

TOSHIBA POWER MOS FET MODULE SILICON N & P CHANNEL MOS TYPE ( $L^2$ - $\pi$ -MOS $^{\text{IV}}$  4 IN 1)

# MP4207

○ HIGH POWER HIGH SPEED SWITCHING APPLICATIONS.

○ H - SWITCH DRIVER

• 4-Volt Gate Drive.

• Small Package by Full Molding. (SIP 10 Pin)

• High Drain Power Dissipation. (4 Devices Operation)

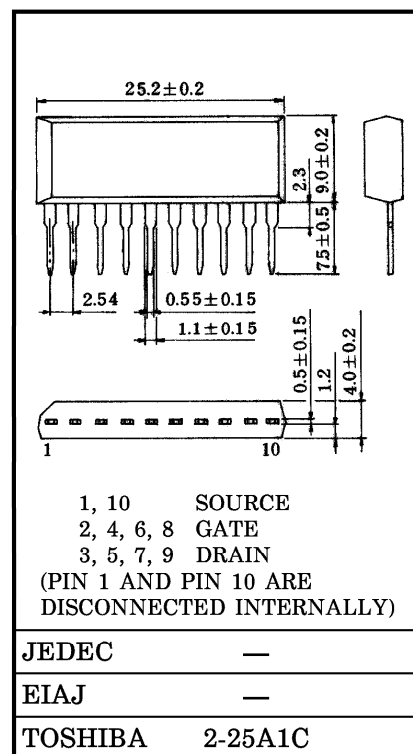
:  $P_T = 4W$  @  $T_a = 25^\circ C$ 

• Low Drain-Source ON Resistance

:  $R_{DS(ON)} = 90m\Omega$  TYP. (Nch):  $R_{DS(ON)} = 170m\Omega$  TYP.(Pch)• Low Leakage Current :  $I_{GSS} = \pm 10\mu A$  (Max.) @  $V_{GS} = \pm 16V$ :  $I_{DSS} = 100\mu A$  (Max.) @  $V_{DS} = 60V$ • Enhancement-Mode :  $V_{th} = 0.8 \sim 2.0V$  @  $I_D = 1mA$ 

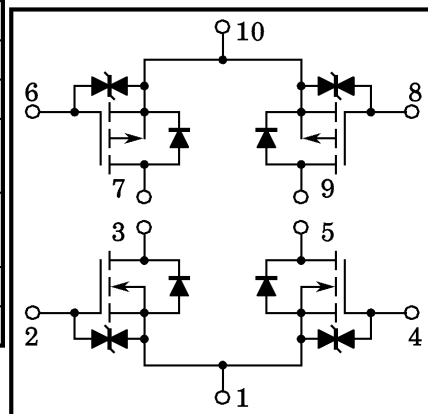
## INDUSTRIAL APPLICATIONS

Unit in mm

MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

| CHARACTERISTIC                                                        | SYMBOL    | RATING         |          | UNIT       |
|-----------------------------------------------------------------------|-----------|----------------|----------|------------|
|                                                                       |           | Nch            | Pch      |            |
| Drain-Source Voltage                                                  | $V_{DSS}$ | 60             | -60      | V          |
| Gate-Source Voltage                                                   | $V_{GSS}$ | $\pm 20$       | $\pm 20$ | V          |
| Drain Current                                                         | $I_D$     | 5              | -5       | A          |
| Peak Drain Current                                                    | $I_{DP}$  | 10             | -10      | A          |
| Drain Power Dissipation<br>(1 Device Operation, $T_a = 25^\circ C$ )  | $P_D$     | 2.0            |          | W          |
| Drain Power Dissipation<br>(4 Devices Operation, $T_a = 25^\circ C$ ) | $P_T$     | 4.0            |          | W          |
| Channel Temperature                                                   | $T_{ch}$  | 150            |          | $^\circ C$ |
| Storage Temperature Range                                             | $T_{stg}$ | $-55 \sim 150$ |          | $^\circ C$ |

## ARRAY CONFIGURATION

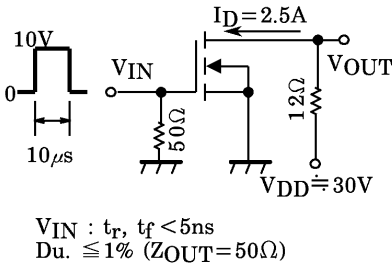


## THERMAL CHARACTERISTICS

| CHARACTERISTIC                                                                         | SYMBOL                | RATING | UNIT           |
|----------------------------------------------------------------------------------------|-----------------------|--------|----------------|
| Thermal Resistance of Channel to Ambient<br>(4 Devices Operation, $T_a = 25^\circ C$ ) | $\Sigma R_{th(ch-a)}$ | 31.2   | $^\circ C / W$ |
| Maximum Lead Temperature for Soldering Purposes<br>(3.2mm from Case for 10 second)     | $T_L$                 | 260    | $^\circ C$     |

THIS TRANSISTOR IS AN ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

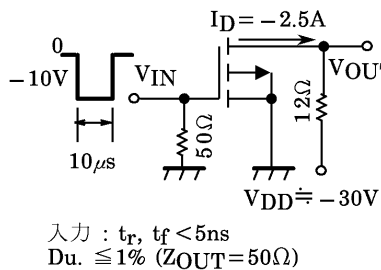
## ELECTRICAL CHARACTERISTICS (Ta = 25°C) (Nch MOS FET)

| CHARACTERISTIC                                  |               | SYMBOL        | TEST CONDITION                                                                                                                                                                         | MIN. | TYP. | MAX.     | UNIT      |
|-------------------------------------------------|---------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|----------|-----------|
| Gate Leakage Current                            |               | $I_{GSS}$     | $V_{GS} = \pm 16V, V_{DS} = 0$                                                                                                                                                         | —    | —    | $\pm 10$ | $\mu A$   |
| Drain Cut-off Current                           |               | $I_{DSS}$     | $V_{DS} = 60V, V_{GS} = 0$                                                                                                                                                             | —    | —    | 100      | $\mu A$   |
| Drain-Source Breakdown Voltage                  |               | $V_{(BR)DSS}$ | $I_D = 10mA, V_{GS} = 0$                                                                                                                                                               | 60   | —    | —        | V         |
| Gate Threshold Voltage                          |               | $V_{th}$      | $V_{DS} = 10V, I_D = 1mA$                                                                                                                                                              | 0.8  | —    | 2.0      | V         |
| Forward Transfer Admittance                     |               | $ Y_{fs} $    | $V_{DS} = 10V, I_D = 2.5A$                                                                                                                                                             | 3.0  | 6.0  | —        | S         |
| Drain-Source ON Resistance                      |               | $R_{DS(ON)}$  | $I_D = 2.5A, V_{GS} = 4V$                                                                                                                                                              | —    | 135  | 200      | $m\Omega$ |
| Drain-Source ON Resistance                      |               | $R_{DS(ON)}$  | $I_D = 2.5A, V_{GS} = 10V$                                                                                                                                                             | —    | 90   | 130      | $m\Omega$ |
| Input Capacitance                               |               | $C_{iss}$     | $V_{DS} = 10V, V_{GS} = 0, f = 1MHz$                                                                                                                                                   | —    | 500  | 900      | pF        |
| Reverse Transfer Capacitance                    |               | $C_{rss}$     |                                                                                                                                                                                        | —    | 90   | 180      | pF        |
| Output Capacitance                              |               | $C_{oss}$     |                                                                                                                                                                                        | —    | 290  | 500      | pF        |
| Switching Time                                  | Rise Time     | $t_r$         |  <p><math>V_{IN} : t_r, t_f &lt; 5ns</math><br/> <math>Du. \leq 1\% (Z_{OUT} = 50\Omega)</math></p> | —    | 20   | 40       | ns        |
|                                                 | Turn-on Time  | $t_{on}$      |                                                                                                                                                                                        | —    | 60   | 120      |           |
|                                                 | Fall Time     | $t_f$         |                                                                                                                                                                                        | —    | 80   | 160      |           |
|                                                 | Turn-off Time | $t_{off}$     |                                                                                                                                                                                        | —    | 300  | 600      |           |
| Total Gate Charge (Gate-Source Plus Gate-Drain) |               | $Q_g$         | $I_D = 5A, V_{GS} = 10V$<br>$V_{DD} = 48V$                                                                                                                                             | —    | 20   | 40       | nC        |
| Gate-Source Charge                              |               | $Q_{gs}$      |                                                                                                                                                                                        | —    | 14   | —        | nC        |
| Gate-Drain ("Miller") Charge                    |               | $Q_{gd}$      |                                                                                                                                                                                        | —    | 6    | —        | nC        |

## SOURCE-DRAIN DIODE RATING AND CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC             | SYMBOL    | TEST CONDITION                | MIN. | TYPE | MAX. | UNIT    |
|----------------------------|-----------|-------------------------------|------|------|------|---------|
| Drain Reverse Current      | $I_{DR}$  | —                             | —    | —    | 5    | A       |
| Peak Drain Reverse Current | $I_{DRP}$ | —                             | —    | —    | 10   | A       |
| Diode Forward Voltage      | $V_{DSF}$ | $I_{DR} = 5A, V_{GS} = 0$     | —    | —    | —1.5 | V       |
| Reverse Recovery Time      | $t_{rr}$  | $I_{DR} = 5A, V_{GS} = 0$     | —    | 140  | —    | ns      |
| Reverse Recovery Charge    | $Q_{rr}$  | $dI_{DR} / dt = -50A / \mu s$ | —    | 0.4  | —    | $\mu C$ |

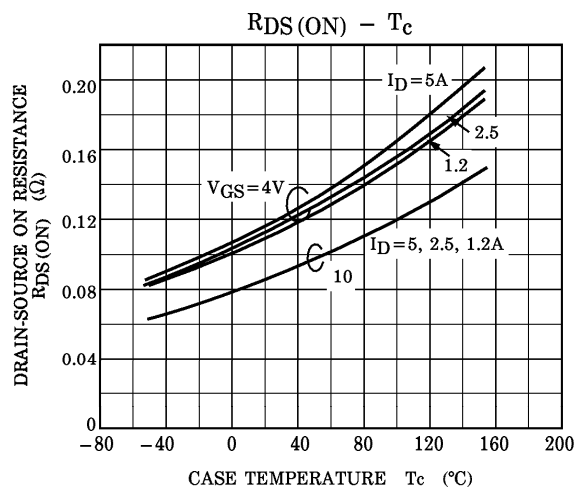
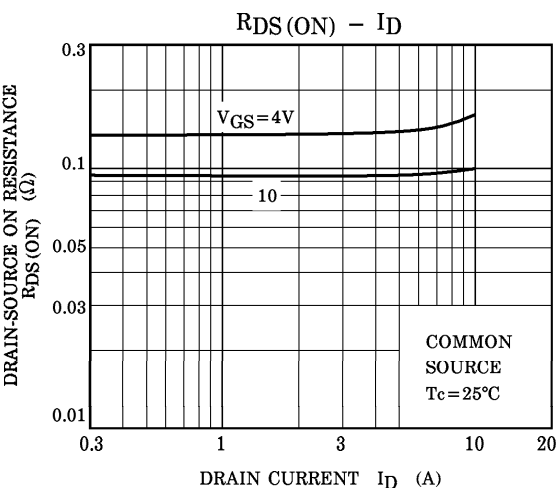
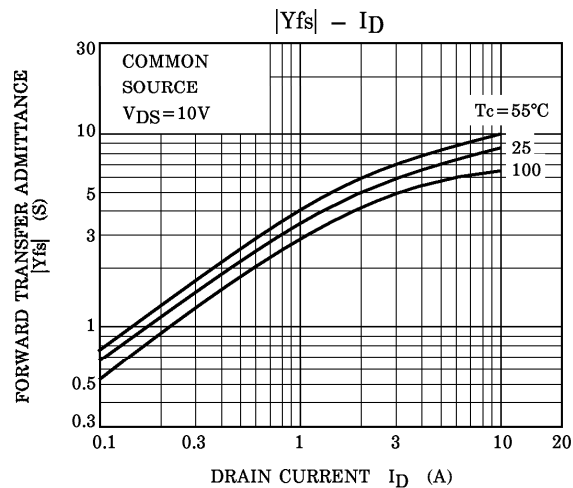
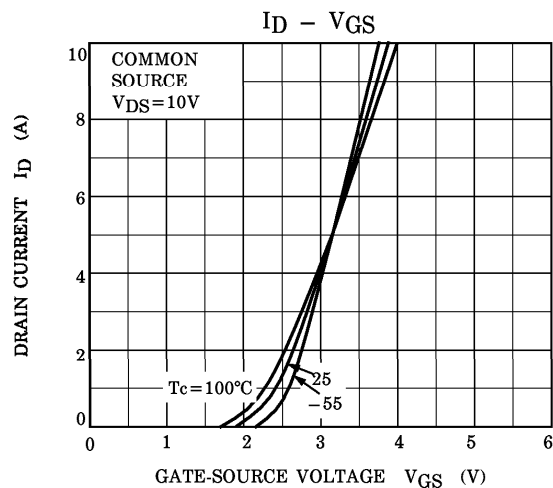
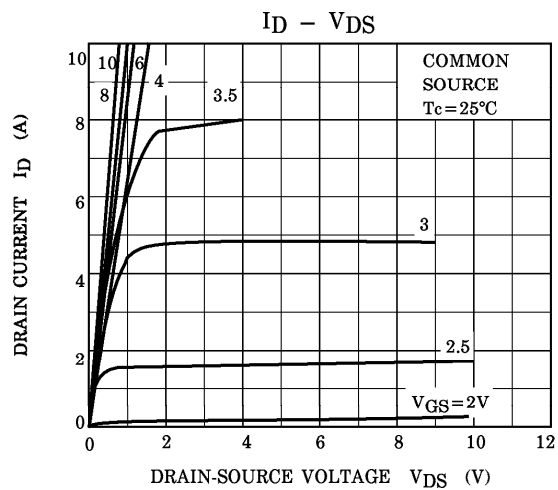
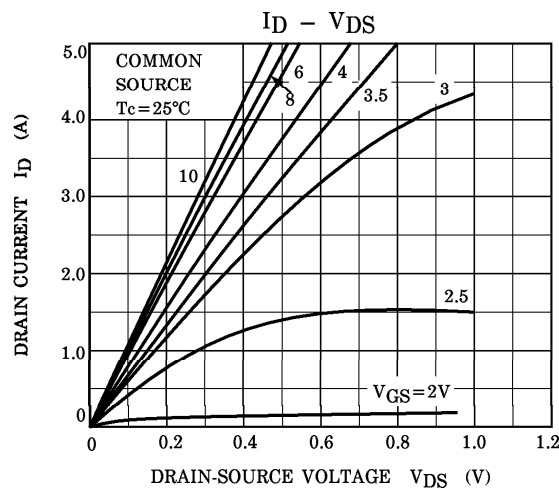
## ELECTRICAL CHARACTERISTICS (Ta = 25°C) (Pch MOS FET)

| CHARACTERISTIC                                  |               | SYMBOL        | TEST CONDITION                                                                                                                                                                                 | MIN. | TYP. | MAX.     | UNIT      |
|-------------------------------------------------|---------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|----------|-----------|
| Gate Leakage Current                            |               | $I_{GSS}$     | $V_{GS} = \pm 16V, V_{DS} = 0$                                                                                                                                                                 | —    | —    | $\pm 10$ | $\mu A$   |
| Drain Cut-off Current                           |               | $I_{DSS}$     | $V_{DS} = -60V, V_{GS} = 0$                                                                                                                                                                    | —    | —    | -100     | $\mu A$   |
| Drain-Source Breakdown Voltage                  |               | $V_{(BR)DSS}$ | $I_D = -10mA, V_{GS} = 0$                                                                                                                                                                      | -60  | —    | —        | V         |
| Gate Threshold Voltage                          |               | $V_{th}$      | $V_{DS} = -10V, I_D = -1mA$                                                                                                                                                                    | -0.8 | —    | -2.0     | V         |
| Forward Transfer Admittance                     |               | $ Y_{fs} $    | $V_{DS} = -10V, I_D = -2.5A$                                                                                                                                                                   | 1.0  | 2.0  | —        | S         |
| Drain-Source ON Resistance                      |               | $R_{DS(ON)}$  | $I_D = -2.5A, V_{GS} = -4V$                                                                                                                                                                    | —    | 250  | 400      | $m\Omega$ |
| Drain-Source ON Resistance                      |               | $R_{DS(ON)}$  | $I_D = -2.5A, V_{GS} = -10V$                                                                                                                                                                   | —    | 170  | 250      | $m\Omega$ |
| Input Capacitance                               |               | $C_{iss}$     | $V_{DS} = -10V, V_{GS} = 0, f = 1MHz$                                                                                                                                                          | —    | 500  | 720      | pF        |
| Reverse Transfer Capacitance                    |               | $C_{rss}$     |                                                                                                                                                                                                | —    | 90   | 150      | pF        |
| Output Capacitance                              |               | $C_{oss}$     |                                                                                                                                                                                                | —    | 290  | 420      | pF        |
| Switching Time                                  | Rise Time     | $t_r$         |  <p>入力 : <math>t_r, t_f &lt; 5ns</math><br/>Du. <math>\leq 1\%</math> (<math>Z_{OUT} = 50\Omega</math>)</p> | —    | 120  | 240      | ns        |
|                                                 | Turn-on Time  | $t_{on}$      |                                                                                                                                                                                                | —    | 130  | 260      |           |
|                                                 | Fall Time     | $t_f$         |                                                                                                                                                                                                | —    | 80   | 160      |           |
|                                                 | Turn-off Time | $t_{off}$     |                                                                                                                                                                                                | —    | 200  | 400      |           |
| Total Gate Charge (Gate-Source Plus Gate-Drain) |               | $Q_g$         | $I_D = -5A, V_{GS} = -10V$<br>$V_{DD} = -48V$                                                                                                                                                  | —    | 22   | 45       | nC        |
| Gate-Source Charge                              |               | $Q_{gs}$      |                                                                                                                                                                                                | —    | 14   | —        | nC        |
| Gate-Drain ("Miller") Charge                    |               | $Q_{gd}$      |                                                                                                                                                                                                | —    | 8    | —        | nC        |

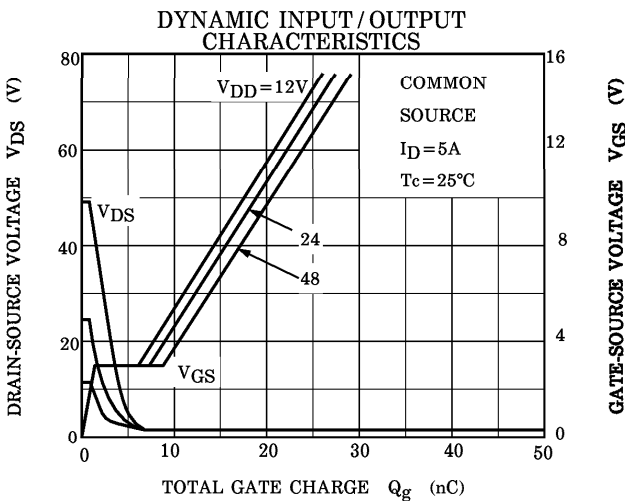
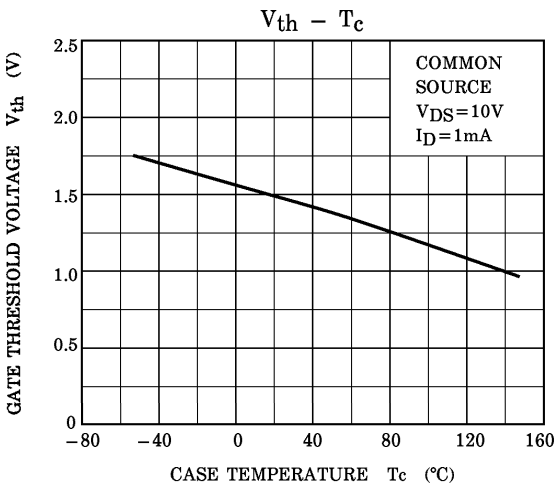
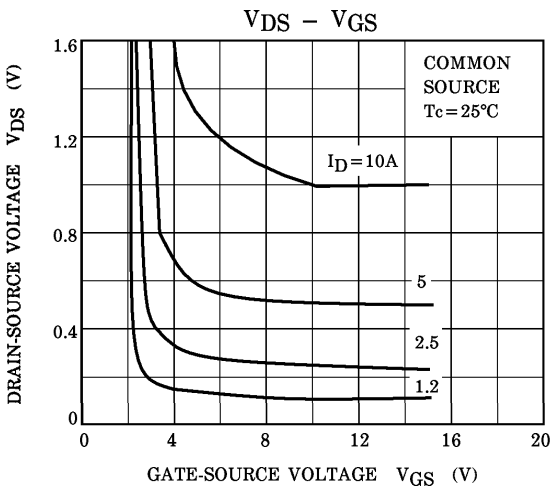
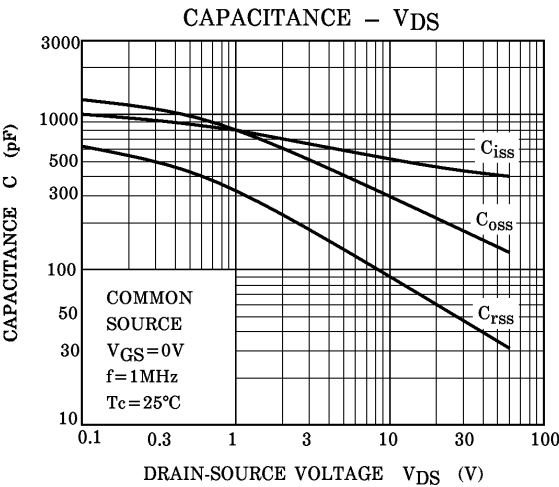
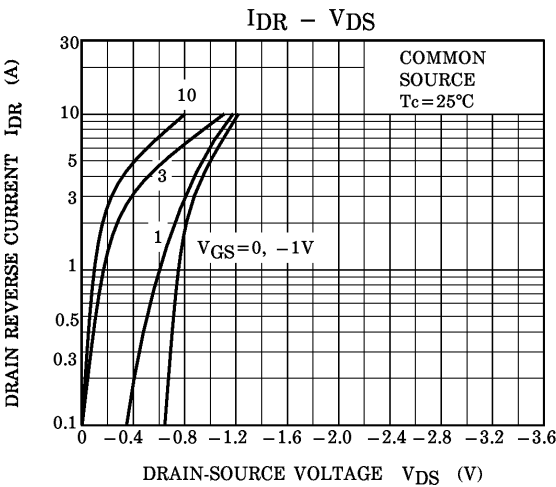
## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC             | SYMBOL    | TEST CONDITION                | MIN. | TYPE | MAX. | UNIT    |
|----------------------------|-----------|-------------------------------|------|------|------|---------|
| Drain Reverse Current      | $I_{DR}$  | —                             | —    | —    | -5   | A       |
| Peak Drain Reverse Current | $I_{DRP}$ | —                             | —    | —    | -10  | A       |
| Diode Forward Voltage      | $V_{DSF}$ | $I_{DR} = -5A, V_{GS} = 0$    | —    | —    | 1.5  | V       |
| Reverse Recovery Time      | $t_{rr}$  | $I_{DR} = -5A, V_{GS} = 0$    | —    | 120  | —    | ns      |
| Reverse Recovery Charge    | $Q_{rr}$  | $dI_{DR} / dt = -50A / \mu s$ | —    | 0.24 | —    | $\mu C$ |

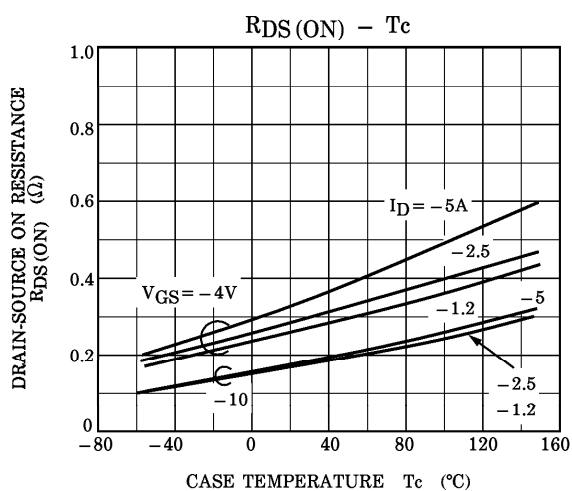
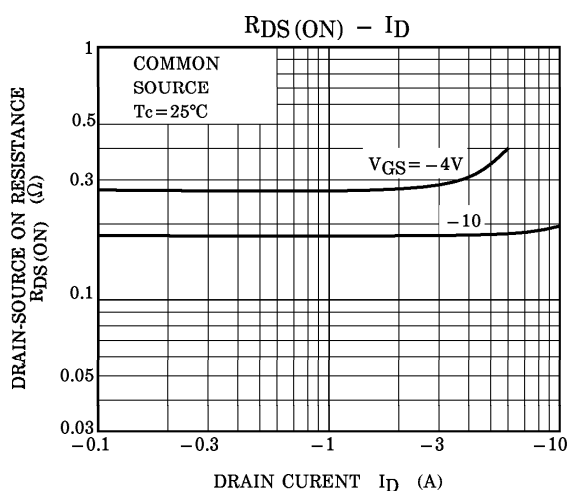
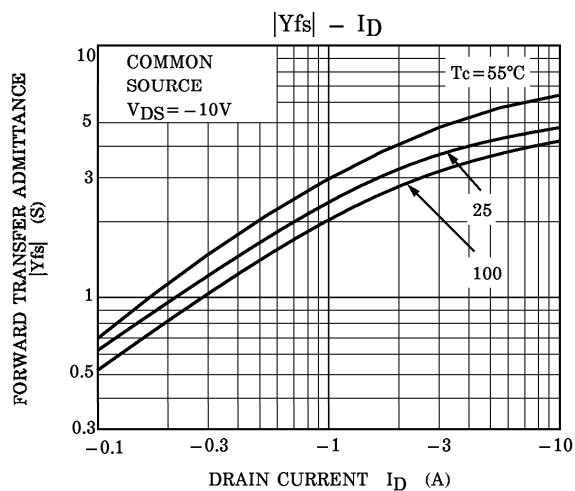
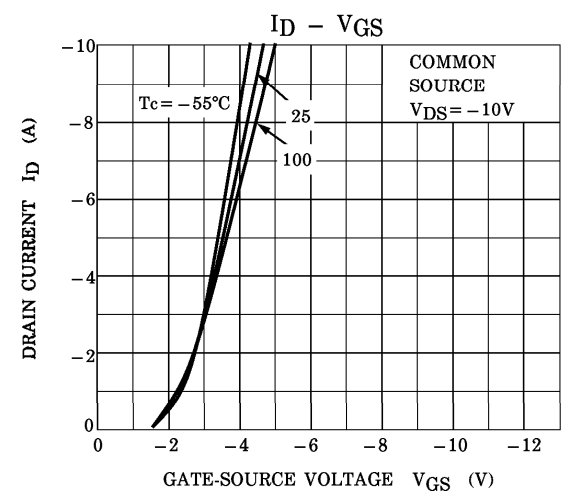
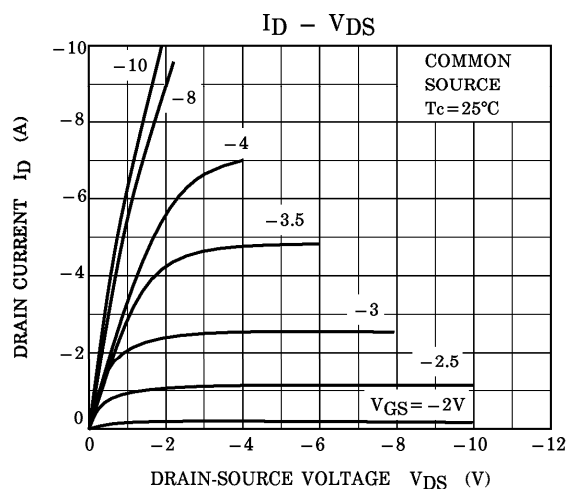
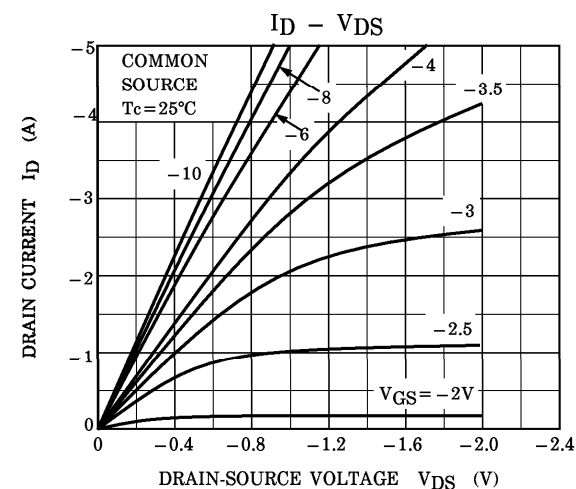
Nch FET



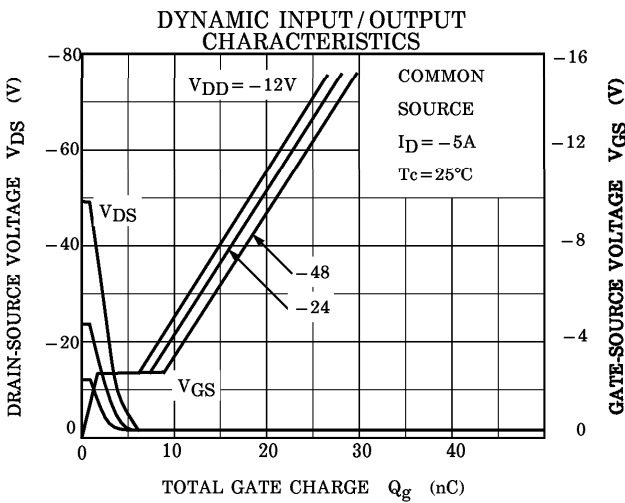
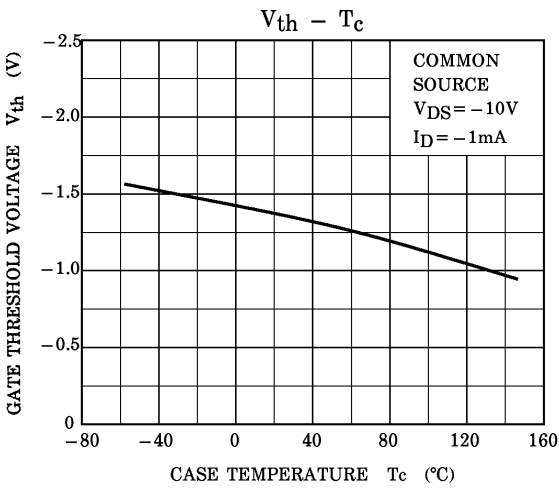
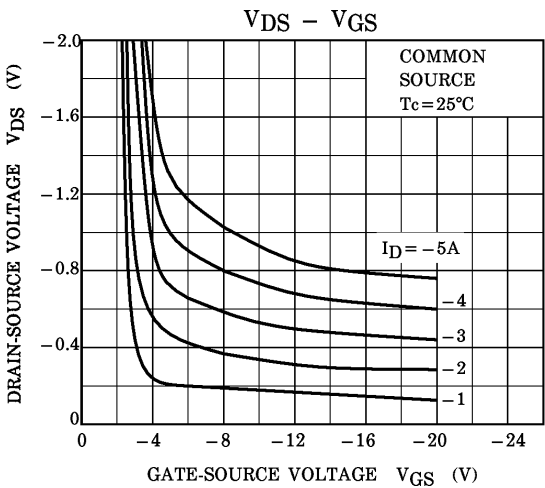
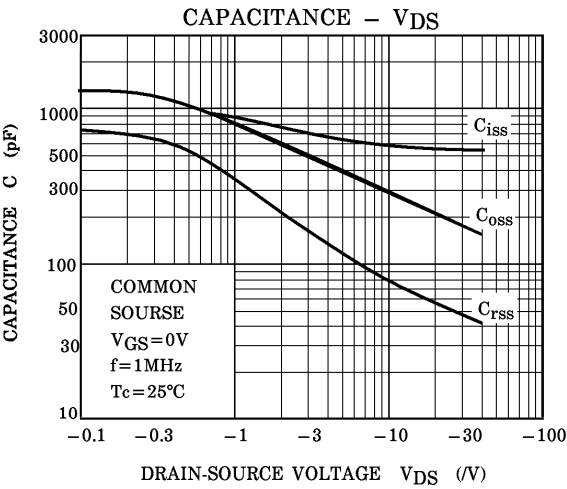
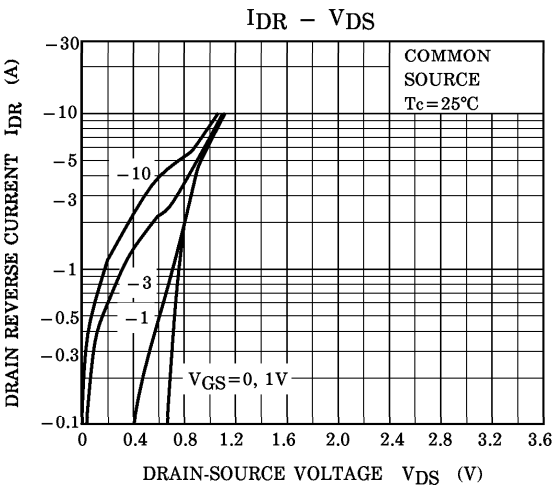
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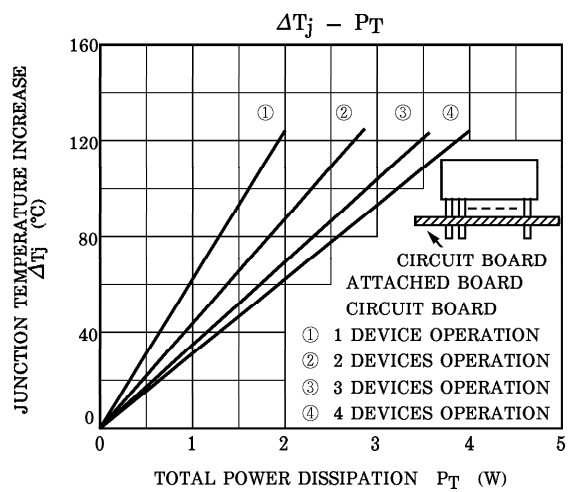
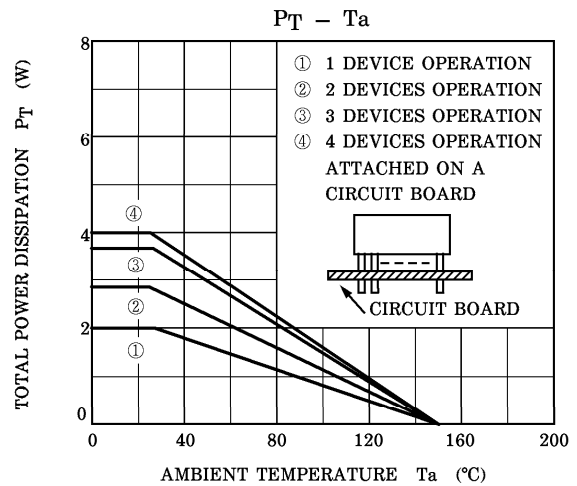
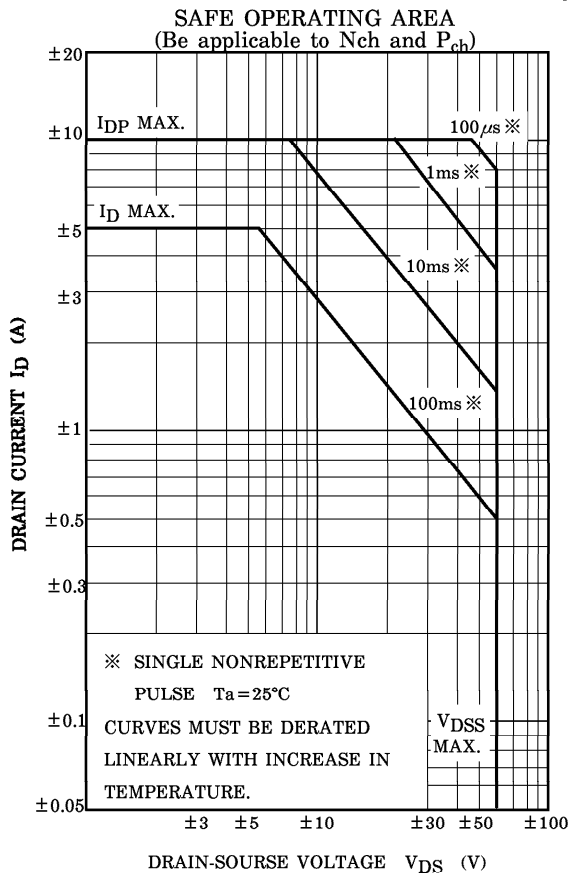
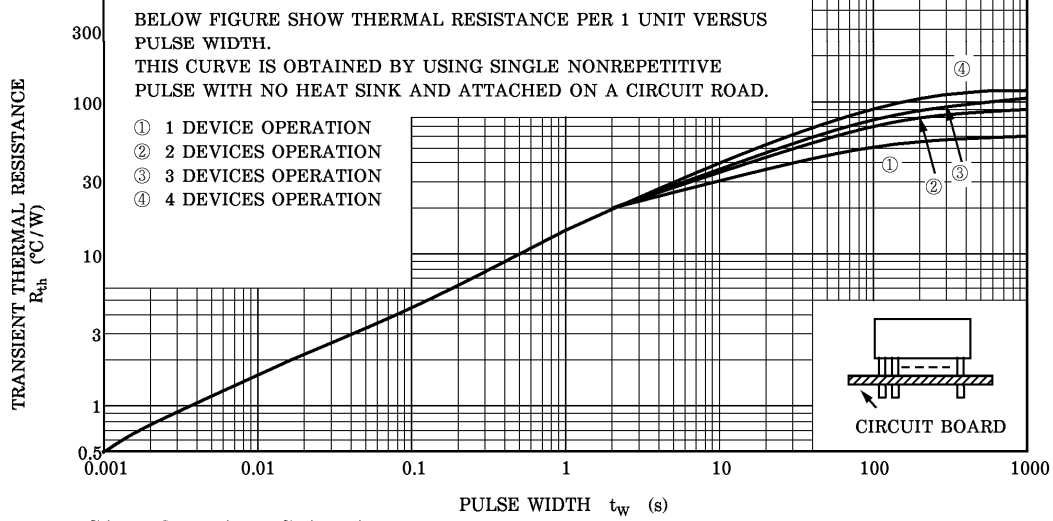


Pch FET



Pch FET





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