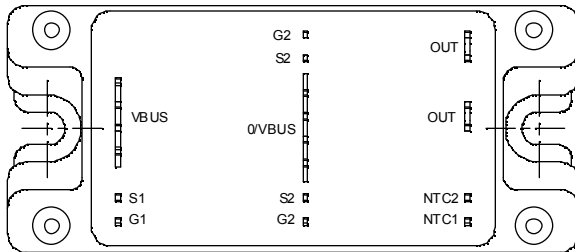
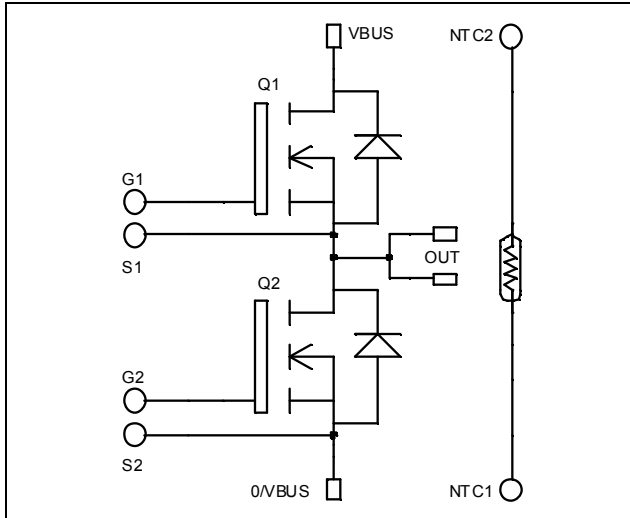


Phase leg MOSFET Power Module

$V_{DSS} = 1000V$
 $R_{DSon} = 180m\Omega \text{ typ @ } T_j = 25^\circ C$
 $I_D = 43A \text{ @ } T_c = 25^\circ C$



Application

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

Features

- Power MOS 7[®] 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
 - Lead frames for power connections
- Internal thermistor for temperature monitoring
- High level of integration

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- 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 | $T_c = 25^\circ C$ | 43 |
| | | $T_c = 80^\circ C$ | 33 |
| I_{DM} | Pulsed Drain current | 172 | A |
| V_{GS} | Gate - Source Voltage | ± 30 | |
| R_{DSon} | Drain - Source ON Resistance | 210 | $m\Omega$ |
| P_D | Maximum Power Dissipation | $T_c = 25^\circ C$ | 780 |
| 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

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 | $V_{GS} = 0\text{V}, V_{DS} = 1000\text{V}$ | | | 200 | μA |
| | | $V_{GS} = 0\text{V}, V_{DS} = 800\text{V}$ | | | 1000 | |
| $R_{DS(on)}$ | Drain – Source on Resistance | $V_{GS} = 10\text{V}, I_D = 21.5\text{A}$ | | 180 | 210 | $\text{m}\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS} = V_{DS}, I_D = 5\text{mA}$ | 3 | | 5 | V |
| I_{GSS} | Gate – Source Leakage Current | $V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$ | | | ± 150 | nA |

Dynamic Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|--------------|------------------------------|--|-----|------|-----|---------------|
| C_{iss} | Input Capacitance | $V_{GS} = 0\text{V}$ $V_{DS} = 25\text{V}$ $f = 1\text{MHz}$ | | 10.4 | | nF |
| C_{oss} | Output Capacitance | | | 1.76 | | |
| C_{rss} | Reverse Transfer Capacitance | | | 0.32 | | |
| Q_g | Total gate Charge | $V_{GS} = 10\text{V}$ $V_{Bus} = 500\text{V}$ $I_D = 43\text{A}$ | | 372 | | nC |
| Q_{gs} | Gate – Source Charge | | | 48 | | |
| Q_{gd} | Gate – Drain Charge | | | 244 | | |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive switching @ 125°C $V_{GS} = 15\text{V}$ $V_{Bus} = 670\text{V}$ $I_D = 43\text{A}$ $R_G = 2.5\Omega$ | | 18 | | 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 | Inductive switching @ 25°C $V_{GS} = 15\text{V}, V_{Bus} = 670\text{V}$ $I_D = 43\text{A}, R_G = 2.5\Omega$ | | 1800 | | μJ |
| E_{off} | Turn-off Switching Energy | | | 1246 | | |
| E_{on} | Turn-on Switching Energy | Inductive switching @ 125°C $V_{GS} = 15\text{V}, V_{Bus} = 670\text{V}$ $I_D = 43\text{A}, R_G = 2.5\Omega$ | | 2846 | | μJ |
| E_{off} | Turn-off Switching Energy | | | 1558 | | |

Source - Drain diode ratings and characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit | |
|----------|--|---|---------------------------|-----|------|---------------|----|
| I_S | Continuous Source current (Body diode) | $T_c = 25^\circ\text{C}$ | | | 43 | A | |
| | | $T_c = 80^\circ\text{C}$ | | | 33 | | |
| V_{SD} | Diode Forward Voltage | $V_{GS} = 0\text{V}, I_S = -43\text{A}$ | | | 1.3 | V | |
| dv/dt | Peak Diode Recovery ^① | | | | 18 | V/ns | |
| t_{rr} | Reverse Recovery Time | $I_S = -43\text{A}$ $V_R = 670\text{V}$ $di/dt = 200\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$ | | | 320 | ns |
| | | | $T_j = 125^\circ\text{C}$ | | | 650 | |
| Q_{rr} | Reverse Recovery Charge | $I_S = -43\text{A}$ $V_R = 670\text{V}$ $di/dt = 200\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$ | | 7.2 | μC | |
| | | | $T_j = 125^\circ\text{C}$ | | 19.5 | | |

^① dv/dt numbers reflect the limitations of the circuit rather than the device itself.

$$I_S \leq -43\text{A} \quad di/dt \leq 700\text{A}/\mu\text{s} \quad V_R \leq V_{DSS} \quad T_j \leq 150^\circ\text{C}$$

Thermal and package characteristics

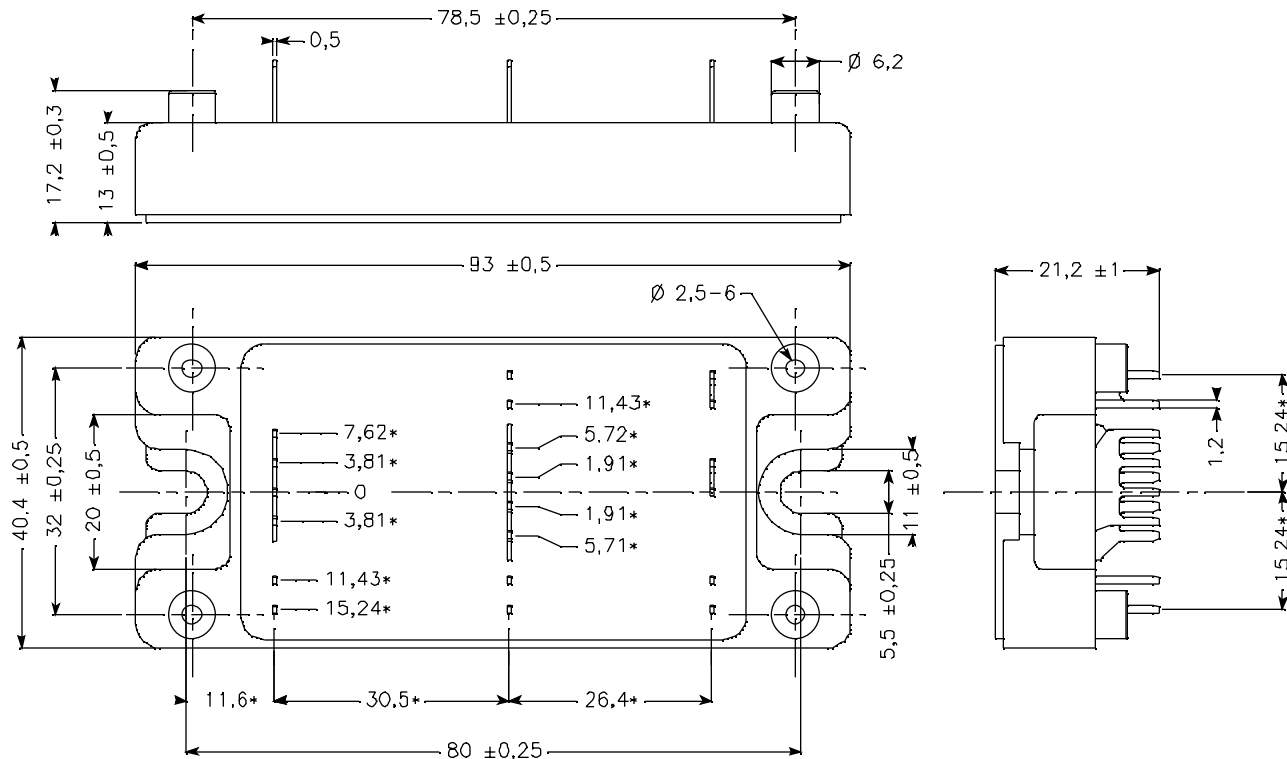
| Symbol | Characteristic | Min | Typ | Max | Unit | |
|-------------------|--|-------------|-----|------|------|-----|
| R _{thJC} | Junction to Case Thermal resistance | | | 0.16 | °C/W | |
| V _{ISOL} | RMS Isolation Voltage, any terminal to case t=1 min, I _{isol} <1mA, 50/60Hz | 2500 | | | V | |
| T _J | Operating junction temperature range | -40 | | 150 | °C | |
| T _{STG} | Storage Temperature Range | -40 | | 125 | | |
| T _C | Operating Case Temperature | -40 | | 100 | | |
| Torque | Mounting torque | To Heatsink | M5 | 2.5 | 4.7 | N.m |
| Wt | Package Weight | | | 160 | | g |

Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

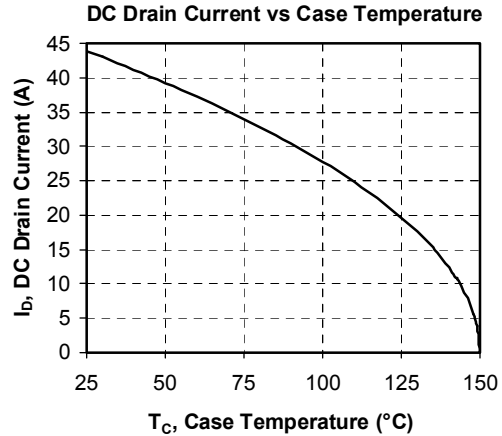
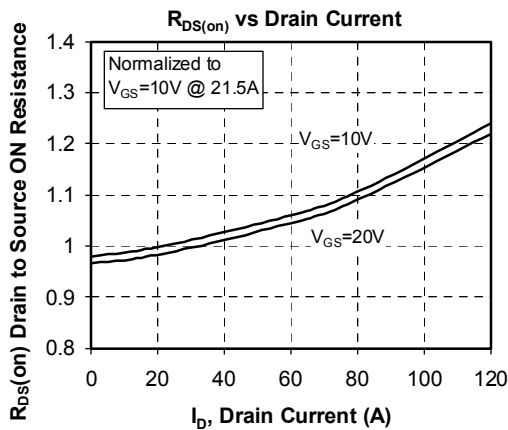
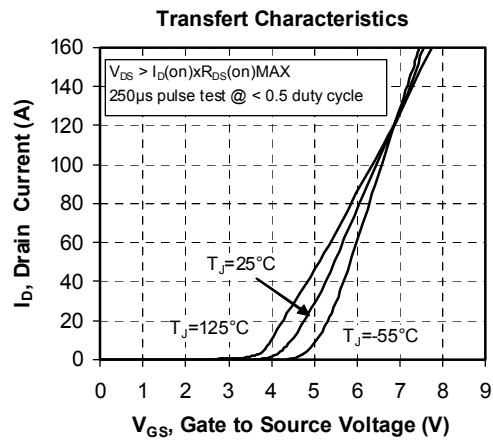
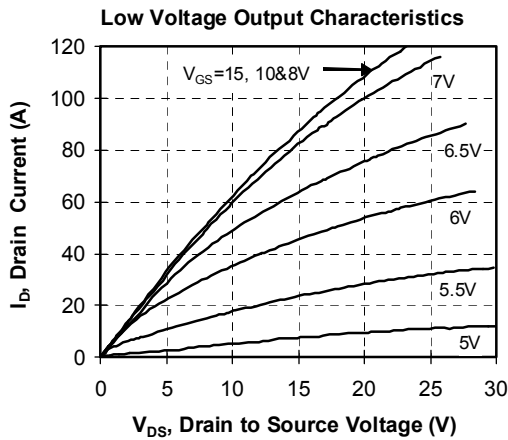
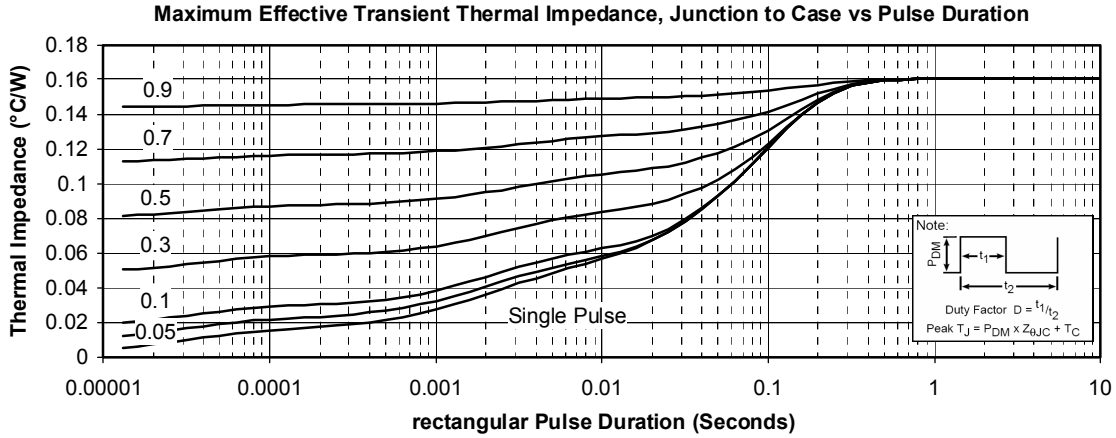
| Symbol | Characteristic | Min | Typ | Max | Unit |
|--------------------|----------------------------|-----|------|-----|------|
| R ₂₅ | Resistance @ 25°C | | 50 | | kΩ |
| B _{25/85} | T ₂₅ = 298.15 K | | 3952 | | K |

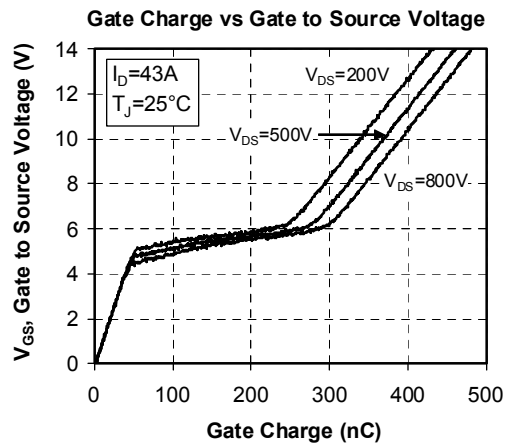
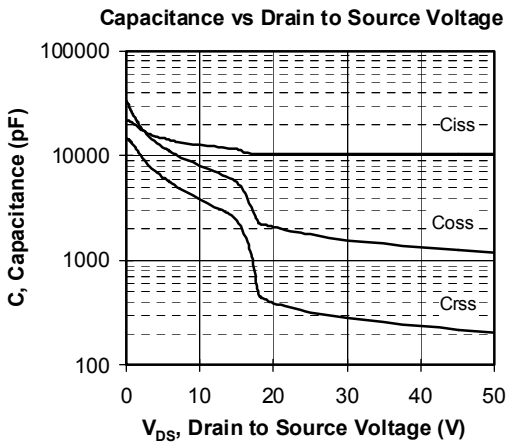
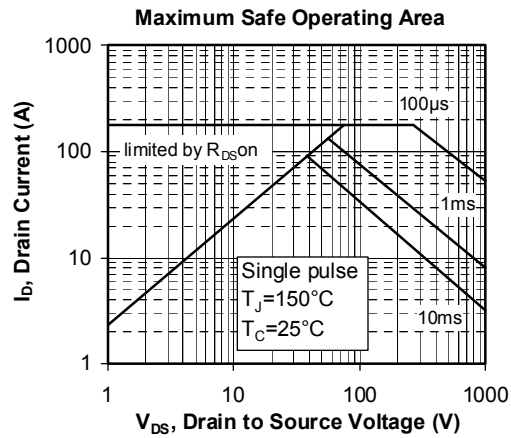
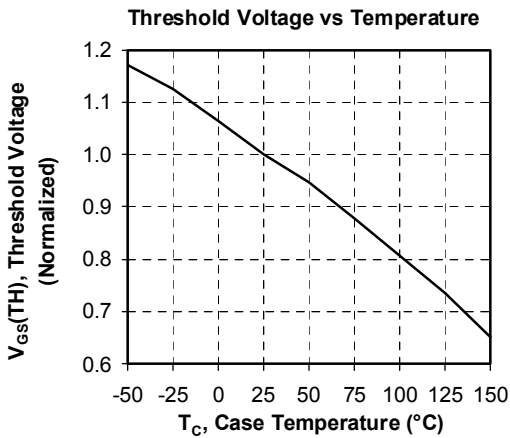
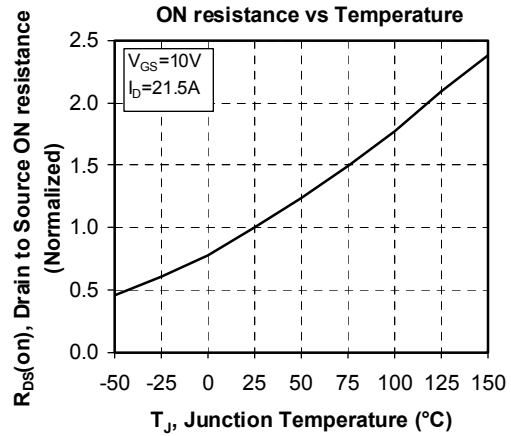
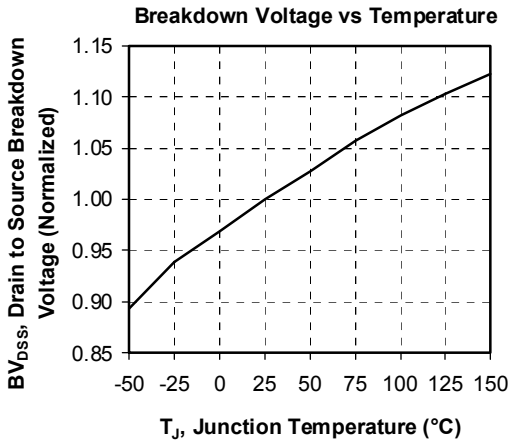
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

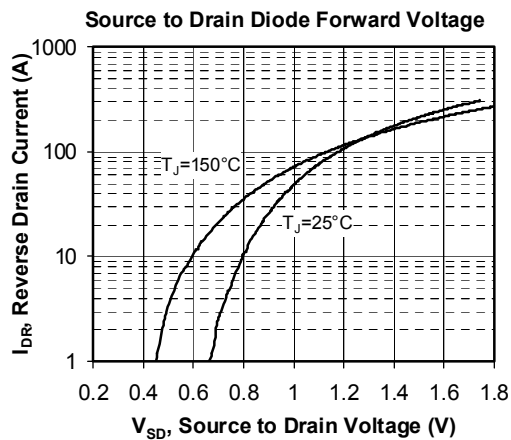
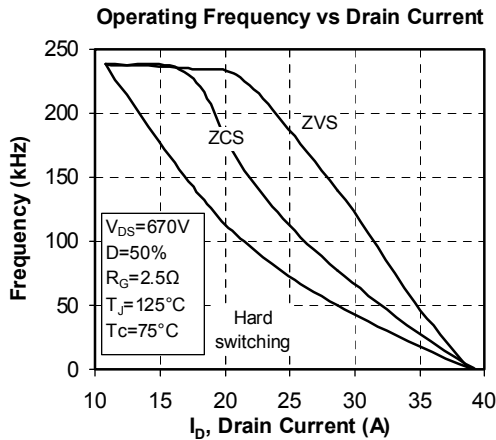
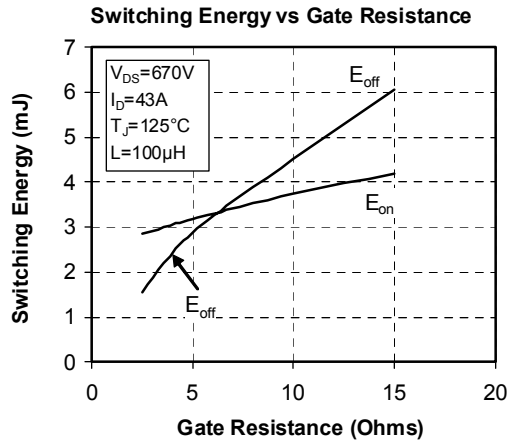
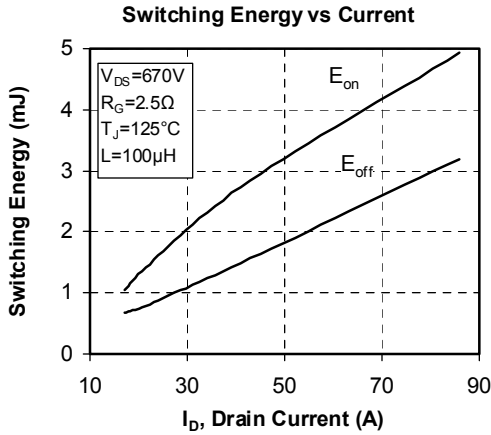
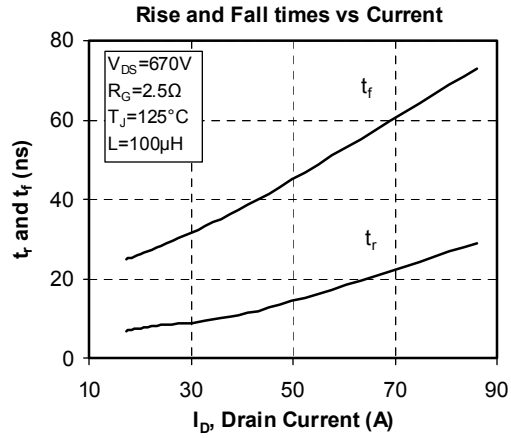
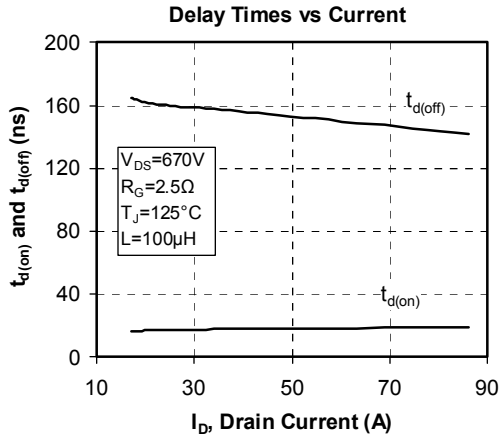
T: Thermistor temperature
 R_T: Thermistor value at T

SP4 Package outline (dimensions in mm)

 ALL DIMENSIONS MARKED "*" ARE TOLERANCED AS: $\varnothing \pm 0.1$

See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

Typical Performance Curve






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