_{DS} = 10V$ , $I_D = 1mA$                                                                       |
| $R_{e (yfs)}$  | 2.6     | 3.7 |           | S        | $V_{DS} = 20V$ , $I_D = 2.5A$                                                                      |
| $R_{DS (on)}$  |         | 1.1 | 1.5       | $\Omega$ | $V_{GS} = 10V$ , $I_D = 2.5A$                                                                      |
| $C_{iss}$      |         | 580 |           | pF       | $V_{DS} = 10V$ , $f = 1.0MHz$ , $V_{GS} = 0V$                                                      |
| $C_{oss}$      |         | 125 |           | pF       |                                                                                                    |
| $C_{rss}$      |         | 50  |           | pF       |                                                                                                    |
| $t_d (on)$     |         | 20  |           | ns       |                                                                                                    |
| $t_r$          |         | 30  |           | ns       | $I_D = 2.5A$ , $V_{DD} \approx 200V$ , $R_L = 80\Omega$ , $V_{GS} = 10V$ , See Figure 2 on Page 5. |
| $t_d (off)$    |         | 55  |           | ns       |                                                                                                    |
| $t_f$          |         | 50  |           | ns       |                                                                                                    |
| $V_{SD}$       |         | 0.9 | 1.4       | V        | $I_{SD} = 5A$ , $V_{GS} = 0V$                                                                      |



### Absolute Maximum Ratings (Ta = 25°C)

| Symbol                    | Ratings                    | Unit |
|---------------------------|----------------------------|------|
| V <sub>DSS</sub>          | 450                        | V    |
| V <sub>GSS</sub>          | ±30                        | V    |
| I <sub>D</sub>            | ±15                        | A    |
| I <sub>D</sub> (pulse) *1 | ±60                        | A    |
| P <sub>D</sub>            | 80 (T <sub>c</sub> = 25°C) | W    |
| E <sub>AS</sub> *2        | 550                        | mJ   |
| I <sub>AS</sub>           | 15                         | A    |
| T <sub>ch</sub>           | 150                        | °C   |
| T <sub>stg</sub>          | -55 to +150                | °C   |

\*1: P<sub>w</sub> ≤ 100μs, duty cycle ≤ 1%

\*2: V<sub>DD</sub> = 30V, L = 4.6mH, I<sub>L</sub> = 15A, unclamped, R<sub>G</sub> = 50Ω,  
See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol               | Ratings |      |      | Unit | Conditions                                                                                                                  |
|----------------------|---------|------|------|------|-----------------------------------------------------------------------------------------------------------------------------|
|                      | min     | typ  | max  |      |                                                                                                                             |
| V(BR) DSS            | 450     |      |      | V    | I <sub>D</sub> = 100μA, V <sub>GS</sub> = 0V                                                                                |
| I <sub>GSS</sub>     |         |      | ±100 | nA   | V <sub>GS</sub> = ±30V                                                                                                      |
| I <sub>DSS</sub>     |         |      | 100  | μA   | V <sub>DS</sub> = 450V, V <sub>GS</sub> = 0V                                                                                |
| V <sub>TH</sub>      | 2.0     | 3.0  | 4.0  | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 1mA                                                                                 |
| Re (yfs)             | 8.0     | 11.5 |      | S    | V <sub>DS</sub> = 20V, I <sub>D</sub> = 7.5A                                                                                |
| R <sub>DS</sub> (on) |         | 0.30 | 0.38 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 7.5A                                                                                |
| C <sub>iss</sub>     |         | 2100 |      | pF   | V <sub>DS</sub> = 10V, f = 1.0MHz,<br>V <sub>GS</sub> = 0V                                                                  |
| C <sub>oss</sub>     |         | 430  |      | pF   |                                                                                                                             |
| C <sub>rss</sub>     |         | 210  |      | pF   |                                                                                                                             |
| t <sub>d</sub> (on)  |         | 35   |      | ns   | I <sub>D</sub> = 7.5A, V <sub>DD</sub> = 200V,<br>R <sub>L</sub> = 26.7Ω, V <sub>GS</sub> = 10V,<br>See Figure 2 on Page 5. |
| t <sub>r</sub>       |         | 45   |      | ns   |                                                                                                                             |
| t <sub>d</sub> (off) |         | 130  |      | ns   |                                                                                                                             |
| t <sub>f</sub>       |         | 60   |      | ns   |                                                                                                                             |
| V <sub>SD</sub>      |         | 0.95 | 1.4  | V    | I <sub>SD</sub> = 15A, V <sub>GS</sub> = 0V                                                                                 |

### Absolute Maximum Ratings (Ta = 25°C)

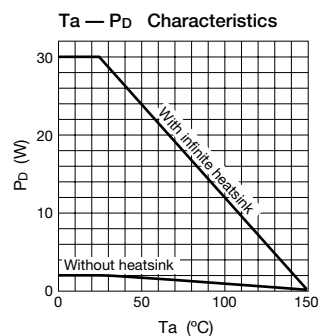
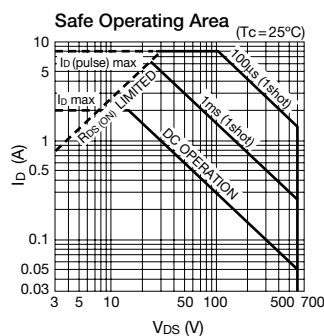
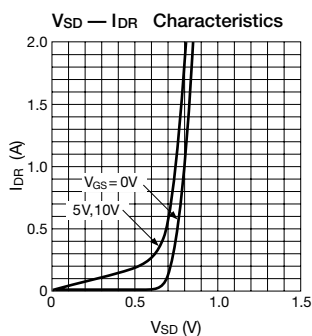
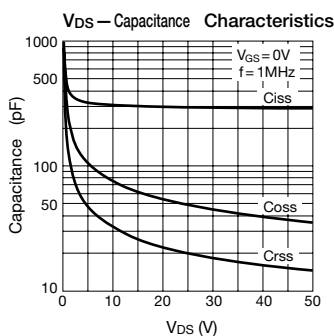
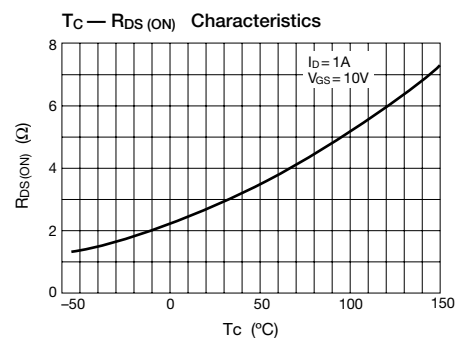
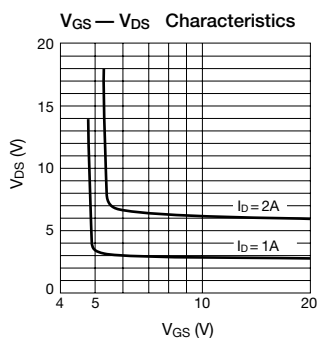
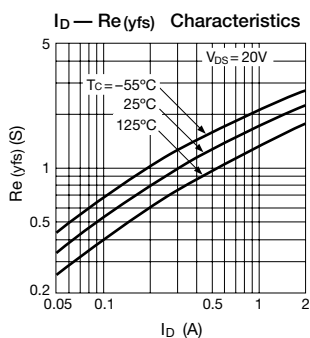
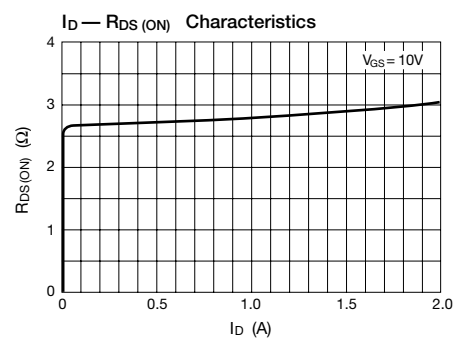
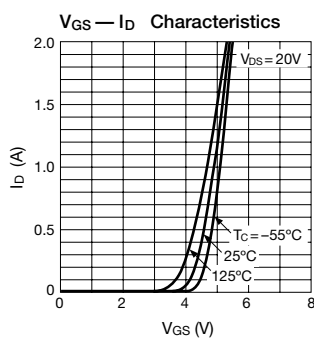
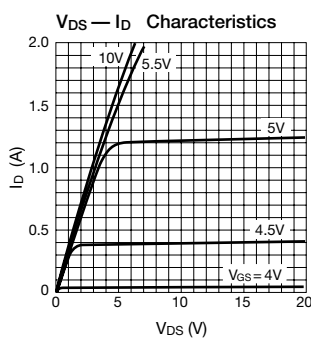
| Symbol           | Ratings        | Unit |
|------------------|----------------|------|
| $V_{DS}$         | 600            | V    |
| $V_{GS}$         | $\pm 30$       | V    |
| $I_D$            | $\pm 2$        | A    |
| $I_D$ (pulse) *1 | $\pm 8$        | A    |
| $P_D$            | 30 (Tc = 25°C) | W    |
| $E_{AS}$ *2      | 10             | mJ   |
| $I_{AS}$         | 2              | A    |
| Tch              | 150            | °C   |
| Tstg             | -55 to +150    | °C   |

\*1:  $P_W \leq 100\mu s$ , duty cycle  $\leq 1\%$

\*2:  $V_{DD} = 30V$ ,  $L = 5mH$ ,  $I_L = 2.0A$ , unclamped,  $R_G = 50\Omega$ , See Figure 1 on Page 5.

### Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |     |           | Unit     | Conditions                                                                                        |
|----------------|---------|-----|-----------|----------|---------------------------------------------------------------------------------------------------|
|                | min     | typ | max       |          |                                                                                                   |
| $V_{(BR) DSS}$ | 600     |     |           | V        | $I_D = 100\mu A$ , $V_{GS} = 0V$                                                                  |
| $I_{GSS}$      |         |     | $\pm 100$ | nA       | $V_{GS} = \pm 30V$                                                                                |
| $I_{DSS}$      |         |     | 100       | $\mu A$  | $V_{DS} = 600V$ , $V_{GS} = 0V$                                                                   |
| $V_{TH}$       | 2.0     | 3.0 | 4.0       | V        | $V_{DS} = 10V$ , $I_D = 250\mu A$                                                                 |
| $R_e$ (yfs)    | 1.2     | 1.7 |           | S        | $V_{DS} = 20V$ , $I_D = 1A$                                                                       |
| $R_{DS(on)}$   |         | 3.0 | 3.8       | $\Omega$ | $V_{GS} = 10V$ , $I_D = 1A$                                                                       |
| $C_{iss}$      |         | 290 |           | pF       | $V_{DS} = 10V$ , $f = 1.0MHz$ , $V_{GS} = 0V$                                                     |
| $C_{oss}$      |         | 70  |           | pF       |                                                                                                   |
| $C_{rss}$      |         | 30  |           | pF       |                                                                                                   |
| $t_d$ (on)     |         | 16  |           | ns       | $I_D = 1A$ , $V_{DD} \approx 250V$ , $R_L = 250\Omega$ , $V_{GS} = 10V$ , See Figure 2 on Page 5. |
| $t_r$          |         | 30  |           | ns       |                                                                                                   |
| $t_d$ (off)    |         | 45  |           | ns       |                                                                                                   |
| $t_f$          |         | 145 |           | ns       |                                                                                                   |
| $V_{SD}$       |         | 0.9 | 1.4       | V        | $I_{SD} = 2.0A$ , $V_{GS} = 0V$                                                                   |



### Absolute Maximum Ratings (Ta = 25°C)

| Symbol                 | Ratings           | Unit |
|------------------------|-------------------|------|
| V <sub>DSS</sub>       | -60               | V    |
| V <sub>GSS</sub>       | ±20               | V    |
| I <sub>D</sub>         | ±5                | A    |
| I <sub>D</sub> (pulse) | ±20 (Tch ≤ 150°C) | A    |
| P <sub>D</sub>         | 25 (Tc = 25°C)    | W    |
| Tch                    | 150               | °C   |
| Tstg                   | -55 to +150       | °C   |

### Electrical Characteristics (Ta = 25°C)

| Symbol                | Ratings |      |      | Unit | Conditions                                                                                      |
|-----------------------|---------|------|------|------|-------------------------------------------------------------------------------------------------|
|                       | min     | typ  | max  |      |                                                                                                 |
| V <sub>(BR)</sub> DSS | -60     |      |      | V    | I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V                                                   |
| I <sub>GSS</sub>      |         |      | ±500 | nA   | V <sub>GS</sub> = ±20V                                                                          |
| I <sub>DSS</sub>      |         |      | -250 | μA   | V <sub>DS</sub> = -60V, V <sub>GS</sub> = 0V                                                    |
| V <sub>TH</sub>       | -2.0    |      | -4.0 | V    | V <sub>DS</sub> = -10V, I <sub>D</sub> = -250μA                                                 |
| Re (yfs)              | 1.0     | 1.6  |      | S    | V <sub>DS</sub> = -10V, I <sub>D</sub> = -2.5A                                                  |
| R <sub>DS</sub> (on)  |         | 0.35 | 0.5  | Ω    | V <sub>GS</sub> = -10V, I <sub>D</sub> = -2.5A                                                  |
| Ciss                  |         | 270  |      | pF   | V <sub>DS</sub> = -25V, f = 1.0MHz, V <sub>GS</sub> = 0V                                        |
| Coss                  |         | 170  |      | pF   |                                                                                                 |
| ton                   |         | 75   |      | ns   | I <sub>D</sub> = -2.5A, V <sub>DD</sub> = -30V, V <sub>GS</sub> = -10V, See Figure 3 on Page 5. |
| toff                  |         | 35   |      | ns   |                                                                                                 |

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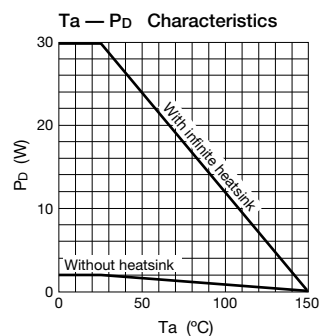
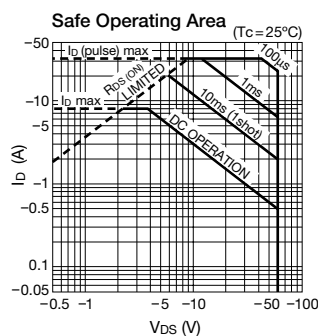
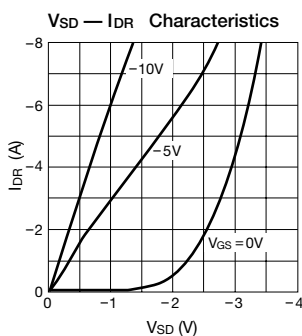
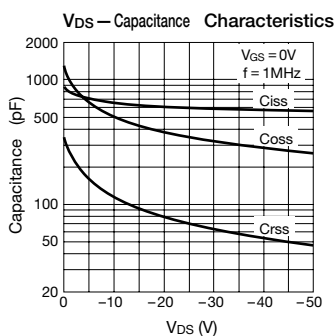
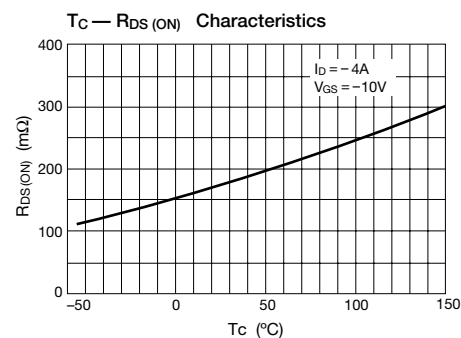
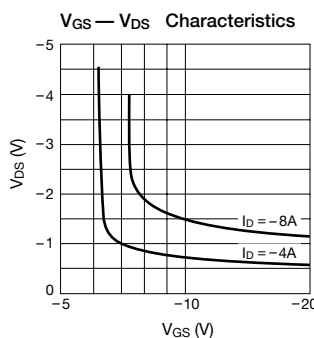
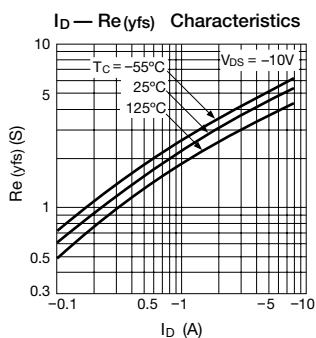
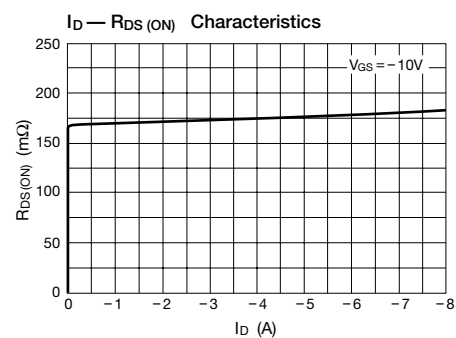
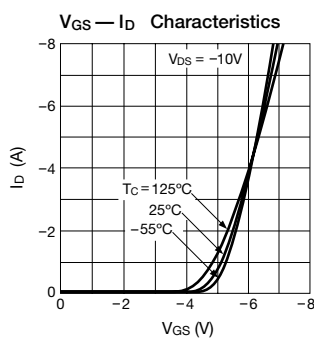
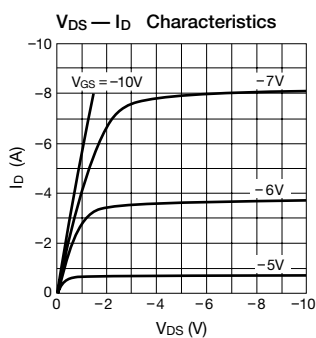
External dimensions 1 ..... FM20

## Absolute Maximum Ratings (Ta = 25°C)

| Symbol        | Ratings                                      | Unit             |
|---------------|----------------------------------------------|------------------|
| $V_{DS}$      | -60                                          | V                |
| $V_{GS}$      | $\pm 20$                                     | V                |
| $I_D$         | $\pm 8$                                      | A                |
| $I_D$ (pulse) | $\pm 32$ ( $T_{ch} \leq 150^\circ\text{C}$ ) | A                |
| $P_D$         | 30 ( $T_c = 25^\circ\text{C}$ )              | W                |
| $T_{ch}$      | 150                                          | $^\circ\text{C}$ |
| $T_{stg}$     | -55 to +150                                  | $^\circ\text{C}$ |

## Electrical Characteristics (Ta = 25°C)

| Symbol         | Ratings |     |           | Unit          | Conditions                                                             |
|----------------|---------|-----|-----------|---------------|------------------------------------------------------------------------|
|                | min     | typ | max       |               |                                                                        |
| $V_{(BR) DSS}$ | -60     |     |           | V             | $I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$                         |
| $I_{GSS}$      |         |     | $\pm 500$ | nA            | $V_{GS} = \pm 20\text{V}$                                              |
| $I_{DSS}$      |         |     | -250      | $\mu\text{A}$ | $V_{DS} = -60\text{V}$ , $V_{GS} = 0\text{V}$                          |
| $V_{TH}$       | -2.0    |     | -4.0      | V             | $V_{DS} = -10\text{V}$ , $I_D = -250\mu\text{A}$                       |
| $R_e$ (yfs)    | 1.8     | 2.8 |           | S             | $V_{DS} = -10\text{V}$ , $I_D = -4.0\text{A}$                          |
| $R_{DS(on)}$   |         | 0.2 | 0.28      | $\Omega$      | $V_{GS} = -10\text{V}$ , $I_D = -4.0\text{A}$                          |
| $C_{iss}$      |         | 580 |           | pF            | $V_{DS} = -25\text{V}$ , $f = 1.0\text{MHz}$ , $V_{GS} = 0\text{V}$    |
| $C_{oss}$      |         | 360 |           | pF            | $V_{DS} = -25\text{V}$ , $f = 1.0\text{MHz}$ , $V_{GS} = 0\text{V}$    |
| $t_{on}$       |         | 90  |           | ns            | $I_D = -4.0\text{A}$ , $V_{DD} = -30\text{V}$ , $V_{GS} = -10\text{V}$ |
| $t_{off}$      |         | 45  |           | ns            | See Figure 3 on Page 5.                                                |



MEMO

# Discontinued part guide

| Discontinued Items |                      |                    |                             |         | Substitute Part |
|--------------------|----------------------|--------------------|-----------------------------|---------|-----------------|
| Part Number        | V <sub>DSS</sub> (V) | I <sub>D</sub> (A) | R <sub>DS(ON)</sub> max (Ω) | Package |                 |
| <b>2SK979</b>      | 450                  | 10                 | 0.7                         | MT100   | —               |
| <b>2SK1193</b>     | 60                   | 45                 | 0.002                       | FM100   | —               |

| Not for new design |                      |                    |                             |         | Substitute Part |
|--------------------|----------------------|--------------------|-----------------------------|---------|-----------------|
| Part Number        | V <sub>DSS</sub> (V) | I <sub>D</sub> (A) | R <sub>DS(ON)</sub> max (Ω) | Package |                 |
| <b>2SJ426</b>      | 60                   | 15                 | 0.14                        | FM20    | —               |
| <b>2SK1366</b>     | 400                  | 2                  | 3.60                        | FM20    | <b>2SK2803</b>  |
| <b>2SK1367</b>     | 400                  | 3                  | 1.80                        | FM20    | <b>2SK2804</b>  |
| <b>2SK1368</b>     | 400                  | 5                  | 1.00                        | FM20    | <b>2SK2701</b>  |
| <b>2SK1369</b>     | 400                  | 10                 | 0.55                        | FM100   | <b>2SK2704</b>  |
| <b>2SK1370</b>     | 400                  | 15                 | 0.30                        | FM100   | <b>2SK2706</b>  |
| <b>2SK1711</b>     | 60                   | 10                 | 0.200                       | FM20    | <b>2SK2778</b>  |
| <b>2SK1713</b>     | 60                   | 22                 | 0.050                       | FM20    | —               |
| <b>2SK1714</b>     | 60                   | 30                 | 0.028                       | FM20    | —               |
| <b>2SK1715</b>     | 60                   | 40                 | 0.028                       | FM100   | —               |
| <b>2SK2156A</b>    | 60                   | 25                 | 0.045                       | FM20    | —               |
| <b>2SK2238</b>     | 450                  | 1.5                | 3.50                        | FM20    | <b>2SK2803</b>  |
| <b>2SK2239</b>     | 450                  | 3                  | 2.00                        | FM20    | <b>2SK2804</b>  |
| <b>2SK2240</b>     | 450                  | 5                  | 1.50                        | FM20    | <b>2SK2804</b>  |
| <b>2SK2241</b>     | 450                  | 7                  | 0.95                        | FM20    | <b>2SK2702</b>  |
| <b>2SK2242</b>     | 450                  | 7                  | 0.95                        | FM100   | <b>2SK2702</b>  |
| <b>2SK2243</b>     | 450                  | 10                 | 0.75                        | FM100   | <b>2SK2702</b>  |
| <b>2SK2244</b>     | 450                  | 12                 | 0.55                        | FM100   | <b>2SK2704</b>  |
| <b>2SK2245</b>     | 450                  | 15                 | 0.45                        | FM100   | <b>2SK2705</b>  |