

## TPCS8101

Lithium Ion Battery Applications  
Portable Equipment Applications  
Notebook PCs

- Small footprint due to small and thin package
- Low drain-source ON resistance:  $R_{DS(ON)} = 15 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 12 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = -10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = -30 \text{ V}$ )
- Enhancement-mode:  $V_{th} = -0.8 \sim -2.0 \text{ V}$  ( $V_{DS} = -10 \text{ V}$ ,  $I_D = -1 \text{ mA}$ )

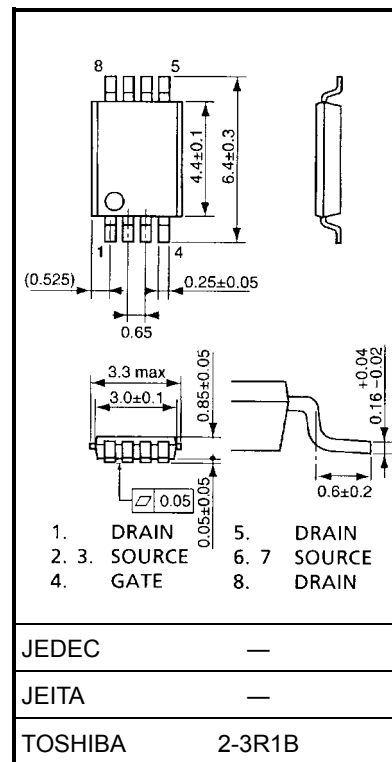
### Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

| Characteristics                                             |                | 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)    | $I_D$     | -6         | A                |
|                                                             | Pulse (Note 1) | $I_{DP}$  | -24        |                  |
| Drain power dissipation ( $t = 10 \text{ s}$ )<br>(Note 2a) |                | $P_D$     | 1.5        | W                |
| Drain power dissipation ( $t = 10 \text{ s}$ )<br>(Note 2b) |                | $P_D$     | 0.6        | W                |
| Single pulse avalanche energy<br>(Note 3)                   |                | $E_{AS}$  | 46.8       | mJ               |
| Avalanche current                                           |                | $I_{AR}$  | -6         | A                |
| Repetitive avalanche energy<br>(Note 2a, Note 4)            |                | $E_{AR}$  | 0.15       | mJ               |
| Channel temperature                                         |                | $T_{ch}$  | 150        | $^\circ\text{C}$ |
| Storage temperature range                                   |                | $T_{stg}$ | -55 to 150 | $^\circ\text{C}$ |

Note: For (Note 1), (Note 2), (Note 3) and (Note 4), please refer to the next page.

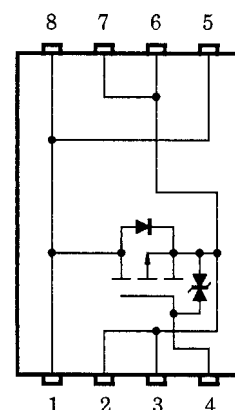
This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 0.035 g (typ.)

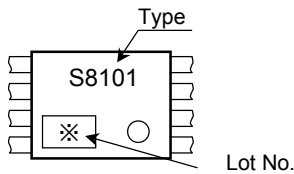
### Circuit Configuration



Thermal Characteristics

| Characteristics                                                   | Symbol          | Max  | Unit |
|-------------------------------------------------------------------|-----------------|------|------|
| Thermal resistance, channel to ambient<br>(t = 10 s)<br>(Note 2a) | $R_{th (ch-a)}$ | 83.3 | °C/W |
| Thermal resistance, channel to ambient<br>(t = 10 s)<br>(Note 2b) | $R_{th (ch-a)}$ | 208  | °C/W |

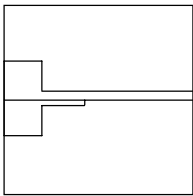
Marking (Note 5)



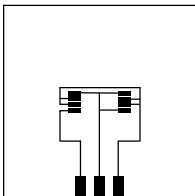
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2:

- a) Device mounted on a glass-epoxy board (a)      b) Device mounted on a glass-epoxy board (b)



FR-4  
25.4 × 25.4 × 0.8  
(unit: mm)



FR-4  
25.4 × 25.4 × 0.8  
(unit: mm)

Note 3:  $V_{DD} = -24\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 1.0\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = -6.0\text{ A}$

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

Note 5: ○ on lower right of the marking indicates Pin 1.

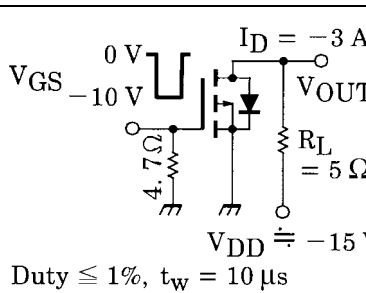
※ Weekly code: (Three digits)



Week of manufacture  
(01 for first week of year, continues up to 52 or 53)

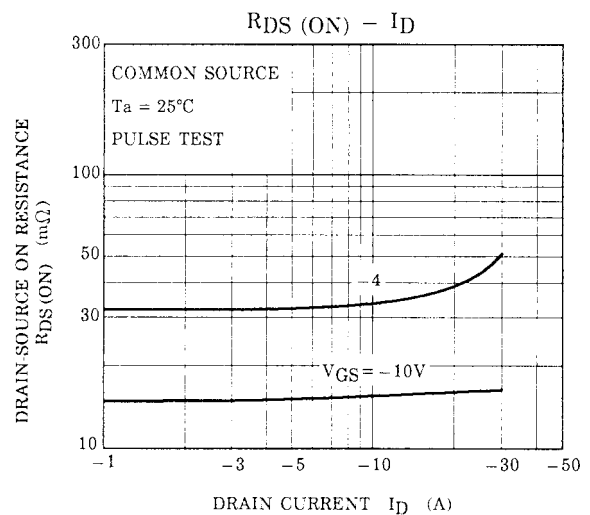
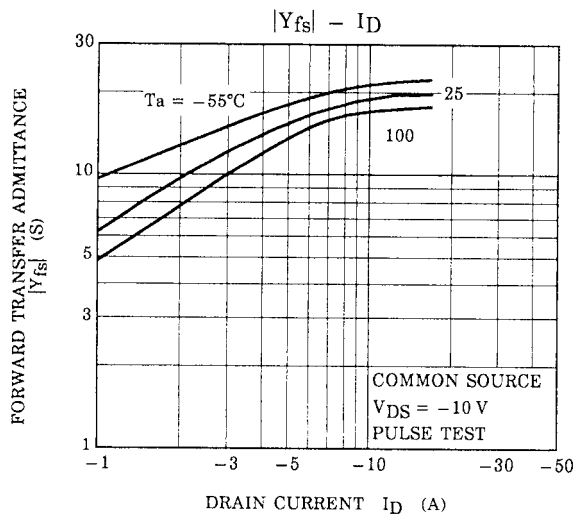
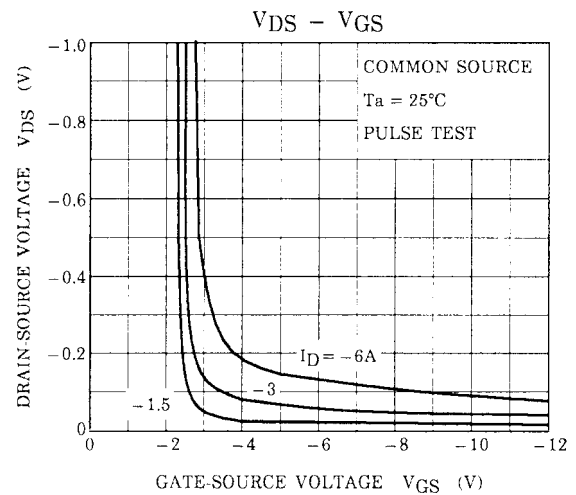
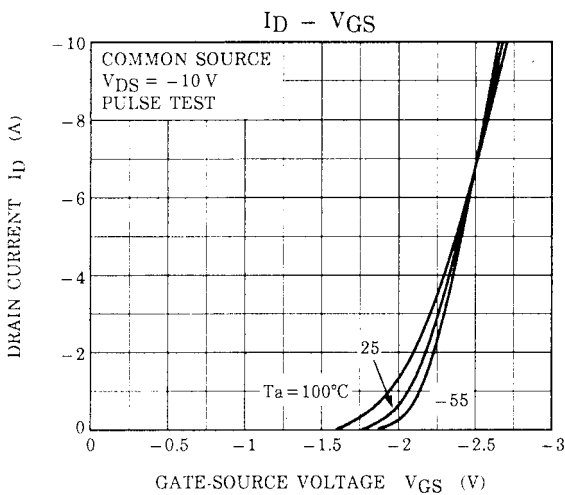
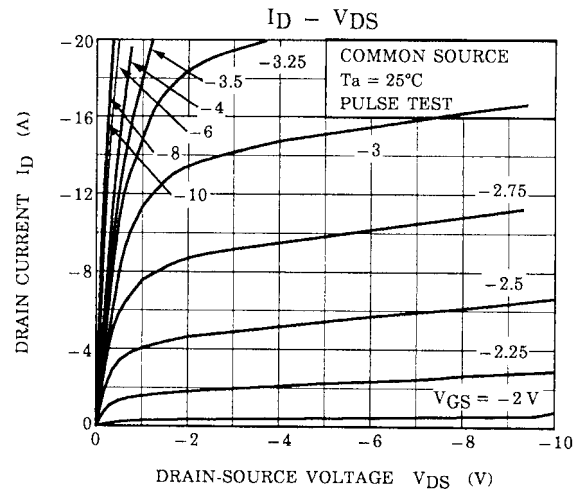
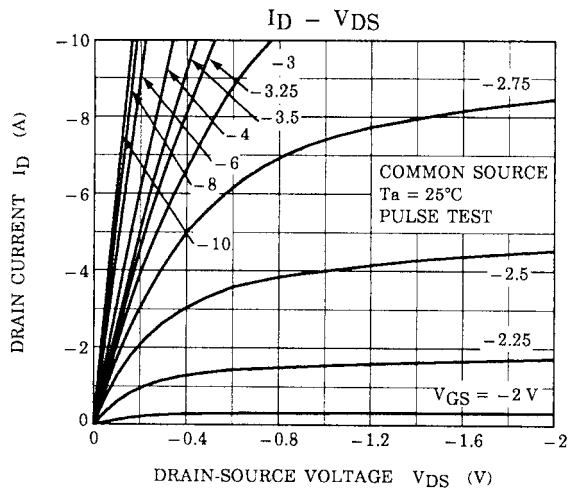
Year of manufacture  
(One low-order digits of calendar year)

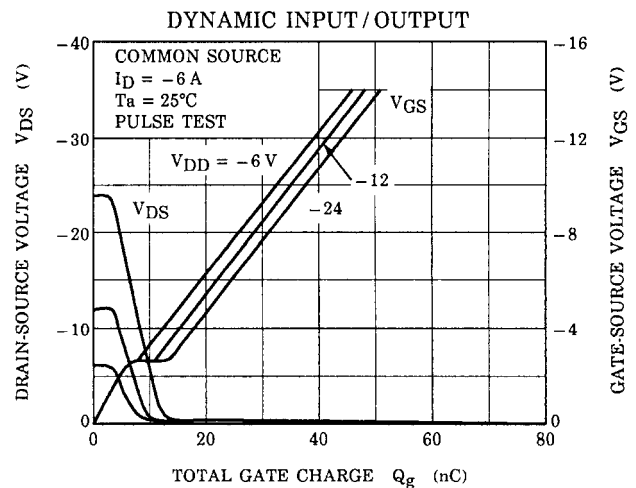
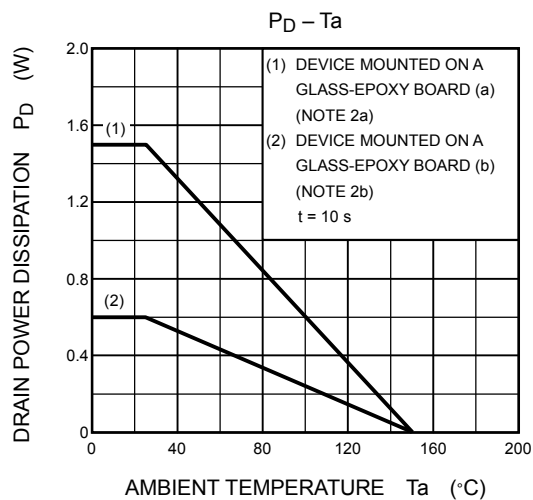
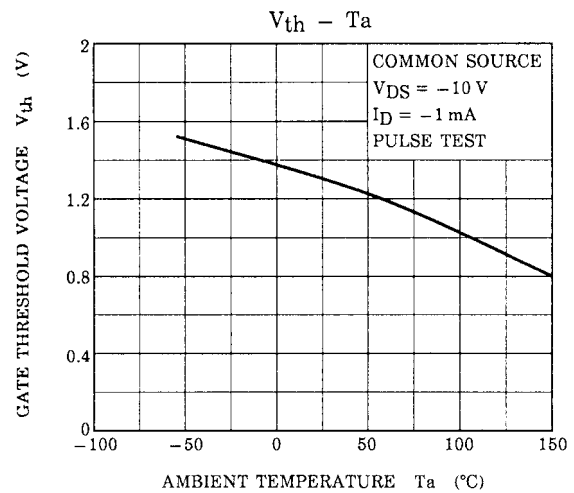
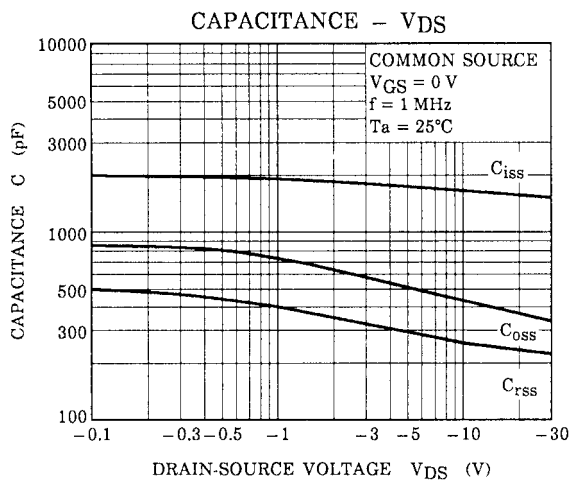
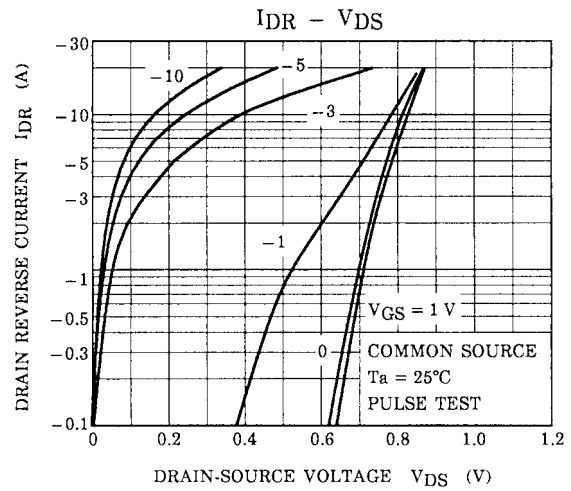
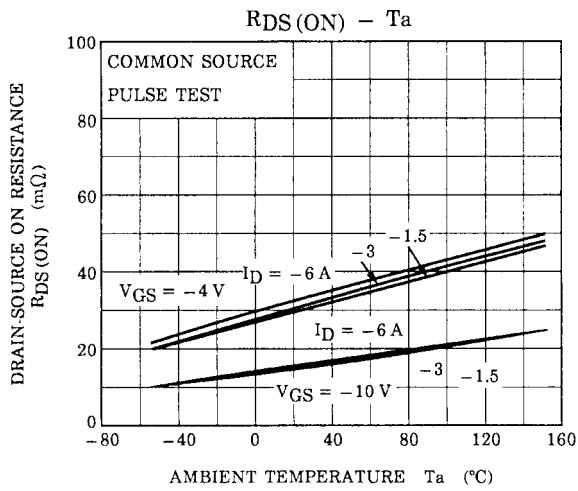
## Electrical Characteristics (Ta = 25°C)

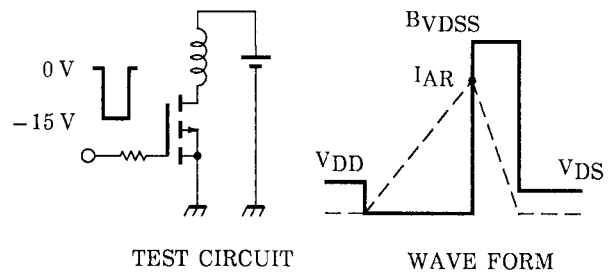
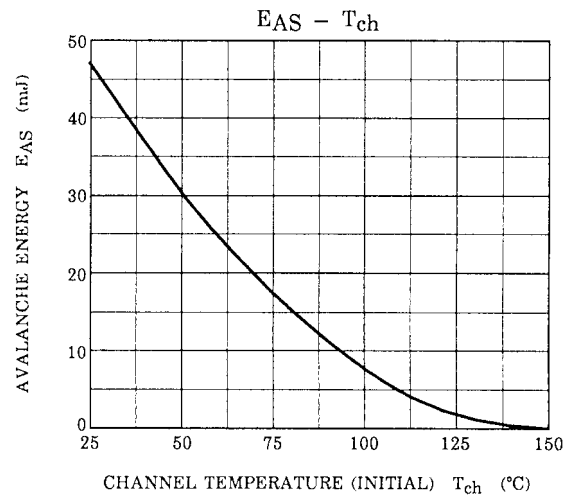
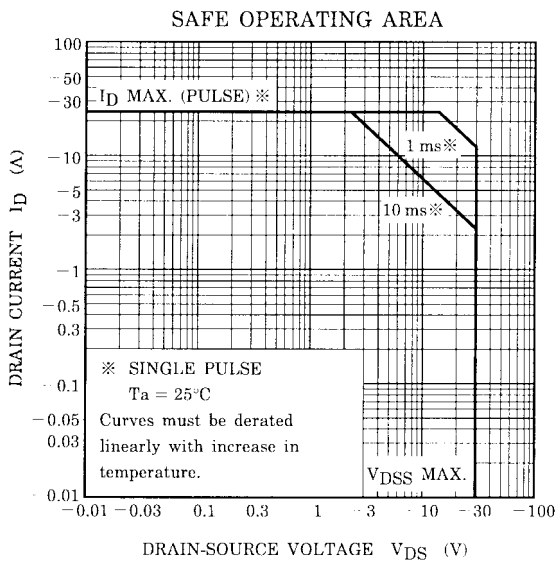
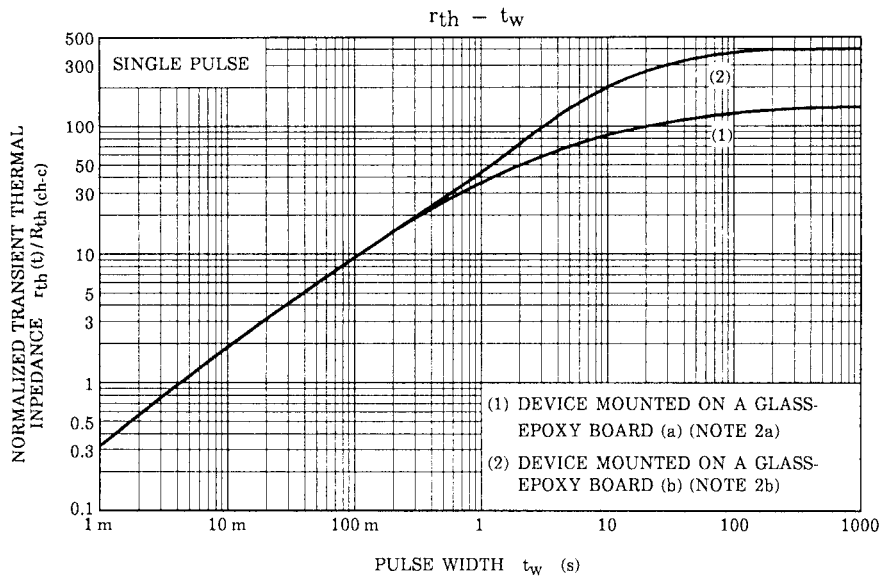
| Characteristics                                 |               | Symbol        | Test Condition                                                                                                                                                                                                                                                                                                                             | Min  | Typ. | Max      | Unit          |
|-------------------------------------------------|---------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|----------|---------------|
| Gate leakage current                            |               | $I_{GSS}$     | $V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$                                                                                                                                                                                                                                                                                          | —    | —    | $\pm 10$ | $\mu\text{A}$ |
| Drain cut-OFF current                           |               | $I_{DSS}$     | $V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}$                                                                                                                                                                                                                                                                                             | —    | —    | -10      | $\mu\text{A}$ |
| Drain-source breakdown voltage                  |               | $V_{(BR)DSS}$ | $I_D = -10 \text{ mA}, V_{GS} = 0 \text{ V}$                                                                                                                                                                                                                                                                                               | -30  | —    | —        | V             |
|                                                 |               | $V_{(BR)DSX}$ | $I_D = -10 \text{ mA}, V_{GS} = 20 \text{ V}$                                                                                                                                                                                                                                                                                              | -15  | —    | —        |               |
| Gate threshold voltage                          |               | $V_{th}$      | $V_{DS} = -10 \text{ V}, I_D = -1 \text{ mA}$                                                                                                                                                                                                                                                                                              | -0.8 | —    | -2.0     | V             |
| Drain-source ON resistance                      |               | $R_{DS(ON)}$  | $V_{GS} = -4 \text{ V}, I_D = -3 \text{ A}$                                                                                                                                                                                                                                                                                                | —    | 32   | 40       | m $\Omega$    |
|                                                 |               | $R_{DS(ON)}$  | $V_{GS} = -10 \text{ V}, I_D = -3 \text{ A}$                                                                                                                                                                                                                                                                                               | —    | 15   | 25       |               |
| Forward transfer admittance                     |               | $ Y_{fs} $    | $V_{DS} = -10 \text{ V}, I_D = -3 \text{ A}$                                                                                                                                                                                                                                                                                               | 6    | 12   | —        | S             |
| Input capacitance                               |               | $C_{iss}$     | $V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$                                                                                                                                                                                                                                                                          | —    | 1810 | —        | pF            |
| Reverse transfer capacitance                    |               | $C_{rss}$     |                                                                                                                                                                                                                                                                                                                                            | —    | 350  | —        | pF            |
| Output capacitance                              |               | $C_{oss}$     |                                                                                                                                                                                                                                                                                                                                            | —    | 610  | —        | pF            |
| Switching time                                  | Rise time     | $t_r$         |  <p><math>I_D = -3 \text{ A}</math><br/> <math>V_{GS} = -10 \text{ V}</math><br/> <math>V_{OUT}</math><br/> <math>R_L = 5 \Omega</math><br/> <math>V_{DD} \approx -15 \text{ V}</math><br/> <math>\text{Duty} \leq 1\%, t_w = 10 \mu\text{s}</math></p> | —    | 9    | —        | ns            |
|                                                 | Turn-ON time  | $t_{on}$      |                                                                                                                                                                                                                                                                                                                                            | —    | 15   | —        |               |
|                                                 | Fall time     | $t_f$         |                                                                                                                                                                                                                                                                                                                                            | —    | 49   | —        |               |
|                                                 | Turn-OFF time | $t_{off}$     |                                                                                                                                                                                                                                                                                                                                            | —    | 135  | —        |               |
| Total gate charge (gate-source plus gate-drain) |               | $Q_g$         | $V_{DD} \approx -24 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -6 \text{ A}$                                                                                                                                                                                                                                                                 | —    | 37   | —        | nC            |
| Gate-source charge                              |               | $Q_{gs}$      |                                                                                                                                                                                                                                                                                                                                            | —    | 30   | —        | nC            |
| Gate-drain ("miller") charge                    |               | $Q_{gd}$      |                                                                                                                                                                                                                                                                                                                                            | —    | 7    | —        | nC            |

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

| Characteristics         |                | Symbol    | Test Condition                                | Min | Typ. | Max | Unit |
|-------------------------|----------------|-----------|-----------------------------------------------|-----|------|-----|------|
| Drain reverse current   | Pulse (Note 1) | $I_{DRP}$ | —                                             | —   | —    | -24 | A    |
| Forward voltage (diode) |                | $V_{DSF}$ | $I_{DR} = -6 \text{ A}, V_{GS} = 0 \text{ V}$ | —   | —    | 1.2 | V    |







$T_{ch} = 25^\circ\text{C}$  (Initial)  
 Peak  $I_{AR} = -6\text{ A}$ ,  $R_G = 25\ \Omega$   $E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{BVDSS}{BVDSS - V_{DD}} \right)$   
 $V_{DD} = -16\text{ V}$ ,  $L = 1.0\text{ mH}$

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