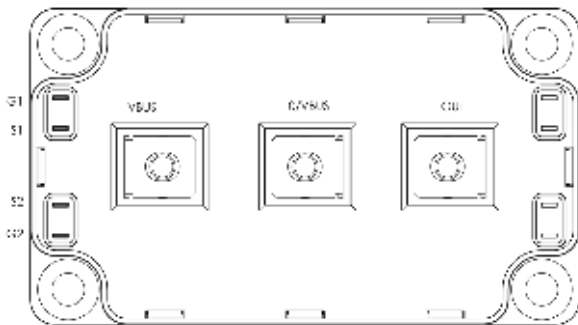
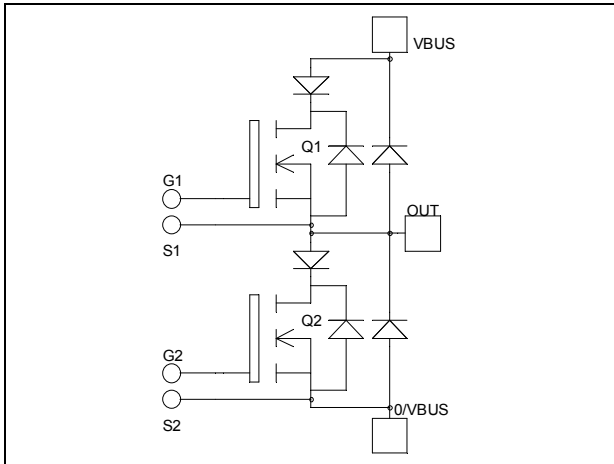


## Phase leg Series & parallel diodes MOSFET Power Module

$V_{DSS} = 1000V$

$R_{DSon} = 130m\Omega$  typ @  $T_j = 25^\circ C$

$I_D = 65A$  @  $T_c = 25^\circ C$



### Application

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

### Features

- Power MOS 7<sup>®</sup> MOSFETs
  - 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

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

### Absolute maximum ratings

| Symbol     | Parameter                                         | Max ratings        | Unit       |
|------------|---------------------------------------------------|--------------------|------------|
| $V_{DSS}$  | Drain - Source Breakdown Voltage                  | 1000               | V          |
| $I_D$      | Continuous Drain Current                          | $T_c = 25^\circ C$ | A          |
|            |                                                   | $T_c = 80^\circ C$ |            |
| $I_{DM}$   | Pulsed Drain current                              | 240                |            |
| $V_{GS}$   | Gate - Source Voltage                             | $\pm 30$           | V          |
| $R_{DSon}$ | Drain - Source ON Resistance                      | 156                | m $\Omega$ |
| $P_D$      | Maximum Power Dissipation                         | $T_c = 25^\circ C$ | W          |
| $I_{AR}$   | Avalanche current (repetitive and non repetitive) | 24                 | A          |
| $E_{AR}$   | Repetitive Avalanche Energy                       | 30                 | mJ         |
| $E_{AS}$   | Single Pulse Avalanche Energy                     | 1300               |            |

**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)

**Electrical Characteristics**

| Symbol              | Characteristic                  | Test Conditions                                                     | Min | Typ | Max  | Unit |
|---------------------|---------------------------------|---------------------------------------------------------------------|-----|-----|------|------|
| I <sub>DSS</sub>    | Zero Gate Voltage Drain Current | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 1000V T <sub>j</sub> = 25°C |     |     | 600  | μA   |
|                     |                                 | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 800V T <sub>j</sub> = 125°C |     |     | 2    | mA   |
| R <sub>DS(on)</sub> | Drain – Source on Resistance    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 32.5A                       |     | 130 | 156  | mΩ   |
| V <sub>GS(th)</sub> | Gate Threshold Voltage          | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 6mA            | 3   |     | 5    | V    |
| I <sub>GSS</sub>    | Gate – Source Leakage Current   | V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0V                       |     |     | ±450 | nA   |

**Dynamic Characteristics**

| Symbol              | Characteristic                      | Test Conditions                                                                                                                         | Min | Typ  | Max | Unit |
|---------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|------|
| C <sub>iss</sub>    | Input Capacitance                   | V <sub>GS</sub> = 0V                                                                                                                    |     | 15.2 |     | nF   |
| C <sub>oss</sub>    | Output Capacitance                  | V <sub>DS</sub> = 25V                                                                                                                   |     | 2.6  |     |      |
| C <sub>rss</sub>    | Reverse Transfer Capacitance        | f = 1MHz                                                                                                                                |     | 0.42 |     |      |
| Q <sub>g</sub>      | Total gate Charge                   | V <sub>GS</sub> = 10V<br>V <sub>Bus</sub> = 500V<br>I <sub>D</sub> = 65A                                                                |     | 562  |     | nC   |
| Q <sub>gs</sub>     | Gate – Source Charge                |                                                                                                                                         |     | 75   |     |      |
| Q <sub>gd</sub>     | Gate – Drain Charge                 |                                                                                                                                         |     | 363  |     |      |
| T <sub>d(on)</sub>  | Turn-on Delay Time                  | <b>Inductive switching @ 125°C</b><br>V <sub>GS</sub> = 15V<br>V <sub>Bus</sub> = 667V<br>I <sub>D</sub> = 65A<br>R <sub>G</sub> = 0.5Ω |     | 9    |     | ns   |
| T <sub>r</sub>      | Rise Time                           |                                                                                                                                         |     | 9    |     |      |
| T <sub>d(off)</sub> | Turn-off Delay Time                 |                                                                                                                                         |     | 50   |     |      |
| T <sub>f</sub>      | Fall Time                           |                                                                                                                                         |     | 24   |     |      |
| E <sub>on</sub>     | Turn-on Switching Energy            | <b>Inductive switching @ 25°C</b><br>V <sub>GS</sub> = 15V, V <sub>Bus</sub> = 667V<br>I <sub>D</sub> = 65A, R <sub>G</sub> = 0.5Ω      |     | 2.13 |     | mJ   |
| E <sub>off</sub>    | Turn-off Switching Energy           |                                                                                                                                         |     | 0.46 |     |      |
| E <sub>on</sub>     | Turn-on Switching Energy            | <b>Inductive switching @ 125°C</b><br>V <sub>GS</sub> = 15V, V <sub>Bus</sub> = 667V<br>I <sub>D</sub> = 65A, R <sub>G</sub> = 0.5Ω     |     | 4.4  |     | mJ   |
| E <sub>off</sub>    | Turn-off Switching Energy           |                                                                                                                                         |     | 0.57 |     |      |
| R <sub>thJC</sub>   | Junction to Case Thermal Resistance |                                                                                                                                         |     |      | 0.1 | °C/W |

**Series diode ratings and characteristics**

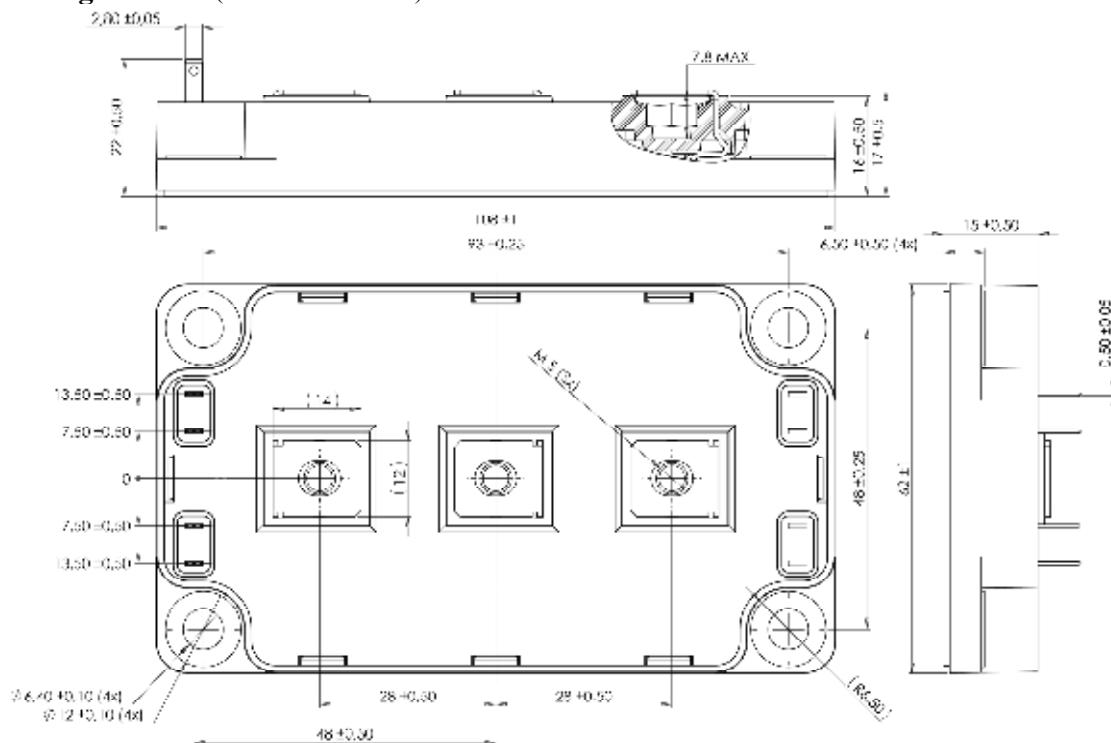
| Symbol            | Characteristic                      | Test Conditions                                                   | Min                    | Typ  | Max  | Unit |
|-------------------|-------------------------------------|-------------------------------------------------------------------|------------------------|------|------|------|
| V <sub>RRM</sub>  | Maximum Repetitive Reverse Voltage  |                                                                   | 1000                   |      |      | V    |
| I <sub>RM</sub>   | Maximum Reverse Leakage Current     | V <sub>R</sub> = 1000V                                            |                        |      | 350  | μA   |
| I <sub>F</sub>    | DC Forward Current                  | T <sub>c</sub> = 100°C                                            |                        | 120  |      | A    |
| V <sub>F</sub>    | Diode Forward Voltage               | I <sub>F</sub> = 120A                                             |                        | 1.9  | 2.5  | V    |
|                   |                                     | I <sub>F</sub> = 240A                                             |                        | 2.2  |      |      |
|                   |                                     | I <sub>F</sub> = 120A T <sub>j</sub> = 125°C                      |                        | 1.7  |      |      |
| t <sub>rr</sub>   | Reverse Recovery Time               | I <sub>F</sub> = 120A<br>V <sub>R</sub> = 667V<br>di/dt = 400A/μs | T <sub>j</sub> = 25°C  | 280  |      | ns   |
|                   |                                     |                                                                   | T <sub>j</sub> = 125°C | 350  |      |      |
| Q <sub>rr</sub>   | Reverse Recovery Charge             | I <sub>F</sub> = 120A<br>V <sub>R</sub> = 667V<br>di/dt = 400A/μs | T <sub>j</sub> = 25°C  | 1520 |      | nC   |
|                   |                                     |                                                                   | T <sub>j</sub> = 125°C | 7200 |      |      |
| R <sub>thJC</sub> | Junction to Case Thermal Resistance |                                                                   |                        |      | 0.46 | °C/W |

**Parallel diode ratings and characteristics**

| Symbol     | Characteristic                      | Test Conditions                                      |                     | Min  | Typ  | Max  | Unit         |
|------------|-------------------------------------|------------------------------------------------------|---------------------|------|------|------|--------------|
| $V_{RRM}$  | Maximum Repetitive Reverse Voltage  |                                                      |                     | 1000 |      |      | V            |
| $I_{RM}$   | Maximum Reverse Leakage Current     | $V_R=1000V$                                          |                     |      |      | 350  | $\mu A$      |
| $I_F$      | DC Forward Current                  |                                                      | $T_c = 100^\circ C$ |      | 120  |      | A            |
| $V_F$      | Diode Forward Voltage               | $I_F = 120A$                                         |                     |      | 1.9  | 2.5  | V            |
|            |                                     | $I_F = 240A$                                         |                     |      | 2.2  |      |              |
|            |                                     | $I_F = 120A$                                         | $T_j = 125^\circ C$ |      | 1.7  |      |              |
| $t_{rr}$   | Reverse Recovery Time               | $I_F = 120A$<br>$V_R = 667V$<br>$di/dt = 400A/\mu s$ | $T_j = 25^\circ C$  |      | 280  |      | ns           |
|            |                                     |                                                      | $T_j = 125^\circ C$ |      | 350  |      |              |
| $Q_{rr}$   | Reverse Recovery Charge             |                                                      | $T_j = 25^\circ C$  |      | 1520 |      | nC           |
|            |                                     |                                                      | $T_j = 125^\circ C$ |      | 7200 |      |              |
| $R_{thJC}$ | Junction to Case Thermal Resistance |                                                      |                     |      |      | 0.46 | $^\circ C/W$ |

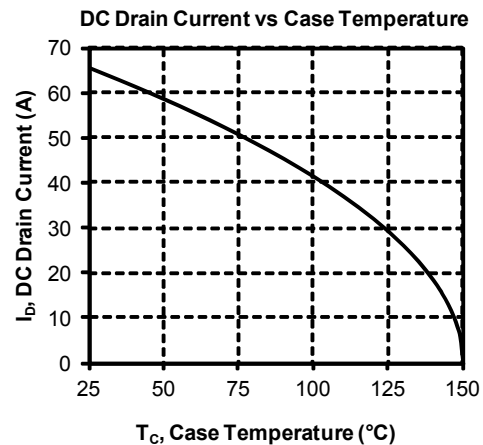
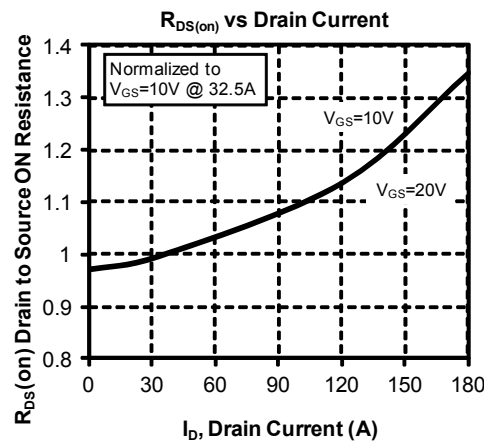
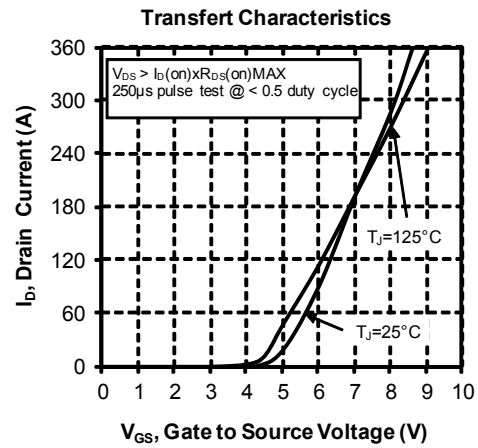
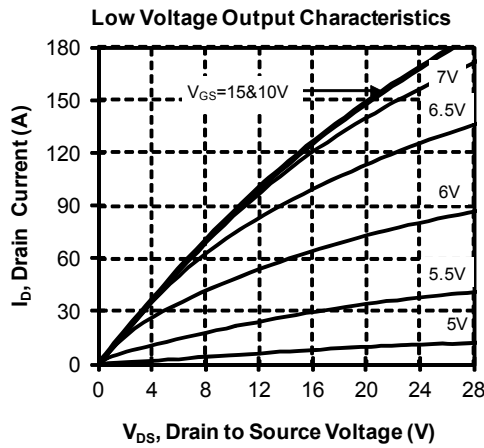
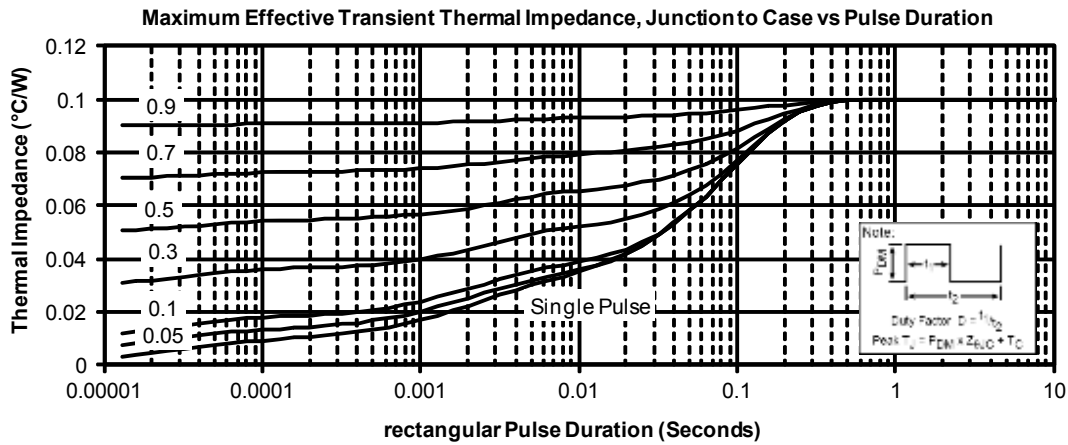
**Thermal and package characteristics**

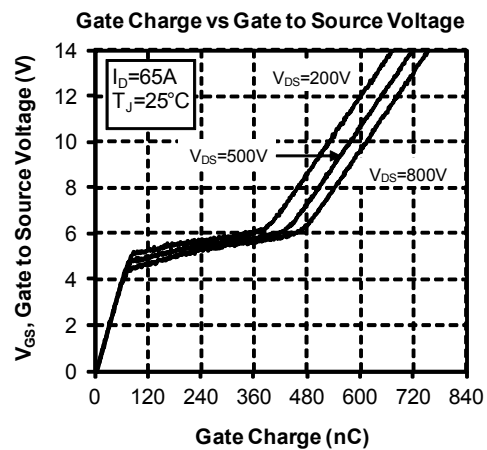
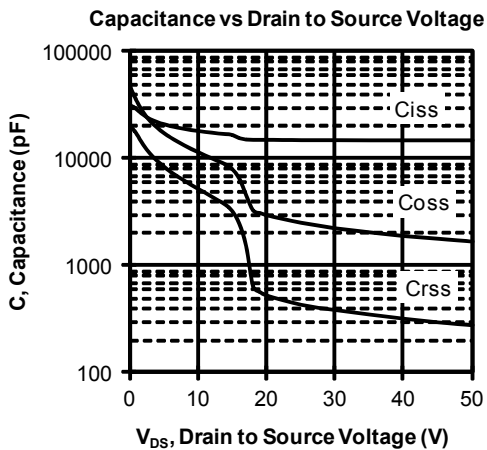
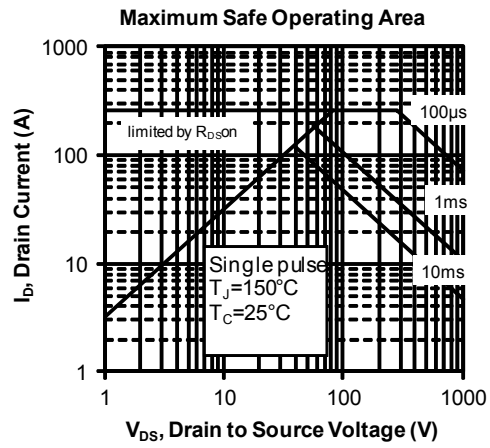
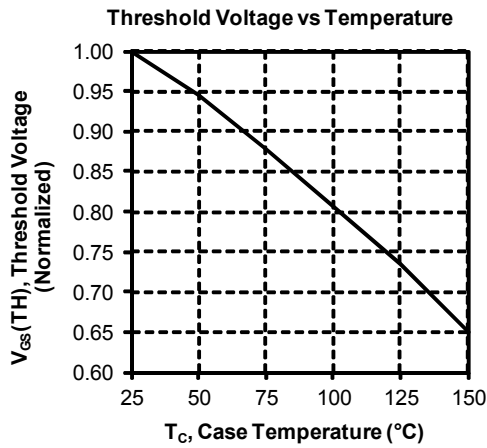
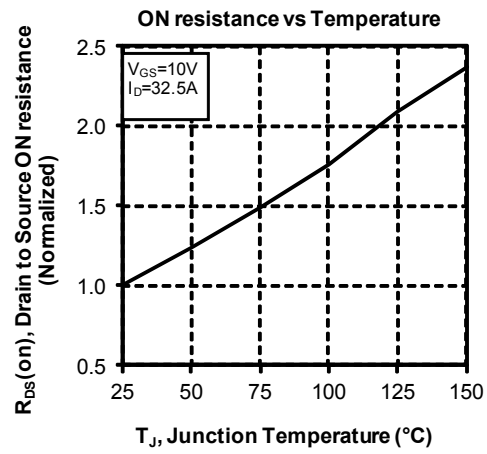
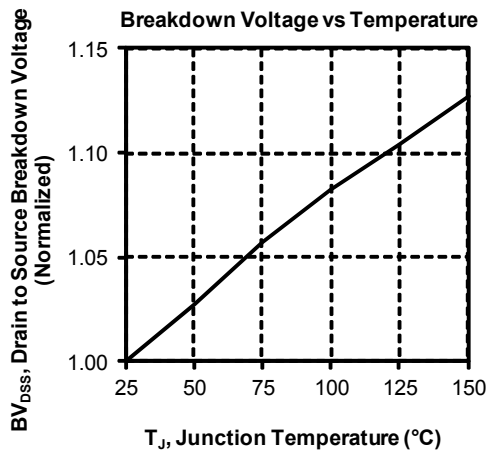
| Symbol     | Characteristic                                                 | Min           | Typ | Max | Unit       |
|------------|----------------------------------------------------------------|---------------|-----|-----|------------|
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case $t=1$ min, 50/60Hz | 4000          |     |     | V          |
| $T_J$      | Operating junction temperature range                           | -40           |     | 150 | $^\circ C$ |
| $T_{STG}$  | Storage Temperature Range                                      | -40           |     | 125 |            |
| $T_C$      | Operating Case Temperature                                     | -40           |     | 100 |            |
| Torque     | Mounting torque                                                | To heatsink   | M6  | 3   | N.m        |
|            |                                                                | For terminals | M5  | 2   |            |
| Wt         | Package Weight                                                 |               |     | 300 | g          |

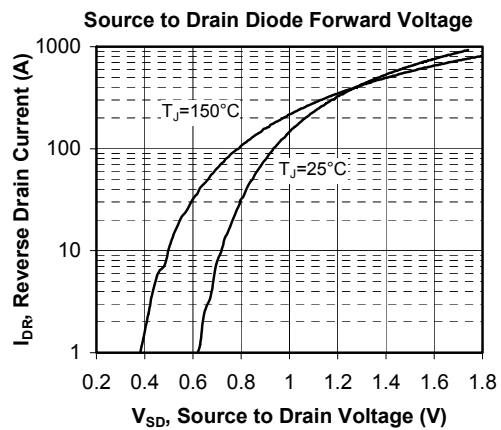
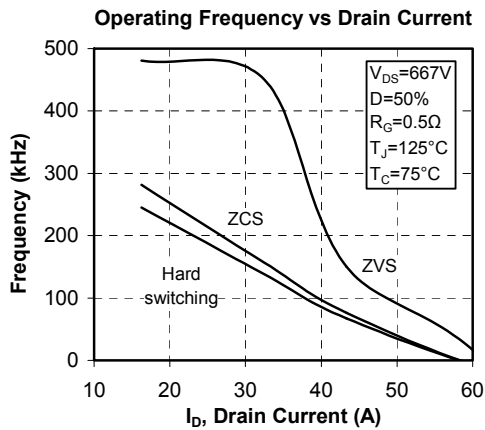
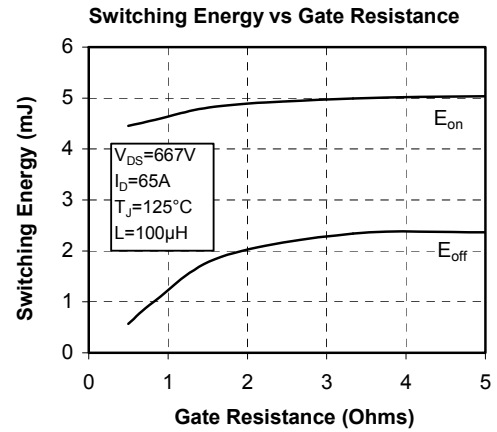
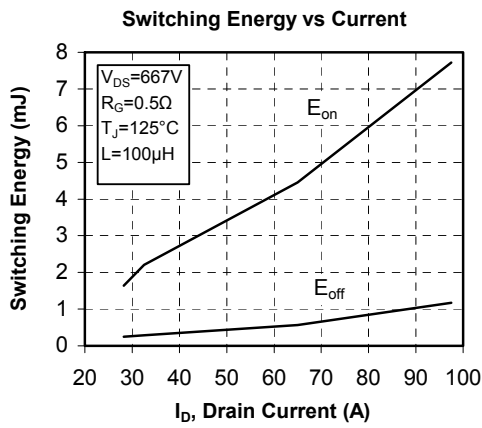
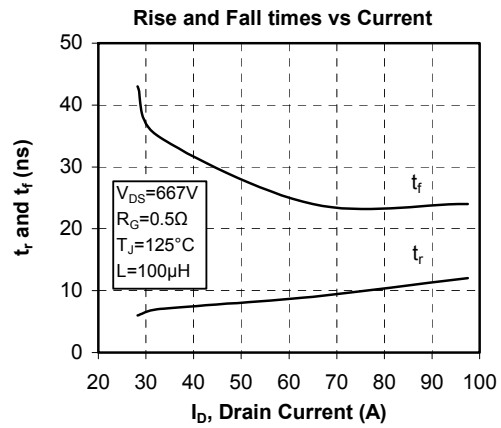
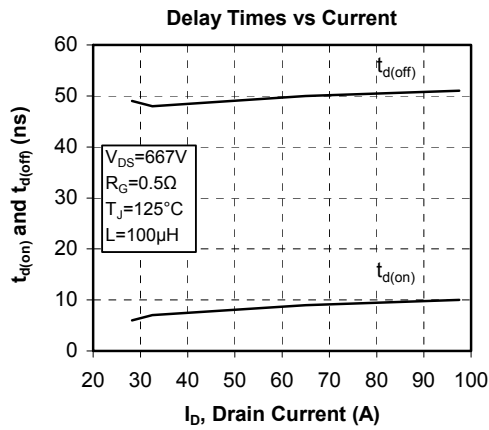
**SP6 Package outline (dimensions in mm)**


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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