

## Triple phase leg MOSFET Power Module

$$V_{DSS} = 1200V$$

$$R_{DSon} = 570m\Omega \text{ typ @ } T_j = 25^\circ C$$

$$I_D = 17A \text{ @ } T_c = 25^\circ C$$

### Application

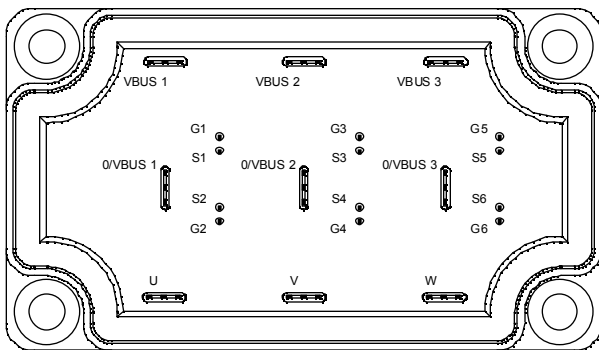
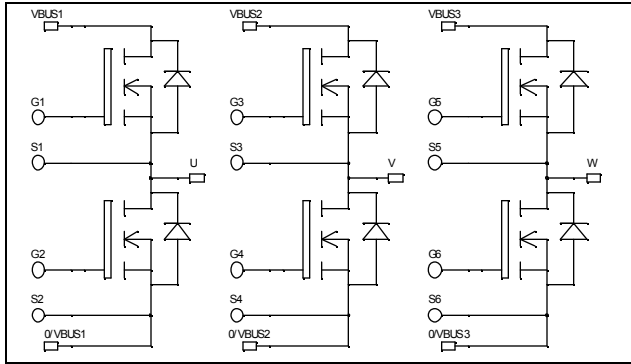
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

### 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
  - Lead frames for power connections
- 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
- Very low (12mm) profile
- Each leg can be easily paralleled to achieve a phase leg of three times the current capability
- Module can be configured as a three phase bridge
- Module can be configured as a boost followed by a full bridge
- RoHS Compliant



### Absolute maximum ratings

| Symbol     | Parameter                                         | Max ratings        | Unit      |
|------------|---------------------------------------------------|--------------------|-----------|
| $V_{DSS}$  | Drain - Source Breakdown Voltage                  | 1200               | V         |
| $I_D$      | Continuous Drain Current                          | $T_c = 25^\circ C$ | 17        |
|            |                                                   | $T_c = 80^\circ C$ | 13        |
| $I_{DM}$   | Pulsed Drain current                              | 68                 |           |
| $V_{GS}$   | Gate - Source Voltage                             | $\pm 30$           | V         |
| $R_{DSon}$ | Drain - Source ON Resistance                      | 684                | $m\Omega$ |
| $P_D$      | Maximum Power Dissipation                         | $T_c = 25^\circ C$ | 390       |
| $I_{AR}$   | Avalanche current (repetitive and non repetitive) | 22                 | 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 | $V_{GS} = 0\text{V}, V_{DS} = 1200\text{V}$   |     |     | 250       | $\mu\text{A}$    |
|              |                                 | $V_{GS} = 0\text{V}, V_{DS} = 1000\text{V}$   |     |     | 1000      |                  |
| $R_{DS(on)}$ | Drain – Source on Resistance    | $V_{GS} = 10\text{V}, I_D = 8.5\text{A}$      |     | 570 | 684       | $\text{m}\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage          | $V_{GS} = V_{DS}, I_D = 2.5\text{mA}$         | 3   |     | 5         | V                |
| $I_{GSS}$    | Gate – Source Leakage Current   | $V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$ |     |     | $\pm 100$ | nA               |

**Dynamic Characteristics**

| Symbol       | Characteristic               | Test Conditions                                                                                                                                          | Min | Typ  | Max | Unit          |
|--------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|---------------|
| $C_{iss}$    | Input Capacitance            | $V_{GS} = 0\text{V}$<br>$V_{DS} = 25\text{V}$<br>$f = 1\text{MHz}$                                                                                       |     | 5155 |     | pF            |
| $C_{oss}$    | Output Capacitance           |                                                                                                                                                          |     | 770  |     |               |
| $C_{rss}$    | Reverse Transfer Capacitance |                                                                                                                                                          |     | 130  |     |               |
| $Q_g$        | Total gate Charge            | $V_{GS} = 10\text{V}$<br>$V_{Bus} = 600\text{V}$<br>$I_D = 17\text{A}$                                                                                   |     | 187  |     | nC            |
| $Q_{gs}$     | Gate – Source Charge         |                                                                                                                                                          |     | 24   |     |               |
| $Q_{gd}$     | Gate – Drain Charge          |                                                                                                                                                          |     | 120  |     |               |
| $T_{d(on)}$  | Turn-on Delay Time           | <b>Inductive switching @ <math>125^\circ\text{C}</math></b><br>$V_{GS} = 15\text{V}$<br>$V_{Bus} = 800\text{V}$<br>$I_D = 17\text{A}$<br>$R_G = 5\Omega$ |     | 20   |     | ns            |
| $T_r$        | Rise Time                    |                                                                                                                                                          |     | 15   |     |               |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                                                          |     | 160  |     |               |
| $T_f$        | Fall Time                    |                                                                                                                                                          |     | 45   |     |               |
| $E_{on}$     | Turn-on Switching Energy     | <b>Inductive switching @ <math>25^\circ\text{C}</math></b><br>$V_{GS} = 15\text{V}, V_{Bus} = 800\text{V}$<br>$I_D = 17\text{A}, R_G = 5\Omega$          |     | 990  |     | $\mu\text{J}$ |
| $E_{off}$    | Turn-off Switching Energy    |                                                                                                                                                          |     | 685  |     |               |
| $E_{on}$     | Turn-on Switching Energy     | <b>Inductive switching @ <math>125^\circ\text{C}</math></b><br>$V_{GS} = 15\text{V}, V_{Bus} = 800\text{V}$<br>$I_D = 17\text{A}, R_G = 5\Omega$         |     | 1565 |     | $\mu\text{J}$ |
| $E_{off}$    | Turn-off Switching Energy    |                                                                                                                                                          |     | 857  |     |               |

**Source - Drain diode ratings and characteristics**

| Symbol   | Characteristic                         | Test Conditions                                                                 | Min                       | Typ | Max | Unit          |
|----------|----------------------------------------|---------------------------------------------------------------------------------|---------------------------|-----|-----|---------------|
| $I_S$    | Continuous Source current (Body diode) |                                                                                 | $T_c = 25^\circ\text{C}$  |     | 17  | A             |
|          |                                        |                                                                                 | $T_c = 80^\circ\text{C}$  |     | 13  |               |
| $V_{SD}$ | Diode Forward Voltage                  | $V_{GS} = 0\text{V}, I_S = -17\text{A}$                                         |                           |     | 1.3 | V             |
| $dv/dt$  | Peak Diode Recovery ①                  |                                                                                 |                           |     | 18  | V/ns          |
| $t_{rr}$ | Reverse Recovery Time                  | $I_S = -17\text{A}$<br>$V_R = 600\text{V}$<br>$di/dt = 100\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  |     | 320 | ns            |
|          |                                        |                                                                                 | $T_j = 125^\circ\text{C}$ |     | 650 |               |
| $Q_{rr}$ | Reverse Recovery Charge                |                                                                                 | $T_j = 25^\circ\text{C}$  |     | 2   | $\mu\text{C}$ |
|          |                                        |                                                                                 | $T_j = 125^\circ\text{C}$ |     | 7   |               |

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

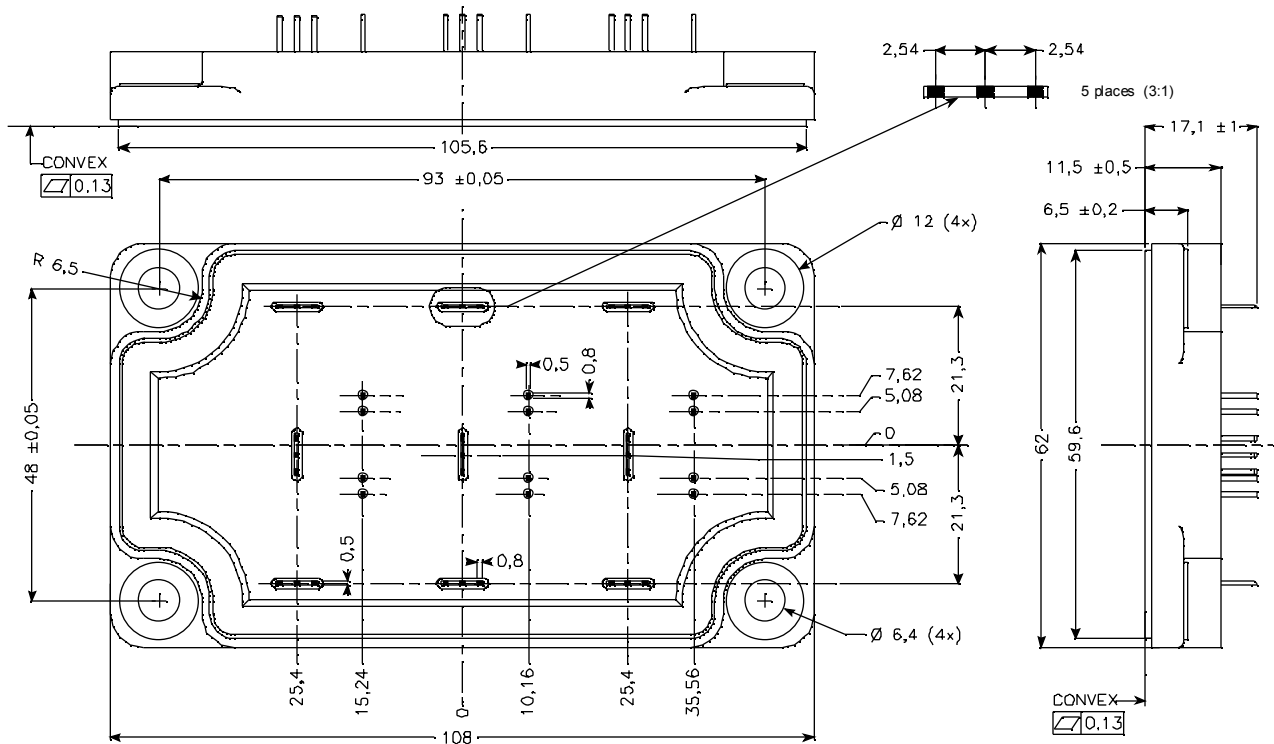
$$I_S \leq -17\text{A} \quad di/dt \leq 700\text{A}/\mu\text{s} \quad V_R \leq V_{DSS} \quad T_j \leq 150^\circ\text{C}$$

## Thermal and package characteristics

*Symbol Characteristic*

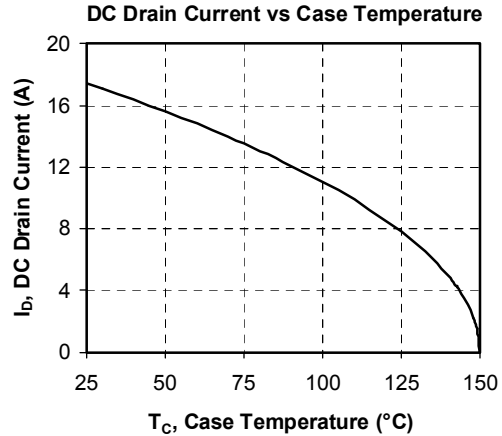
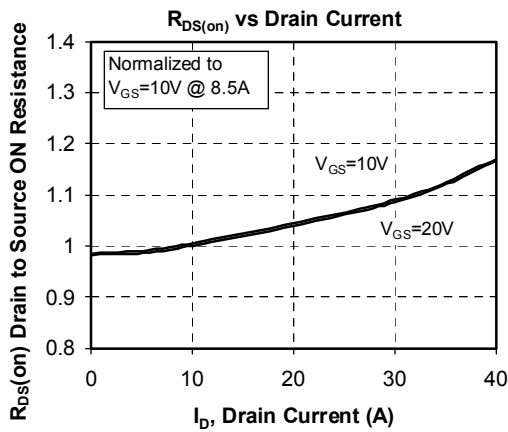
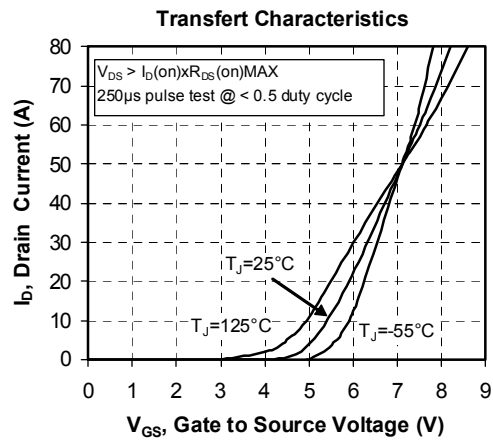
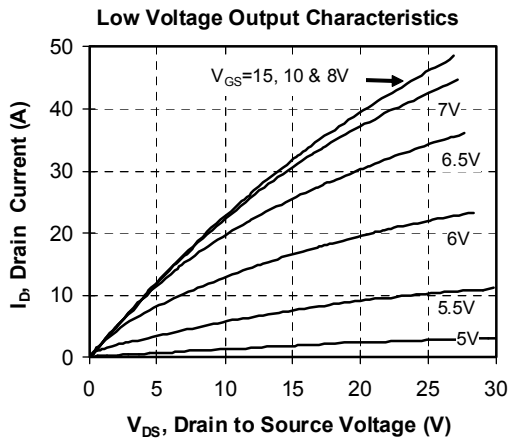
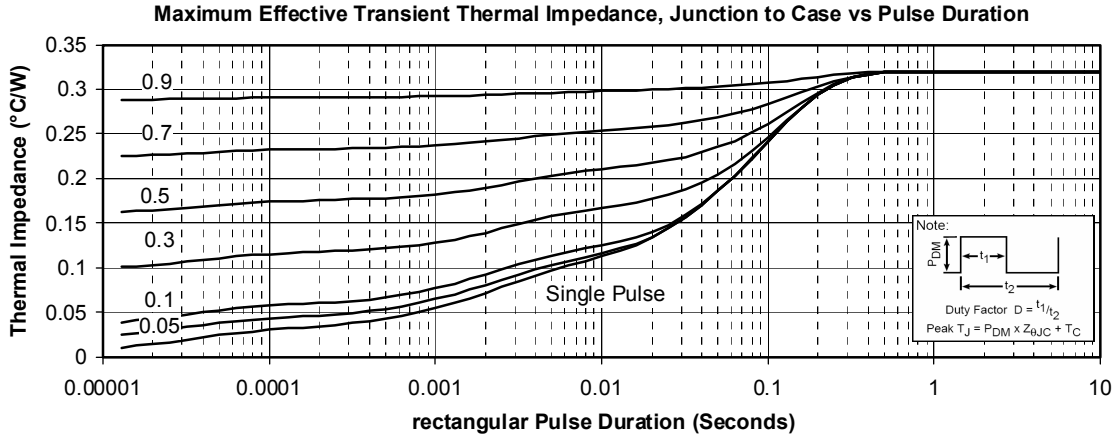
|            |                                                                                      | <i>Min</i>  | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |     |
|------------|--------------------------------------------------------------------------------------|-------------|------------|------------|-------------|-----|
| $R_{thJC}$ | Junction to Case Thermal Resistance                                                  |             |            | 0.32       | °C/W        |     |
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case t=1 min, I <sub>isol</sub> <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 | M6         | 3          | 5           | N.m |
| Wt         | Package Weight                                                                       |             |            |            | 250         | g   |

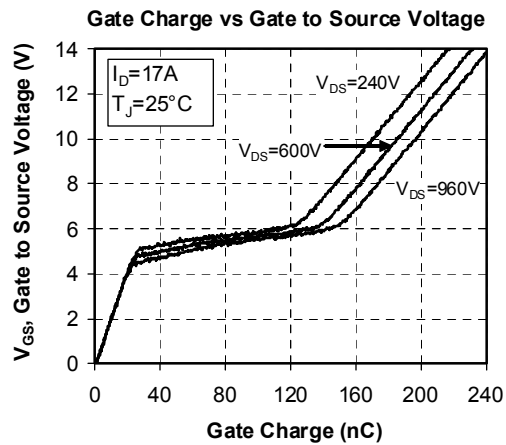
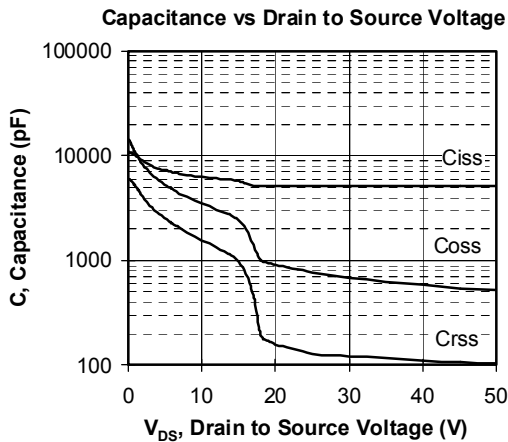
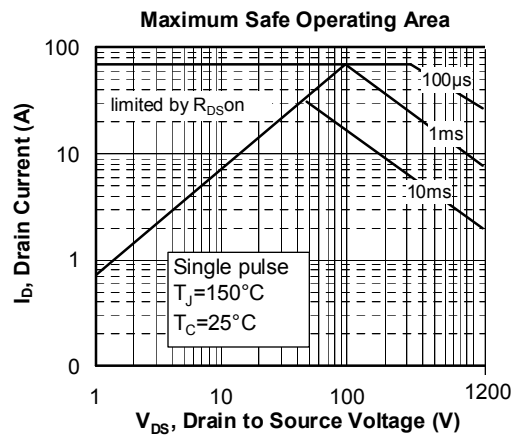
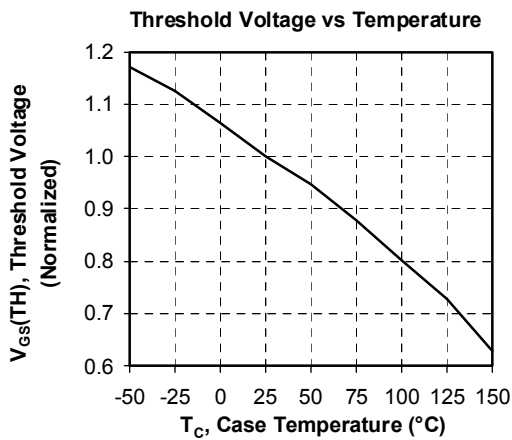
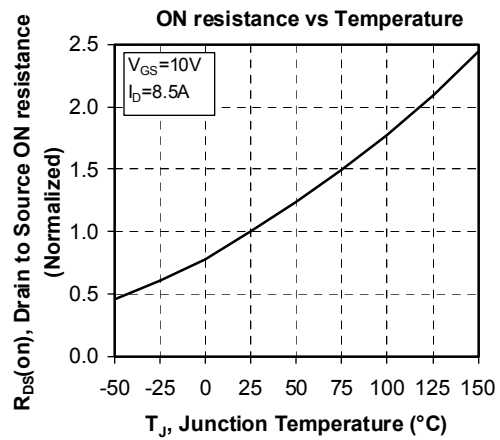
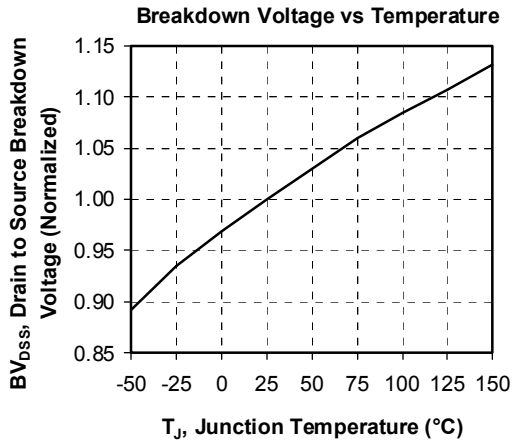
## SP6-P Package outline (dimensions in mm)

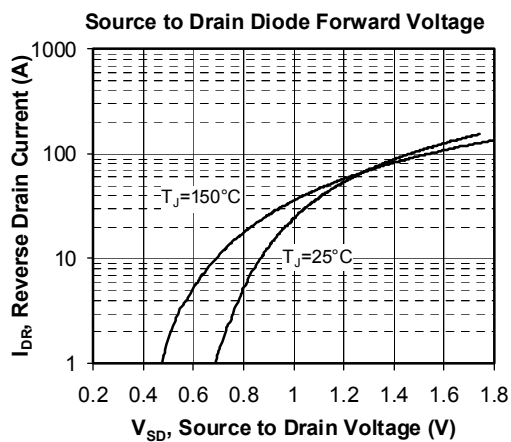
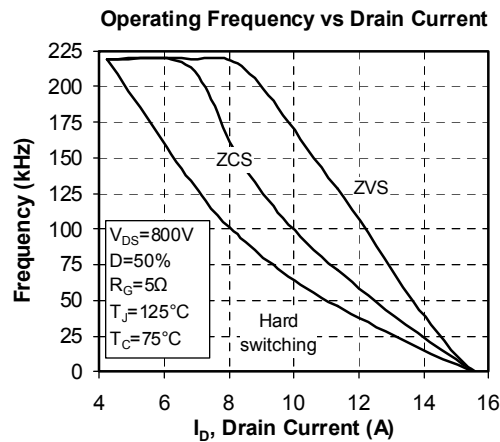
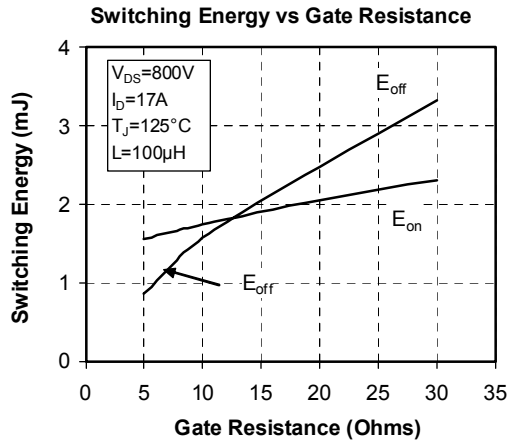
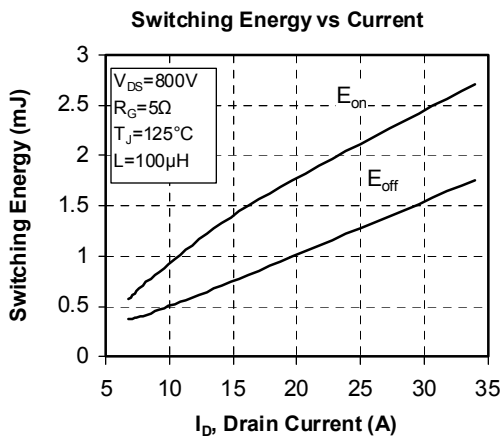
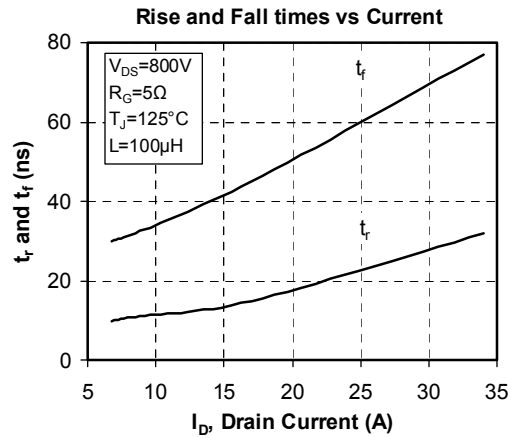
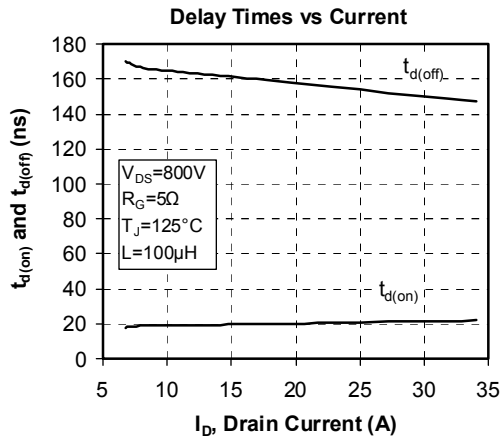


See application note 1902 - Mounting Instructions for SP6-P (12mm) Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve







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