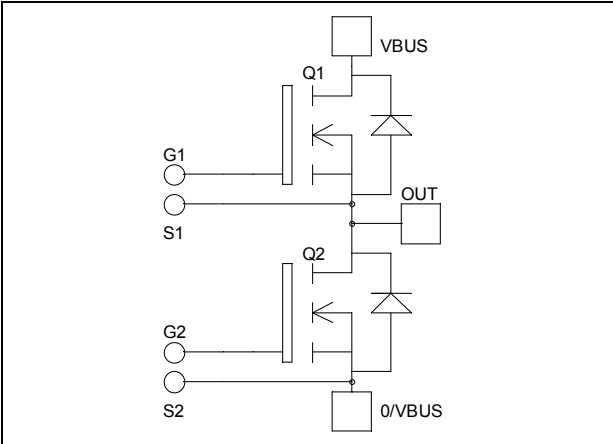


## Phase leg MOSFET Power Module

$V_{DSS} = 1000V$   
 $R_{DSon} = 90m\Omega \text{ typ @ } T_j = 25^\circ C$   
 $I_D = 78A \text{ @ } T_c = 25^\circ C$


**Application**

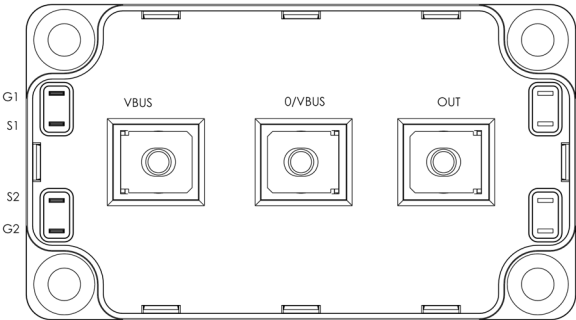
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

**Features**


- Power MOS 7<sup>®</sup> FREDFETs
  - Low  $R_{DSon}$
  - Low input and Miller capacitance
  - Low gate charge
  - Fast intrinsic reverse diode
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
  - Symmetrical design
  - M5 power connectors
- High level of integration

**Benefits**

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Low profile
- RoHS Compliant


**Absolute maximum ratings**

| Symbol     | Parameter   | Max ratings        | Unit      |
|------------|---|--------------------|-----------|
| $V_{DSS}$  | Drain - Source Breakdown Voltage                  | 1000               | V         |
| $I_D$      | Continuous Drain Current                          | $T_c = 25^\circ C$ | 78        |
|            |   | $T_c = 80^\circ C$ | 59        |
| $I_{DM}$   | Pulsed Drain current                              | 312                | A         |
| $V_{GS}$   | Gate - Source Voltage                             | $\pm 30$           | V         |
| $R_{DSon}$ | Drain - Source ON Resistance                      | 105                | $m\Omega$ |
| $P_D$      | Maximum Power Dissipation                         | $T_c = 25^\circ C$ | 1250      |
| $I_{AR}$   | Avalanche current (repetitive and non repetitive) | 25                 | A         |
| $E_{AR}$   | Repetitive Avalanche Energy                       | 50                 | mJ        |
| $E_{AS}$   | Single Pulse Avalanche Energy                     | 3000               |           |


**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://www.microsemi.com)

All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

**Electrical Characteristics**

| Symbol       | Characteristic                  | Test Conditions                      | Min                      | Typ | Max       | Unit             |
|--------------|---------------------------------|--------------------------------------|--------------------------|-----|-----------|------------------|
| $I_{DSS}$    | Zero Gate Voltage Drain Current | $V_{GS} = 0V, V_{DS} = 1000V$        |                          |     | 400       | $\mu\text{A}$    |
|              |                                 | $V_{GS} = 0V, V_{DS} = 800V$         | $T_j = 25^\circ\text{C}$ |     | 2000      |                  |
| $R_{DS(on)}$ | Drain – Source on Resistance    | $V_{GS} = 10V, I_D = 39A$            |                          | 90  | 105       | $\text{m}\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage          | $V_{GS} = V_{DS}, I_D = 10\text{mA}$ | 3                        |     | 5         | V                |
| $I_{GSS}$    | Gate – Source Leakage Current   | $V_{GS} = \pm 30V, V_{DS} = 0V$      |                          |     | $\pm 250$ | $\text{nA}$      |

**Dynamic Characteristics**

| Symbol       | Characteristic               | Test Conditions   | Min | Typ  | Max | Unit        |
|--------------|------------------------------|---|-----|------|-----|-------------|
| $C_{iss}$    | Input Capacitance            | $V_{GS} = 0V$   |     | 20.7 |     | $\text{nF}$ |
| $C_{oss}$    | Output Capacitance           | $V_{DS} = 25V$  |     | 3.5  |     |             |
| $C_{rss}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$   |     | 0.64 |     |             |
| $Q_g$        | Total gate Charge            | $V_{GS} = 10V$<br>$V_{Bus} = 500V$<br>$I_D = 78A$   |     | 744  |     | $\text{nC}$ |
| $Q_{gs}$     | Gate – Source Charge         |   |     | 96   |     |             |
| $Q_{gd}$     | Gate – Drain Charge          |   |     | 488  |     |             |
| $T_{d(on)}$  | Turn-on Delay Time           | <b>Inductive switching @ <math>125^\circ\text{C}</math></b><br>$V_{GS} = 15V$<br>$V_{Bus} = 670V$<br>$I_D = 78A$<br>$R_G = 1.2\Omega$ |     | 18   |     | $\text{ns}$ |
| $T_r$        | Rise Time                    |   |     | 12   |     |             |
| $T_{d(off)}$ | Turn-off Delay Time          |   |     | 155  |     |             |
| $T_f$        | Fall Time                    |   |     | 40   |     |             |
| $E_{on}$     | Turn-on Switching Energy     | <b>Inductive switching @ <math>25^\circ\text{C}</math></b><br>$V_{GS} = 15V, V_{Bus} = 670V$<br>$I_D = 78A, R_G = 1.2\Omega$          |     | 3.6  |     | $\text{mJ}$ |
| $E_{off}$    | Turn-off Switching Energy    |   |     | 2.5  |     |             |
| $E_{on}$     | Turn-on Switching Energy     | <b>Inductive switching @ <math>125^\circ\text{C}</math></b><br>$V_{GS} = 15V, V_{Bus} = 670V$<br>$I_D = 78A, R_G = 1.2\Omega$         |     | 5.7  |     | $\text{mJ}$ |
| $E_{off}$    | Turn-off Switching Energy    |   |     | 3.1  |     |             |

**Source - Drain diode ratings and characteristics**

| Symbol   | Characteristic                         | Test Conditions              | Min                       | Typ | Max  | Unit          |
|----------|--|------------------------------|---------------------------|-----|------|---------------|
| $I_S$    | Continuous Source current (Body diode) |                              | $T_c = 25^\circ\text{C}$  |     | 78   | A             |
|          |  |                              | $T_c = 80^\circ\text{C}$  |     | 59   |               |
| $V_{SD}$ | Diode Forward Voltage                  | $V_{GS} = 0V, I_S = -78A$    |                           |     | 1.3  | V             |
| $dv/dt$  | Peak Diode Recovery ❶                  |                              |                           |     | 18   | $\text{V/ns}$ |
| $t_{rr}$ | Reverse Recovery Time                  | $I_S = -78A$<br>$V_R = 670V$ | $T_j = 25^\circ\text{C}$  |     | 320  | $\text{ns}$   |
|          |  |                              | $T_j = 125^\circ\text{C}$ |     | 650  |               |
| $Q_{rr}$ | Reverse Recovery Charge                | $di/dt = 400A/\mu\text{s}$   | $T_j = 25^\circ\text{C}$  |     | 14.4 | $\mu\text{C}$ |
|          |  |                              | $T_j = 125^\circ\text{C}$ |     | 38.9 |               |

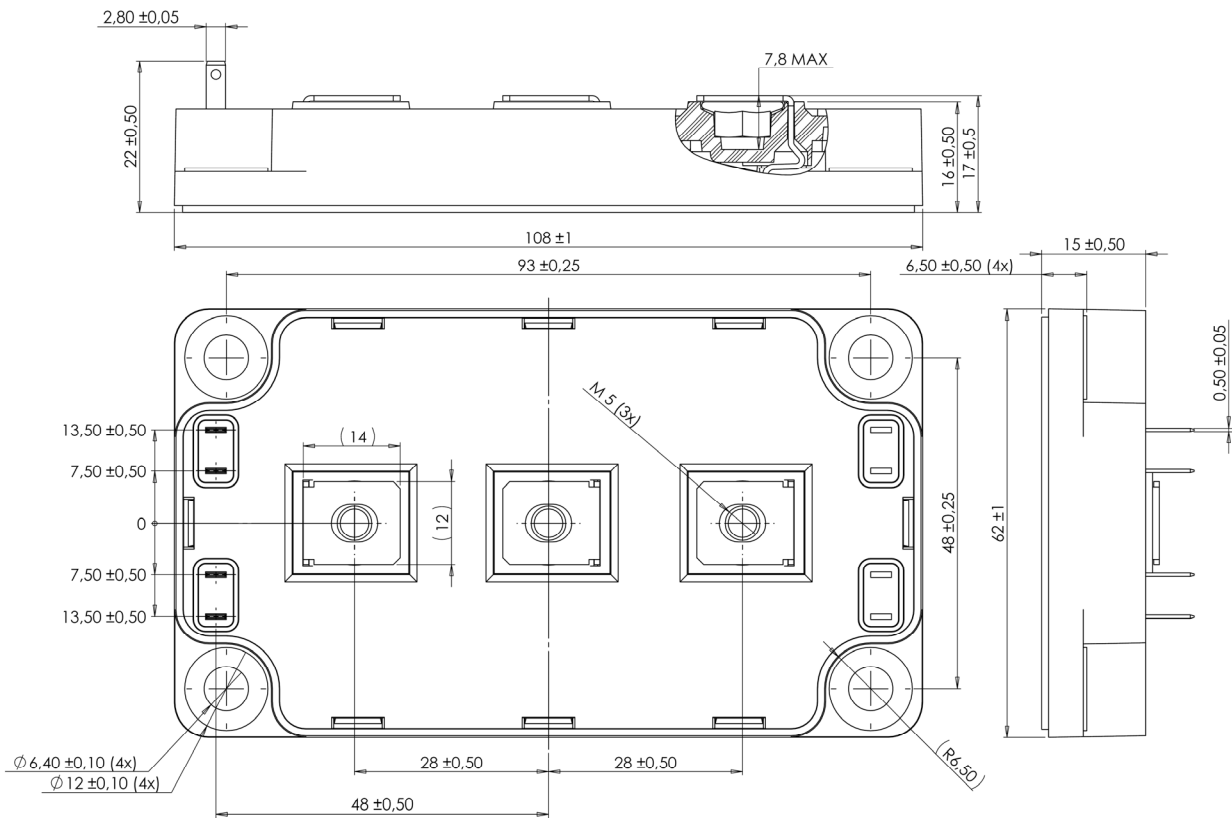
❶  $dv/dt$  numbers reflect the limitations of the circuit rather than the device itself.

$I_S \leq -78A$     $di/dt \leq 700A/\mu\text{s}$     $V_R \leq V_{DSS}$     $T_j \leq 150^\circ\text{C}$

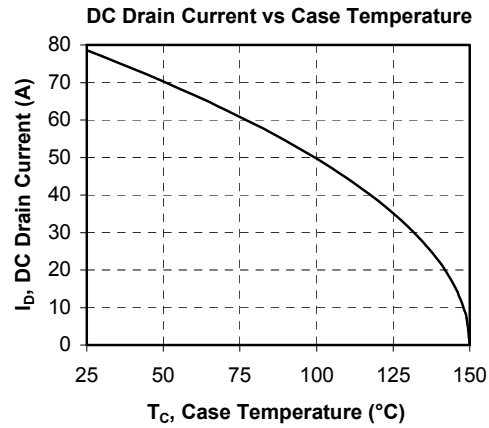
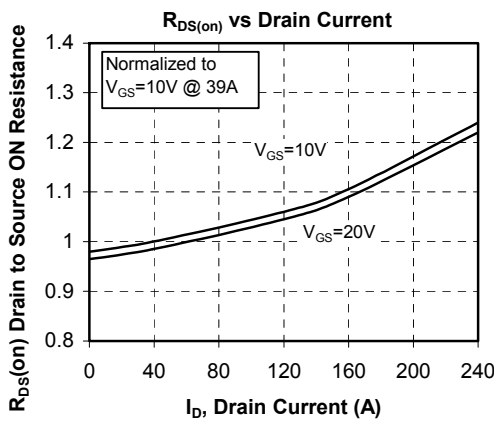
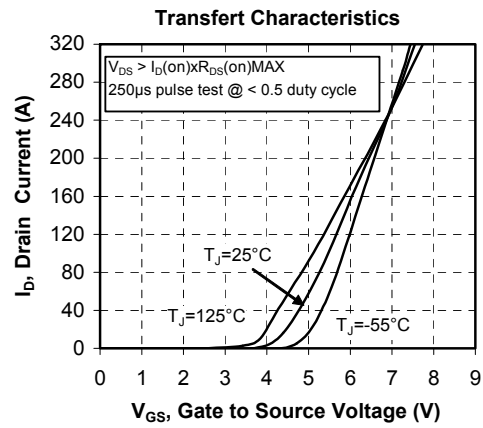
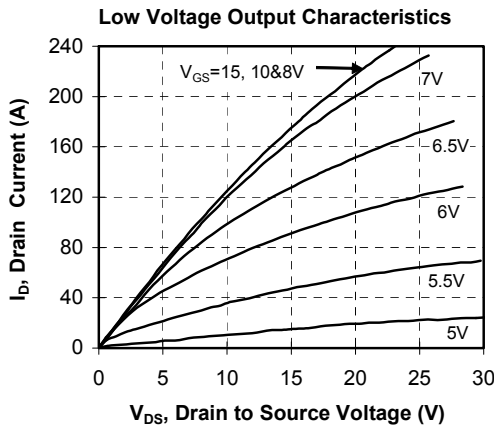
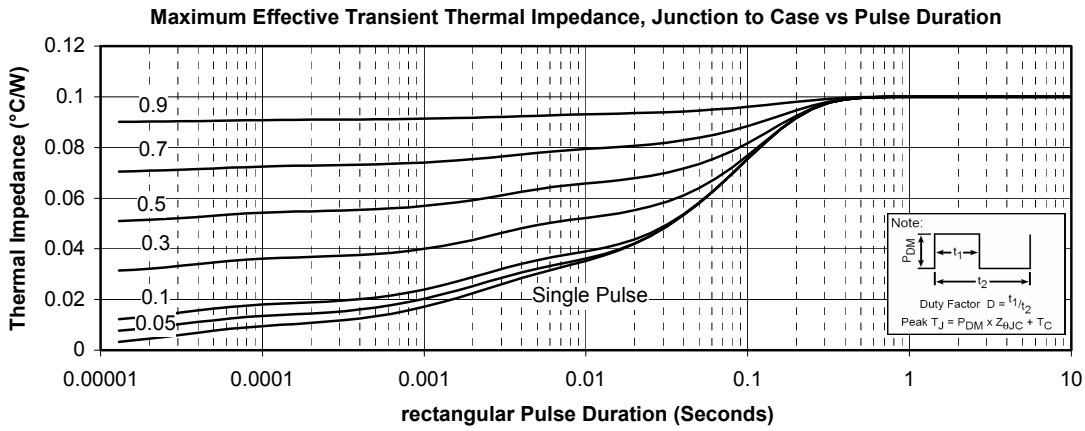
## Thermal and package characteristics

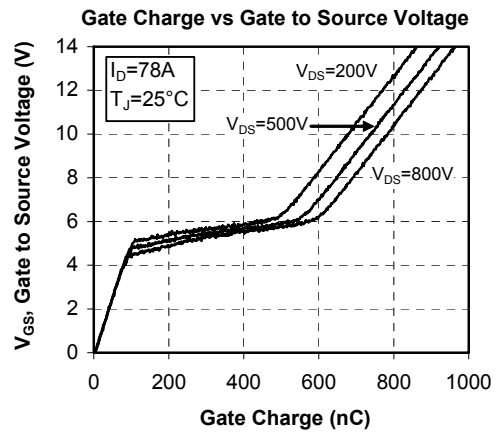
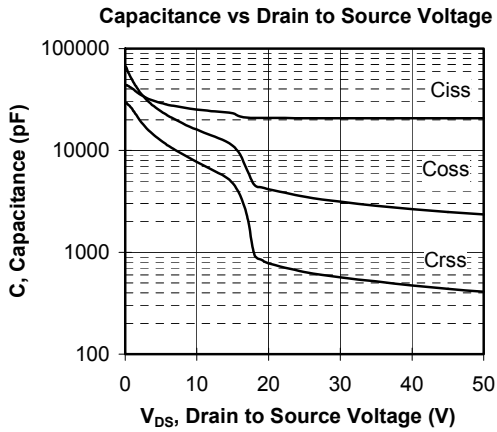
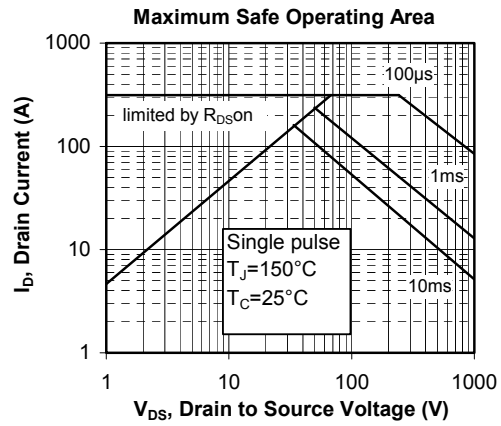
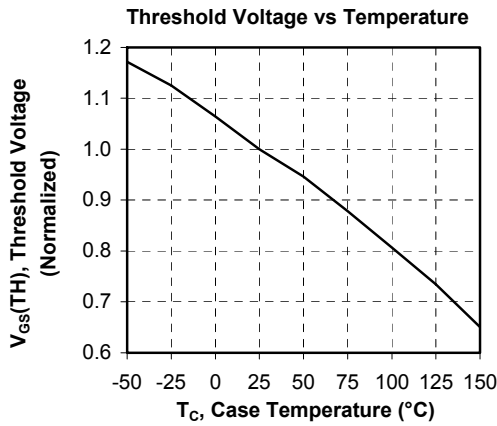
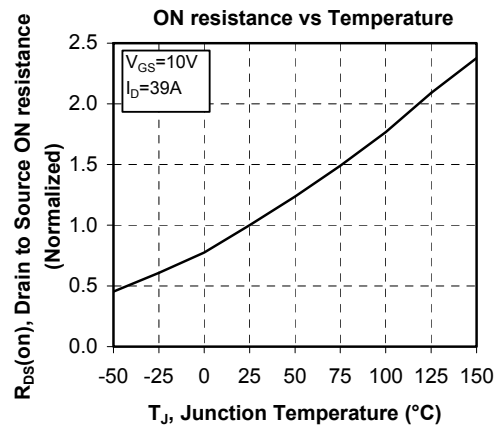
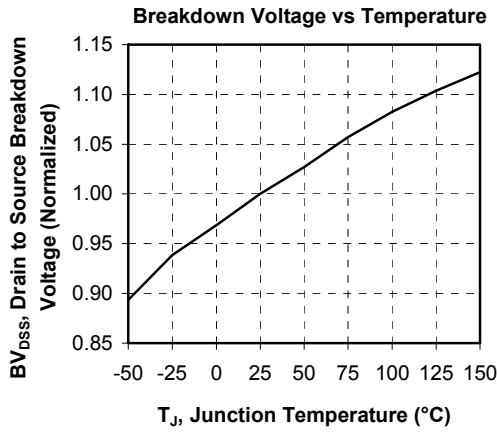
| Symbol            | Characteristic   | Min           | Typ | Max | Unit |     |
|-------------------|--|---------------|-----|-----|------|-----|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance                          |               |     | 0.1 | °C/W |     |
| V <sub>ISOL</sub> | RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz | 4000          |     |     | V    |     |
| T <sub>J</sub>    | Operating junction temperature range                         | -40           |     | 150 | °C   |     |
| T <sub>STG</sub>  | Storage Temperature Range                                    | -40           |     | 125 |      |     |
| T <sub>C</sub>    | Operating Case Temperature                                   | -40           |     | 100 |      |     |
| Torque            | Mounting torque  | To heatsink   | M6  | 3   | 5    | N.m |
|                   |  | For terminals | M5  | 2   | 3.5  |     |
| Wt                | Package Weight   |               |     | 300 | g    |     |

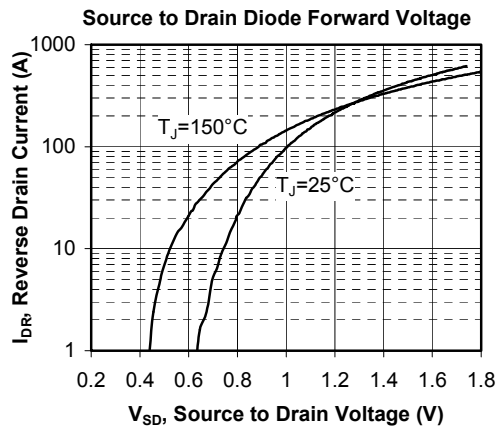
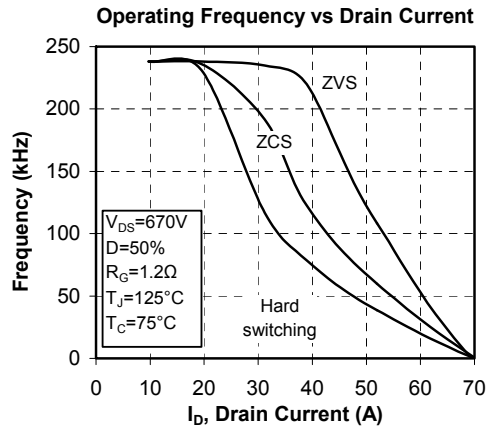
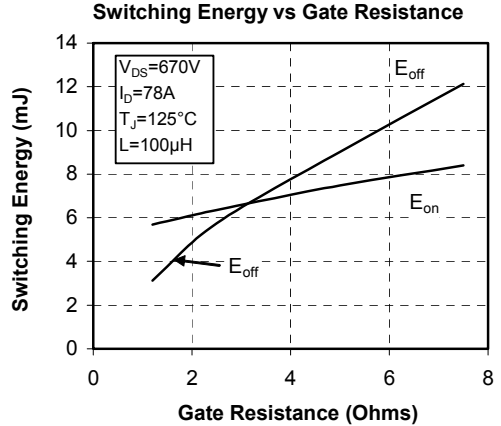
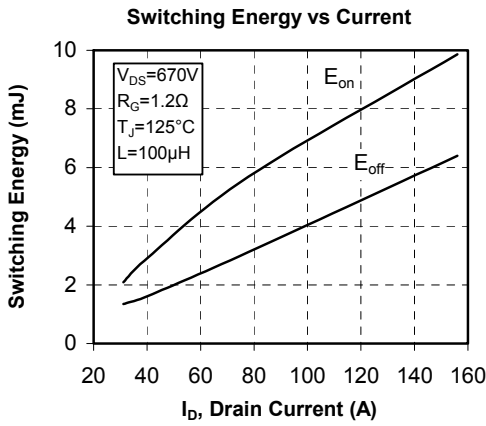
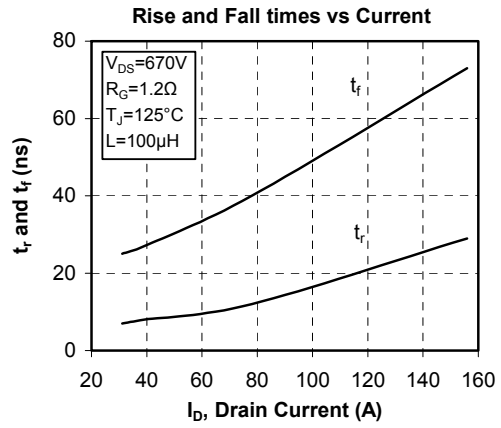
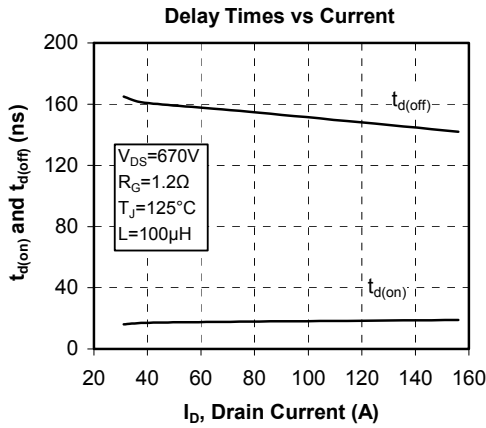
## SP6 Package outline (dimensions in mm)



See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

**Typical Performance Curve**






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