

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (Ultra-High-Speed U-MOSIII)

## TPC8017-H

High-Efficiency DC/DC Converter Applications

Notebook PC Applications

Portable-Equipment Applications

- Small footprint due to small and thin package
- High-speed switching
- Small gate charge:  $Q_{SW} = 7.8 \text{ nC (typ.)}$
- Low drain-source ON-resistance:  $R_{DS(ON)} = 5.1 \text{ m}\Omega \text{ (typ.)}$
- High forward transfer admittance:  $|Y_{fs}| = 38 \text{ S (typ.)}$
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A (max) (} V_{DS} = 30 \text{ V)}$
- Enhancement mode:  $V_{th} = 1.1 \text{ to } 2.3 \text{ V (} V_{DS} = 10 \text{ V, } I_D = 1 \text{ mA)}$

### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

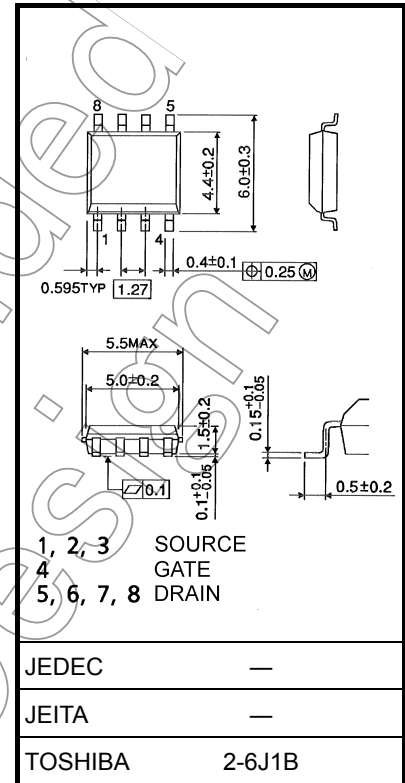
| Characteristic  |                 | Symbol    | Rating     | Unit             |
|---|-----------------|-----------|------------|------------------|
| Drain-source voltage  |                 | $V_{DSS}$ | 30         | V                |
| Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )        |                 | $V_{DGR}$ | 30         | V                |
| Gate-source voltage   |                 | $V_{GSS}$ | $\pm 20$   | V                |
| Drain current   | DC (Note 1)     | $I_D$     | 15         | A                |
|   | Pulsed (Note 1) | $I_{DP}$  | 60         | A                |
| Drain power dissipation ( $t = 10 \text{ s}$ )<br>(Note 2a) |                 | $P_D$     | 1.9        | W                |
| Drain power dissipation ( $t = 10 \text{ s}$ )<br>(Note 2b) |                 | $P_D$     | 1.0        | W                |
| Single-pulse avalanche energy<br>(Note 3)                   |                 | $E_{AS}$  | 146        | mJ               |
| Avalanche current   |                 | $I_{AR}$  | 15         | A                |
| Repetitive avalanche energy<br>(Note 2a) (Note 4)           |                 | $E_{AR}$  | 0.19       | mJ               |
| Channel temperature   |                 | $T_{ch}$  | 150        | $^\circ\text{C}$ |
| Storage temperature range                                   |                 | $T_{stg}$ | -55 to 150 | $^\circ\text{C}$ |

Note: For Notes 1 to 4, refer to the next page.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

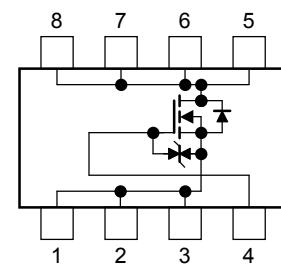
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.085 g (typ.)

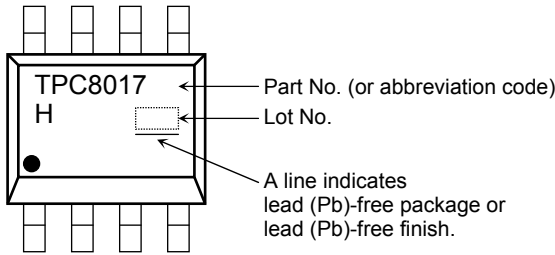
### Circuit Configuration



Thermal Characteristics

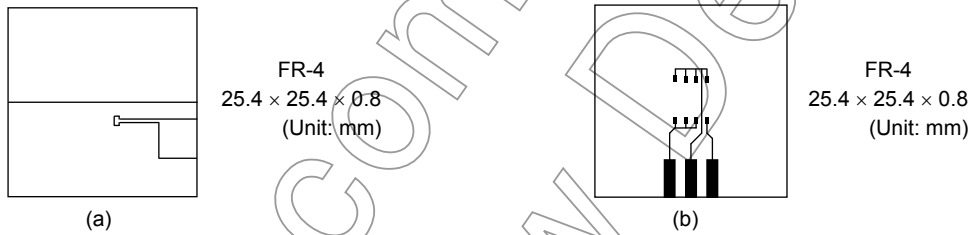
| Characteristic   | Symbol          | Max  | Unit |
|--|-----------------|------|------|
| Thermal resistance, channel to ambient<br>(t = 10 s) (Note 2a) | $R_{th (ch-a)}$ | 65.8 | °C/W |
| Thermal resistance, channel to ambient<br>(t = 10 s) (Note 2b) | $R_{th (ch-a)}$ | 125  | °C/W |

Marking (Note 5)



Note 1: The channel temperature should not exceed 150°C during use.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)

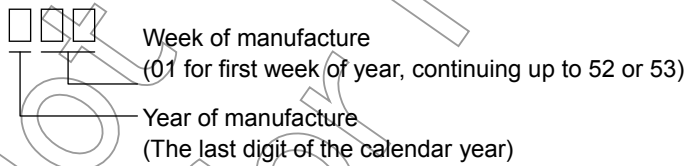


Note 3:  $V_{DD} = 24\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.5\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = 15\text{ A}$

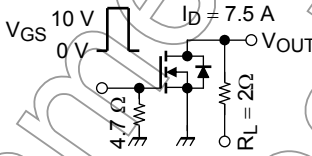
Note 4: Repetitive rating: pulse width limited by max channel temperature

Note 5: • on the lower left of the marking indicates Pin 1.

\* Weekly code: (Three digits)

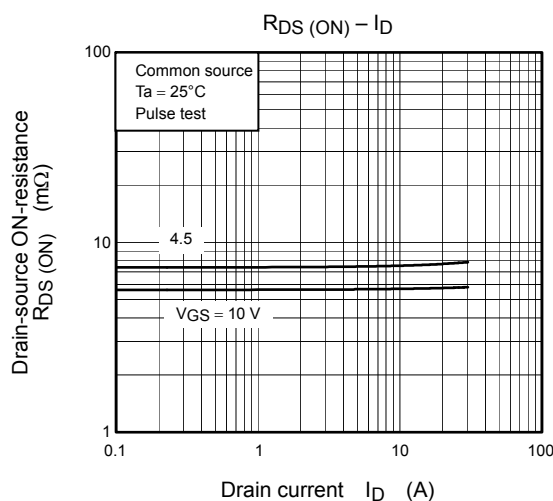
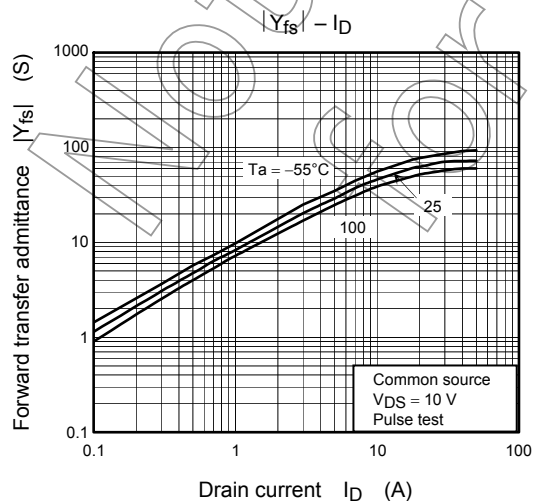
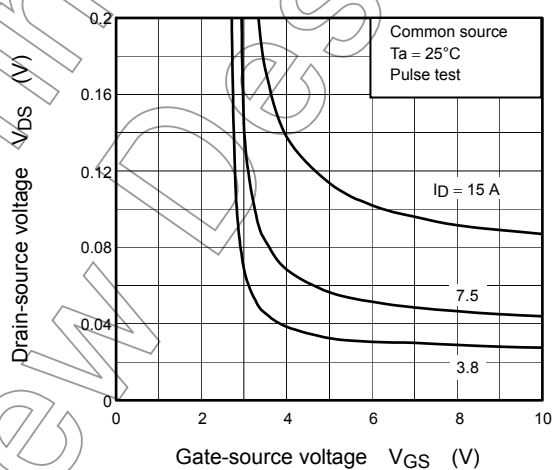
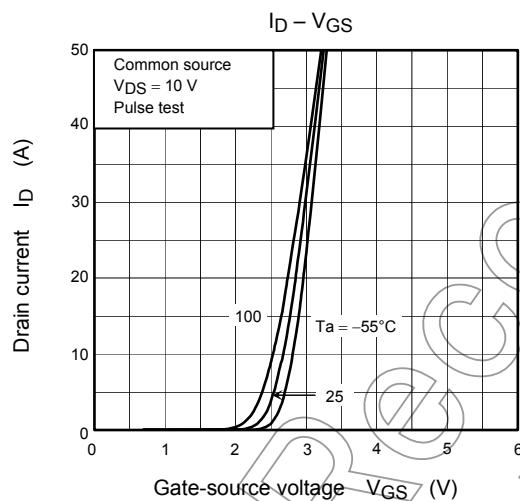
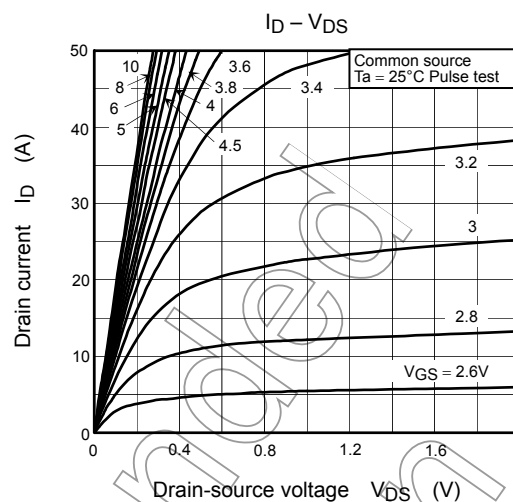
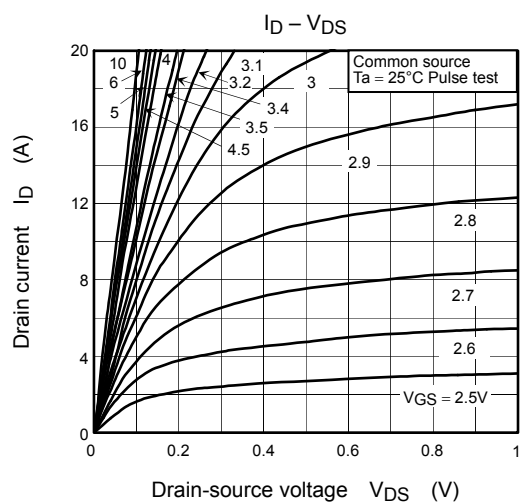


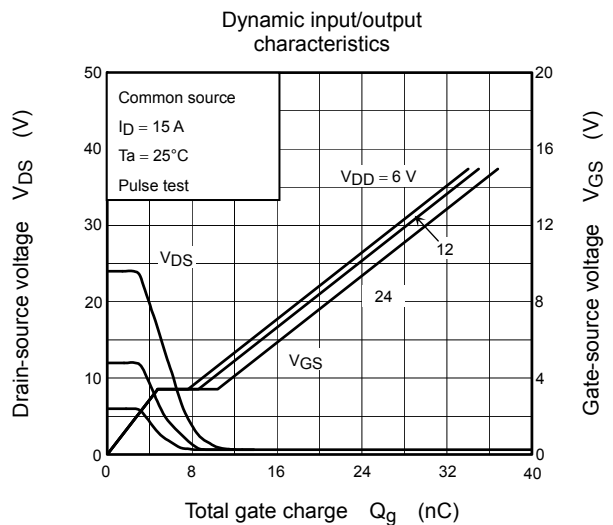
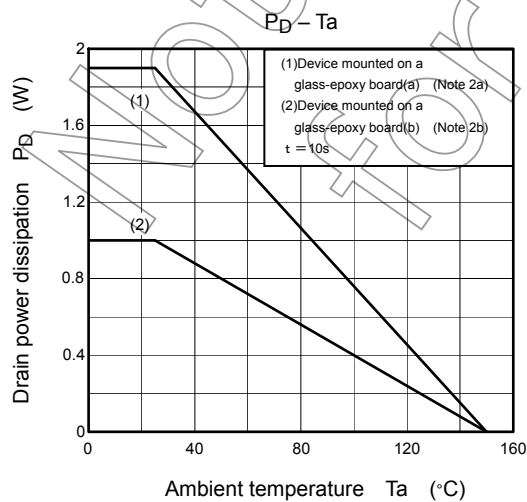
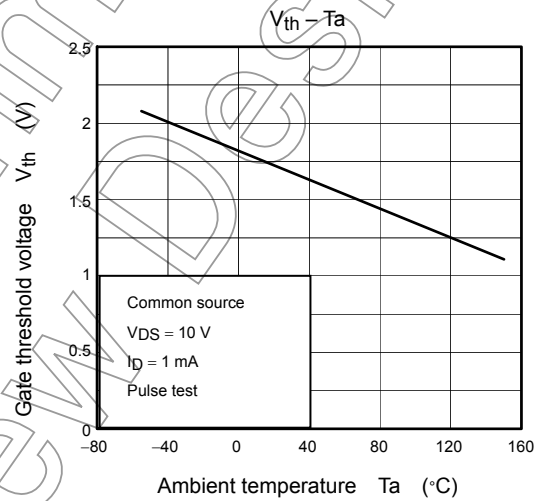
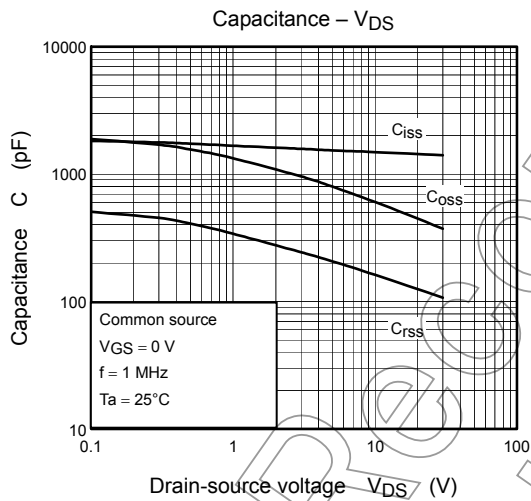
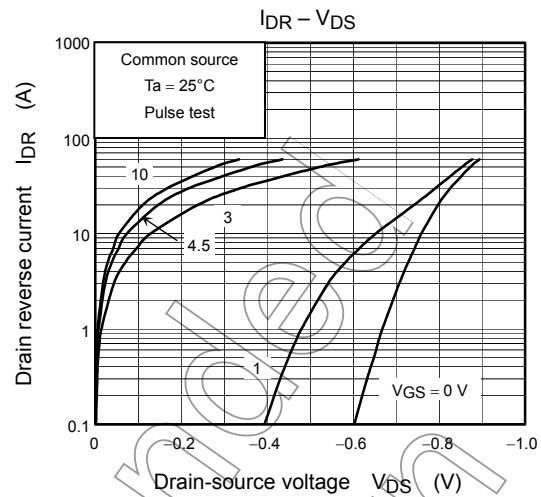
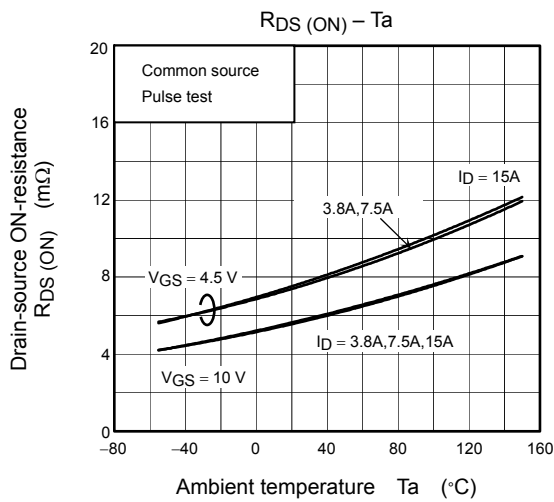
## Electrical Characteristics (Ta = 25°C)

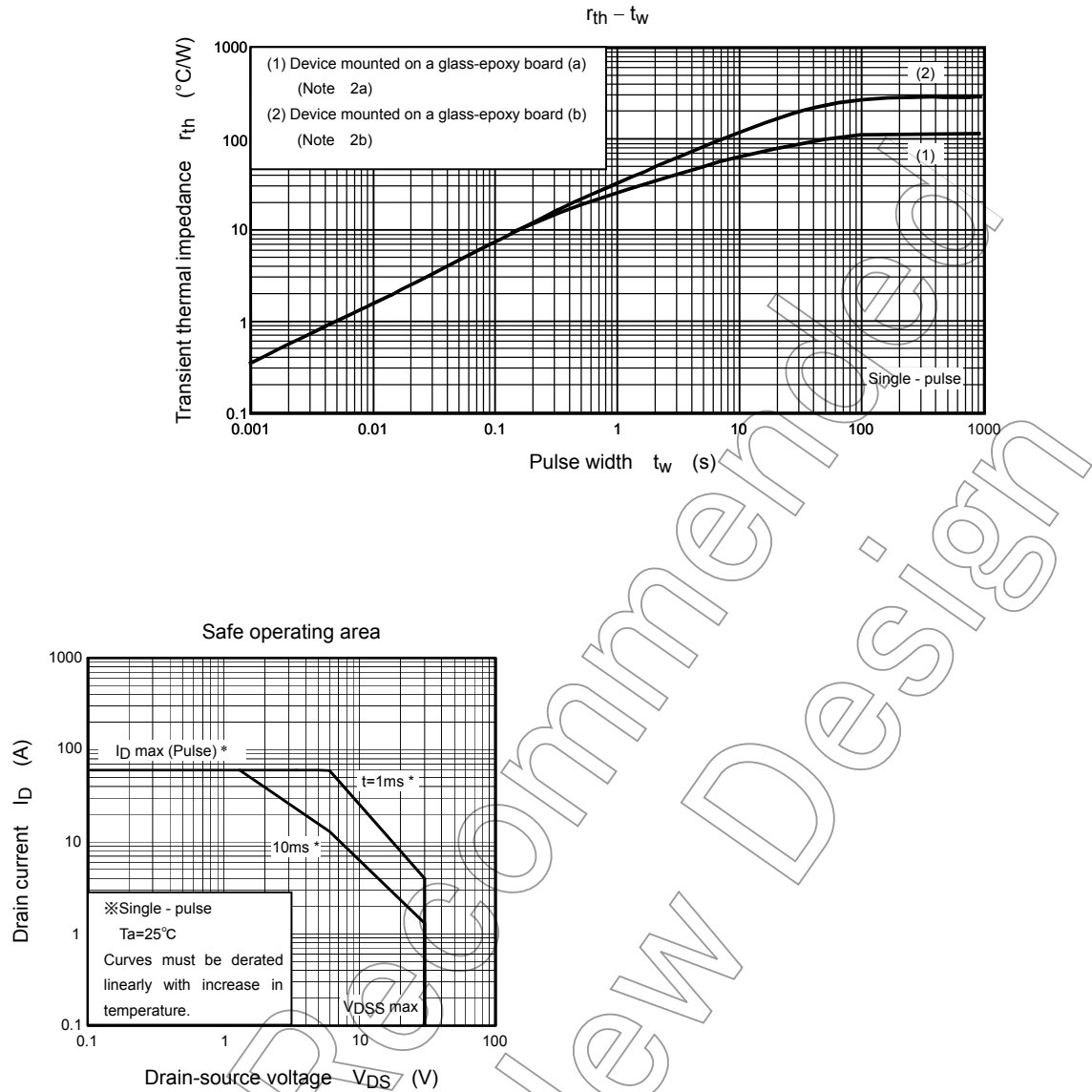
| Characteristic                                  |               | Symbol               | Test Condition  | Min | Typ. | Max | Unit |
|---|---------------|----------------------|---|-----|------|-----|------|
| Gate leakage current                            |               | I <sub>GSS</sub>     | V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V  | —   | —    | ±10 | μA   |
| Drain cutoff current                            |               | I <sub>DSS</sub>     | V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V   | —   | —    | 10  | μA   |
| Drain-source breakdown voltage                  |               | V (BR) DSS           | I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V   | 30  | —    | —   | V    |
|   |               | V (BR) DSX           | I <sub>D</sub> = 10 mA, V <sub>GS</sub> = -20 V   | 15  | —    | —   |      |
| Gate threshold voltage                          |               | V <sub>th</sub>      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA   | 1.1 | —    | 2.3 | V    |
| Drain-source ON-resistance                      |               | R <sub>DS (ON)</sub> | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 7.5 A   | —   | 7.3  | 9.5 | mΩ   |
|   |               |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 7.5 A  | —   | 5.1  | 6.6 |      |
| Forward transfer admittance                     |               | Y <sub>fs</sub>      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 7.5 A  | 19  | 38   | —   | S    |
| Input capacitance                               |               | C <sub>iss</sub>     | V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz  | —   | 1465 | —   | pF   |
| Reverse transfer capacitance                    |               | C <sub>rss</sub>     |   | —   | 175  | —   |      |
| Output capacitance                              |               | C <sub>oss</sub>     |   | —   | 610  | —   |      |
| Switching time                                  | Rise time     | t <sub>r</sub>       |  <p>V<sub>GS</sub> = 10 V, V<sub>DS</sub> = 0 V, I<sub>D</sub> = 7.5 A<br/>V<sub>DD</sub> ≈ 15 V<br/>Duty ≤ 1%, t<sub>w</sub> = 10 μs</p> | —   | 4    | —   | ns   |
|   | Turn-on time  | t <sub>on</sub>      |   | —   | 11   | —   |      |
|   | Fall time     | t <sub>f</sub>       |   | —   | 10   | —   |      |
|   | Turn-off time | t <sub>off</sub>     |   | —   | 38   | —   |      |
| Total gate charge (gate-source plus gate-drain) |               | Q <sub>g</sub>       | V <sub>DD</sub> ≈ 24 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 15 A   | —   | 25   | —   | nC   |
|   |               |                      | V <sub>DD</sub> ≈ 24 V, V <sub>GS</sub> = 5 V, I <sub>D</sub> = 15 A  | —   | 14   | —   |      |
| Gate-source charge 1                            |               | Q <sub>gs1</sub>     | V <sub>DD</sub> ≈ 24 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 15 A   | —   | 4.7  | —   |      |
| Gate-drain (“miller”) charge                    |               | Q <sub>gd</sub>      |   | —   | 5.7  | —   |      |
| Gate switch charge                              |               | Q <sub>SW</sub>      |   | —   | 7.8  | —   |      |

## Source-Drain Ratings and Characteristics (Ta = 25°C)

| Characteristic          |                | Symbol    | Test Condition                                | Min | Typ. | Max  | Unit |
|-------------------------|----------------|-----------|---|-----|------|------|------|
| Drain reverse current   | Pulse (Note 1) | $I_{DRP}$ | —   | —   | —    | 60   | A    |
| Forward voltage (diode) |                | $V_{DSF}$ | $I_{DR} = 15 \text{ A}, V_{GS} = 0 \text{ V}$ | —   | —    | -1.2 | V    |







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