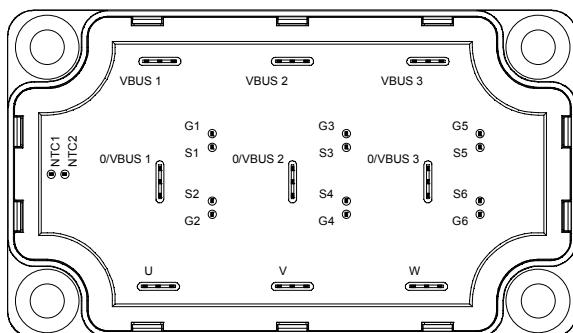
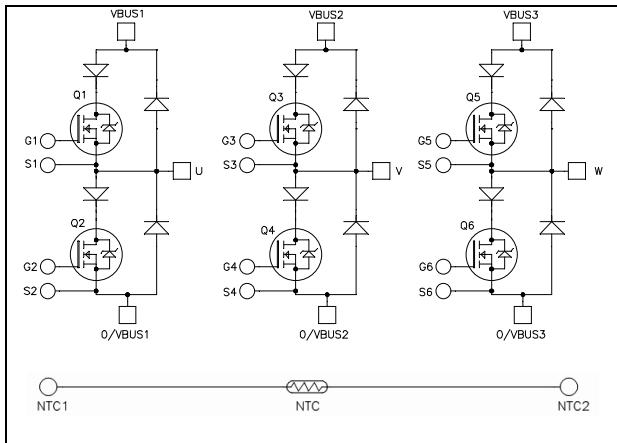


**Triple phase leg  
MOSFET Power Module**

**$V_{DSS} = 1000V$**   
 **$R_{DSon} = 350m\Omega$  typ @  $T_j = 25^\circ C$**   
 **$I_D = 22A$  @  $T_c = 25^\circ C$**



Pins NTC1 & NTC2 are only mounted on  
APTM100TA35SCTPG power module.

**Application**

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

**Features**

- **Power MOS 7® MOSFETs**
  - Low  $R_{DSon}$
  - Low input and Miller capacitance
  - Low gate charge
  - Avalanche energy rated
  - Very rugged
- **SiC Parallel Schottky Diode**
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF
- Kelvin source for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- High level of integration
- Internal thermistor for temperature monitoring

**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
- RoHS Compliant

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

 **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)

**Absolute maximum ratings (Per MOSFET)**

| Symbol       | Parameter   |                          | Max ratings | Unit             |
|--------------|---|--------------------------|-------------|------------------|
| $V_{DSS}$    | Drain - Source Breakdown Voltage                  |                          | 1000        | V                |
| $I_D$        | Continuous Drain Current                          | $T_c = 25^\circ\text{C}$ | 22          | A                |
|              |   | $T_c = 80^\circ\text{C}$ | 17          |                  |
| $I_{DM}$     | Pulsed Drain current                              |                          | 88          |                  |
| $V_{GS}$     | Gate - Source Voltage                             |                          | $\pm 30$    | V                |
| $R_{DS(on)}$ | Drain - Source ON Resistance                      |                          | 420         | $\text{m}\Omega$ |
| $P_D$        | Maximum Power Dissipation                         | $T_c = 25^\circ\text{C}$ | 390         | W                |
| $I_{AR}$     | Avalanche current (repetitive and non repetitive) |                          | 25          | A                |
| $E_{AR}$     | Repetitive Avalanche Energy                       |                          | 50          | mJ               |
| $E_{AS}$     | Single Pulse Avalanche Energy                     |                          | 3000        |                  |

**Electrical Characteristics (Per MOSFET)**

| Symbol              | Characteristic                  | Test Conditions                               | Min                       | Typ | Max       | Unit             |
|---------------------|---------------------------------|---|---------------------------|-----|-----------|------------------|
| $I_{DSS}$           | Zero Gate Voltage Drain Current | $V_{GS} = 0\text{V}, V_{DS} = 1000\text{V}$   | $T_j = 25^\circ\text{C}$  |     |           | 100              |
|                     |                                 | $V_{GS} = 0\text{V}, V_{DS} = 800\text{V}$    | $T_j = 125^\circ\text{C}$ |     |           | 500              |
| $R_{DS(on)}$        | Drain – Source on Resistance    | $V_{GS} = 10\text{V}, I_D = 11\text{A}$       |                           | 350 | 420       | $\text{m}\Omega$ |
| $V_{GS(\text{th})}$ | 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 (Per MOSFET)**

| Symbol      | Characteristic                      | Test Conditions   | Min | Typ  | Max  | Unit                      |
|-------------|-------------------------------------|---|-----|------|------|---------------------------|
| $C_{iss}$   | Input Capacitance                   | $V_{GS} = 0\text{V}$<br>$V_{DS} = 25\text{V}$<br>$f = 1\text{MHz}$  |     | 5.2  |      | nF                        |
|             |                                     |   |     | 0.88 |      |                           |
|             |                                     |   |     | 0.16 |      |                           |
| $Q_g$       | Total gate Charge                   | $V_{GS} = 10\text{V}$<br>$V_{Bus} = 500\text{V}$<br>$I_D = 22\text{A}$  |     | 186  |      | nC                        |
|             |                                     |   |     | 24   |      |                           |
|             |                                     |   |     | 122  |      |                           |
| $T_{d(on)}$ | Turn-on Delay Time                  | <b>Inductive switching @ 125°C</b><br>$V_{GS} = 15\text{V}$<br>$V_{Bus} = 670\text{V}$<br>$I_D = 22\text{A}$            |     | 18   |      | ns                        |
|             |                                     |   |     | 12   |      |                           |
|             |                                     |   |     | 155  |      |                           |
|             |                                     |   |     | 40   |      |                           |
| $E_{on}$    | Turn-on Switching Energy            | <b>Inductive switching @ 25°C</b><br>$V_{GS} = 15\text{V}, V_{Bus} = 670\text{V}$<br>$I_D = 22\text{A}, R_G = 5\Omega$  |     | 540  |      | $\mu\text{J}$             |
|             |                                     |   |     | 623  |      |                           |
| $E_{off}$   | Turn-off Switching Energy           | <b>Inductive switching @ 125°C</b><br>$V_{GS} = 15\text{V}, V_{Bus} = 670\text{V}$<br>$I_D = 22\text{A}, R_G = 5\Omega$ |     | 854  |      | $\mu\text{J}$             |
|             |                                     |   |     | 779  |      |                           |
| $R_{thJC}$  | Junction to Case Thermal Resistance |   |     |      | 0.32 | $^\circ\text{C}/\text{W}$ |

**Series diode ratings and characteristics** (per diode)

| Symbol     | Characteristic                      | Test Conditions                                     |                     | Min                | Typ  | Max | Unit         |
|------------|-------------------------------------|---|---------------------|--------------------|------|-----|--------------|
| $V_{RRM}$  | Maximum Repetitive Reverse Voltage  |   |                     | 1000               |      |     | V            |
| $I_{RM}$   | Maximum Reverse Leakage Current     | $V_R=1000V$   |                     |                    |      | 250 | $\mu A$      |
| $I_F$      | DC Forward Current                  |   |                     | $T_c = 80^\circ C$ | 30   |     | A            |
| $V_F$      | Diode Forward Voltage               | $I_F = 30A$   |                     |                    | 1.9  | 2.3 | V            |
|            |                                     | $I_F = 60A$   |                     |                    | 2.2  |     |              |
|            |                                     | $I_F = 30A$   | $T_j = 125^\circ C$ |                    | 1.7  |     |              |
| $t_{rr}$   | Reverse Recovery Time               | $I_F = 30A$<br>$V_R = 667V$<br>$di/dt = 200A/\mu s$ | $T_j = 25^\circ C$  |                    | 290  |     | ns           |
|            |                                     |   | $T_j = 125^\circ C$ |                    | 390  |     |              |
| $Q_{rr}$   | Reverse Recovery Charge             | $I_F = 30A$<br>$V_R = 667V$<br>$di/dt = 200A/\mu s$ | $T_j = 25^\circ C$  |                    | 670  |     | nC           |
|            |                                     |   | $T_j = 125^\circ C$ |                    | 2350 |     |              |
| $R_{thJC}$ | Junction to Case Thermal Resistance |   |                     |                    |      | 1.2 | $^\circ C/W$ |

**SiC Parallel diode ratings and characteristics** (per SiC diode)

| Symbol     | Characteristic                          | Test Conditions                                |                     | Min                 | Typ | Max  | Unit         |
|------------|---|--|---------------------|---------------------|-----|------|--------------|
| $V_{RRM}$  | Maximum Peak Repetitive Reverse Voltage |  |                     | 1200                |     |      | V            |
| $I_{RM}$   | Maximum Reverse Leakage Current         | $V_R=1200V$                                    | $T_j = 25^\circ C$  |                     | 64  | 400  | $\mu A$      |
|            |   |  | $T_j = 175^\circ C$ |                     | 112 | 2000 |              |
| $I_F$      | DC Forward Current                      |  |                     | $T_c = 125^\circ C$ | 20  |      | A            |
| $V_F$      | Diode Forward Voltage                   | $I_F = 20A$                                    | $T_j = 25^\circ C$  |                     | 1.6 | 1.8  | V            |
|            |   |  | $T_j = 175^\circ C$ |                     | 2.3 | 3    |              |
| $Q_C$      | Total Capacitive Charge                 | $I_F = 20A, V_R = 600V$<br>$di/dt=1000A/\mu s$ |                     |                     | 80  |      | nC           |
| $C$        | Total Capacitance                       | $f = 1MHz, V_R = 200V$                         |                     |                     | 192 |      | pF           |
|            |   | $f = 1MHz, V_R = 400V$                         |                     |                     | 138 |      |              |
| $R_{thJC}$ | Junction to Case Thermal Resistance     |  |                     |                     |     | 1    | $^\circ C/W$ |

**Thermal and package characteristics**

| Symbol     | Characteristic  | Min         | 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            | $^\circ C$ |
| $T_{JOP}$  | Recommended junction temperature under switching conditions   | -40         | $T_{Jmax} -25$ |            |
| $T_{STG}$  | Storage Temperature Range                                     | -40         | 125            |            |
| $T_C$      | Operating Case Temperature                                    | -40         | 100            |            |
| Torque     | Mounting torque   | To heatsink | M6             | 3          |
| Wt         | Package Weight  |             |                | 250        |
|            |   |             |                | g          |

**Temperature sensor NTC** (see application note APT0406 on [www.microsemi.com](http://www.microsemi.com)).

Pins NTC1 &amp; NTC2 are only mounted on APTM100TA35SCTPG power module.

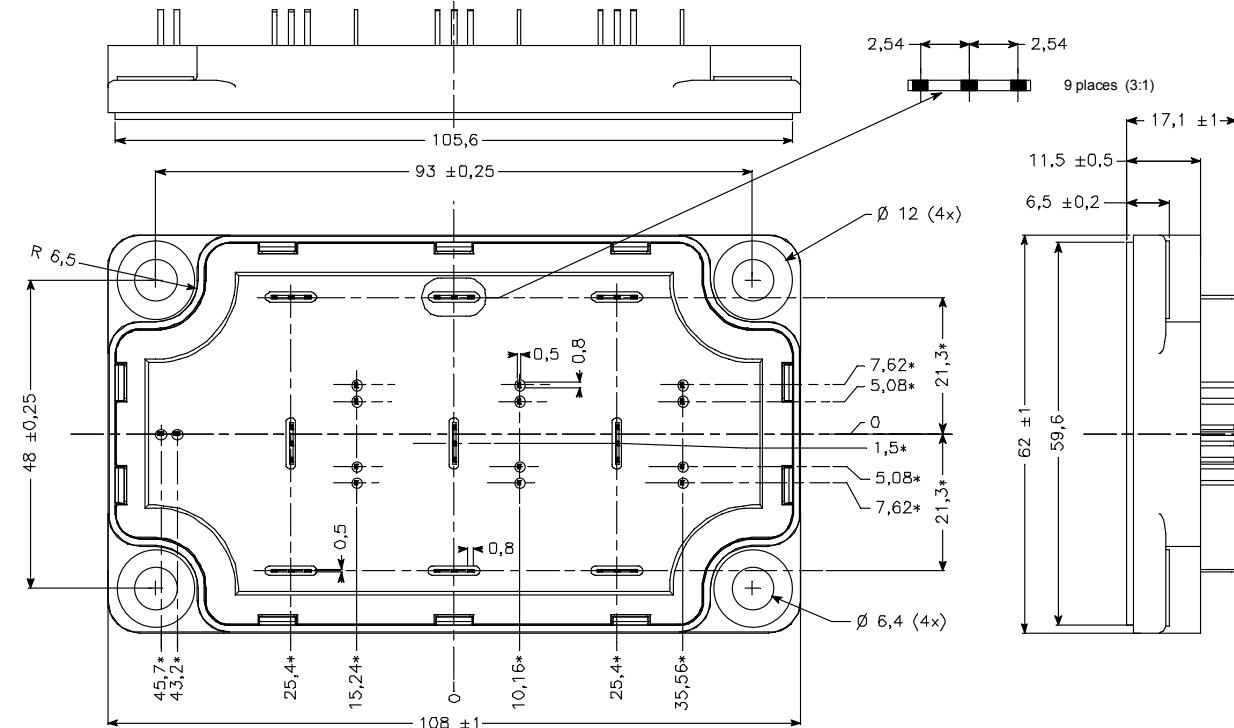
| Symbol                          | Characteristic             | Min | Typ  | Max | Unit |
|---------------------------------|----------------------------|-----|------|-----|------|
| R <sub>25</sub>                 | Resistance @ 25°C          |     | 50   |     | kΩ   |
| ΔR <sub>25/R<sub>25</sub></sub> |                            |     | 5    |     | %    |
| B <sub>25/85</sub>              | T <sub>25</sub> = 298.15 K |     | 3952 |     | K    |
| ΔB/B                            | T <sub>C</sub> =100°C      |     | 4    |     | %    |

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

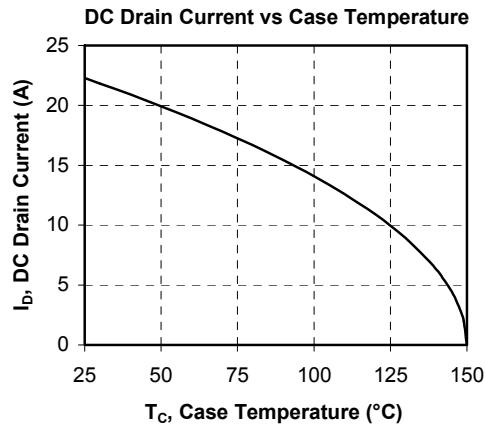
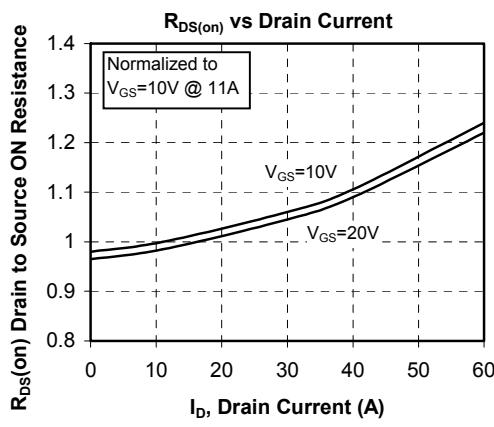
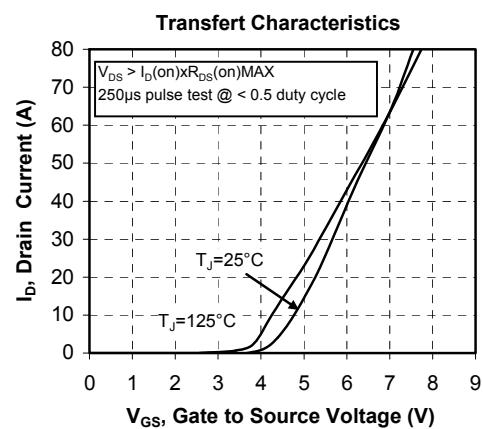
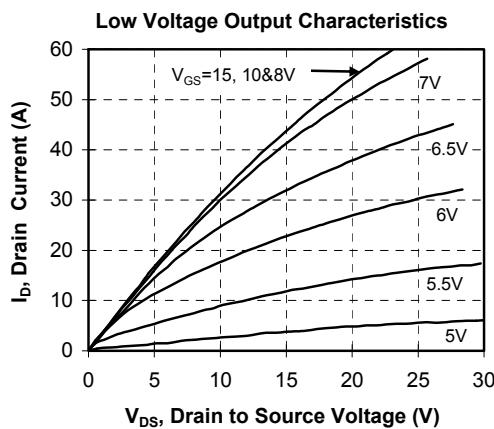
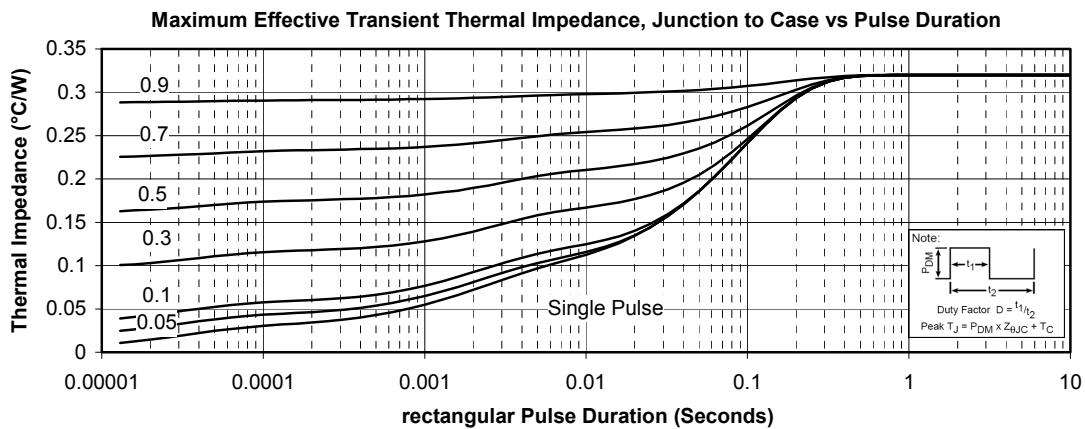
T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

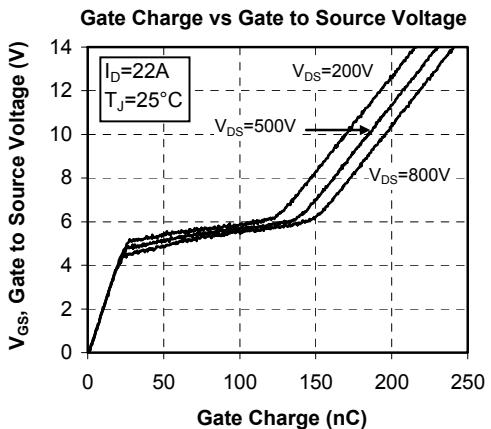
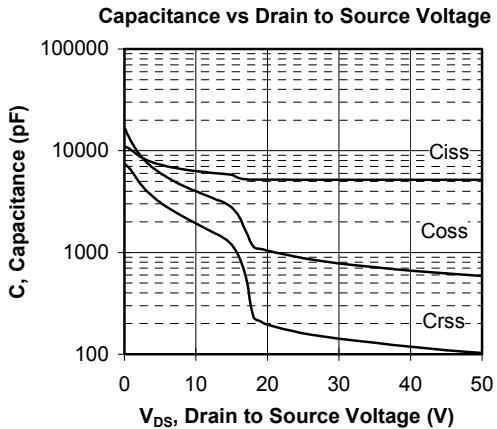
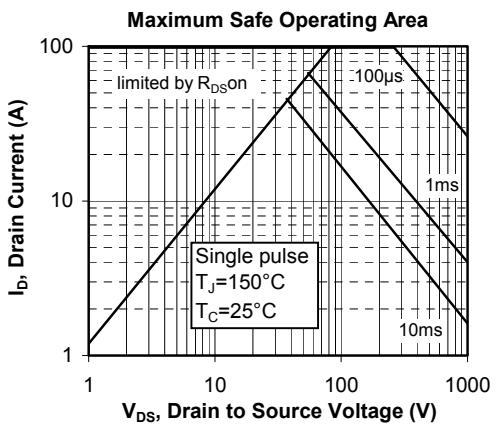
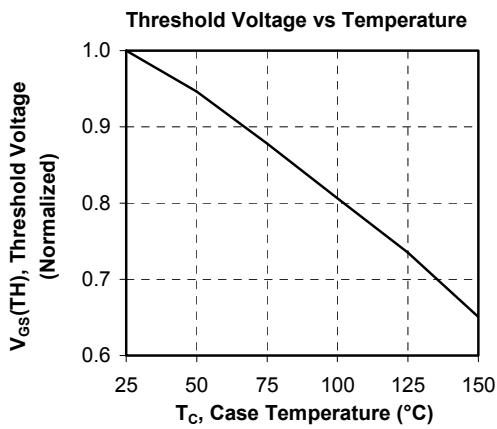
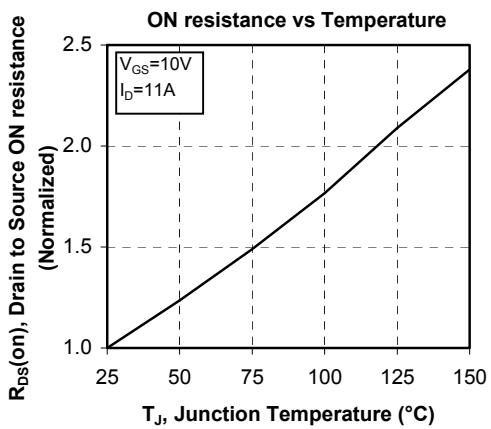
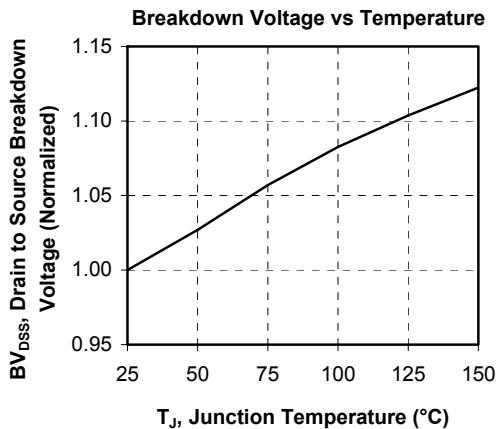
**SP6-P Package outline (dimensions in mm)**

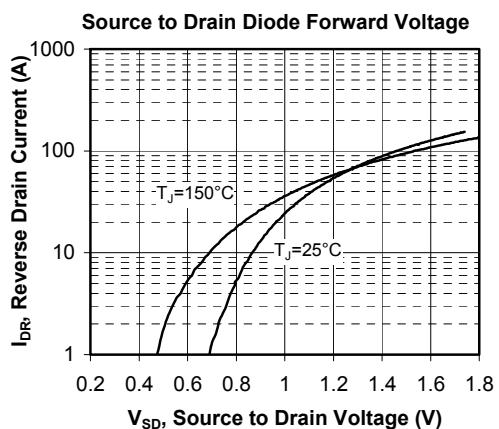
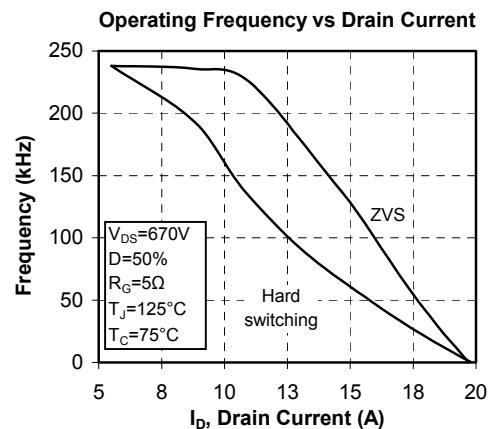
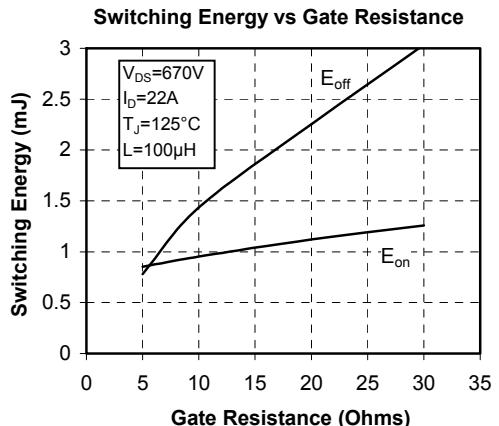
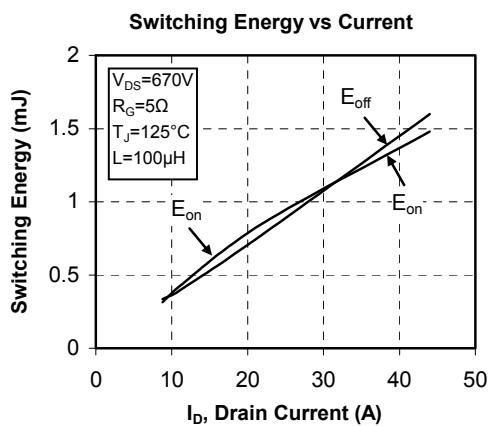
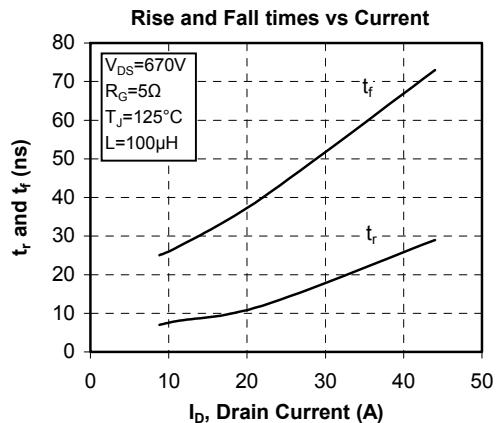
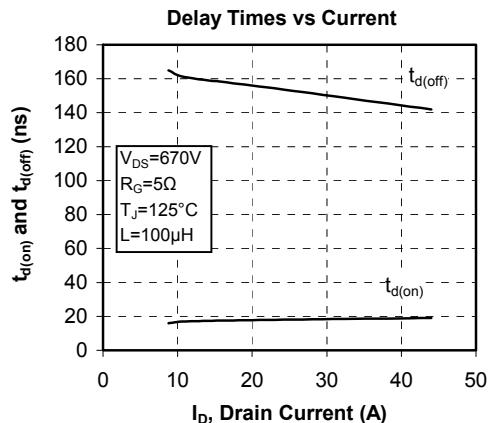
Pins NTC1 &amp; NTC2 are only mounted on APTM100TA35SCTPG power module.

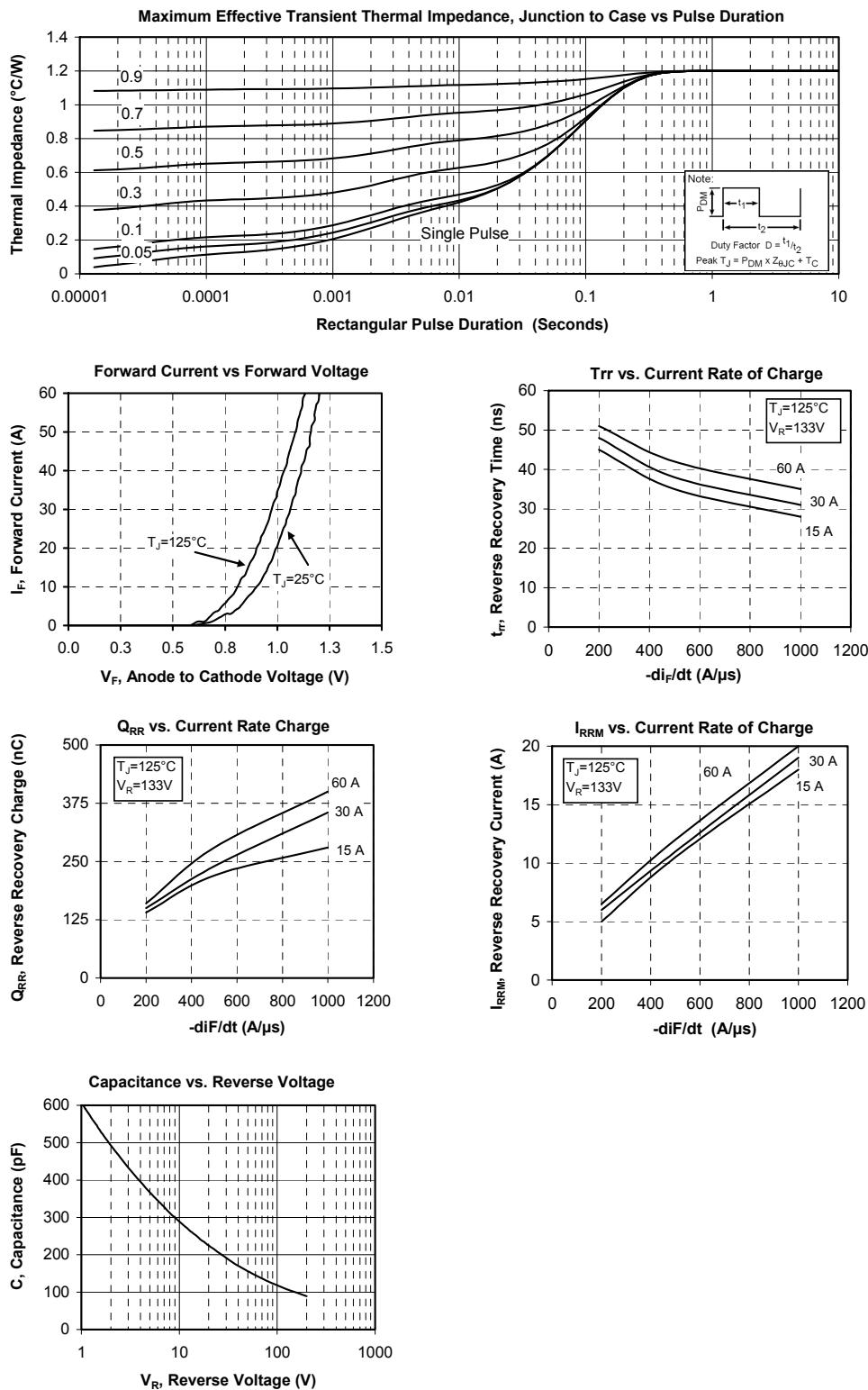

 ALL DIMENSIONS MARKED " \* " ARE TOLERENCED AS : 

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

**Typical MOSFET Performance Curve**


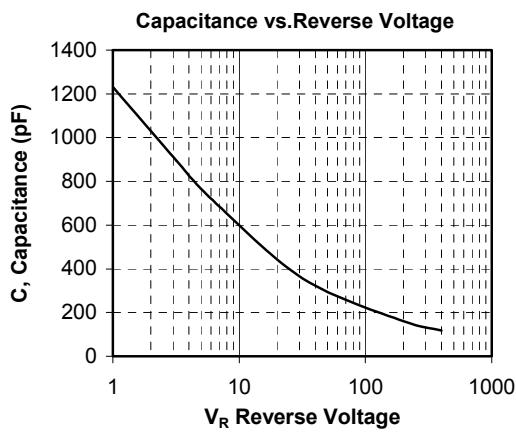
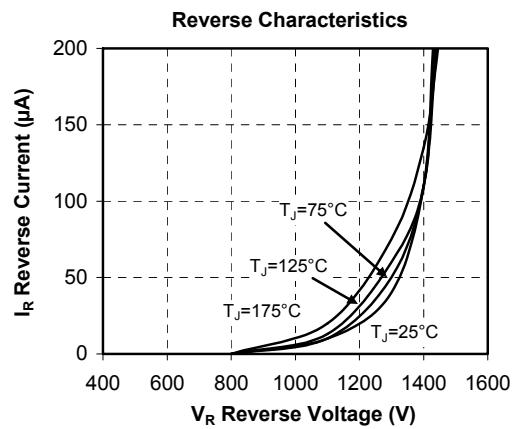
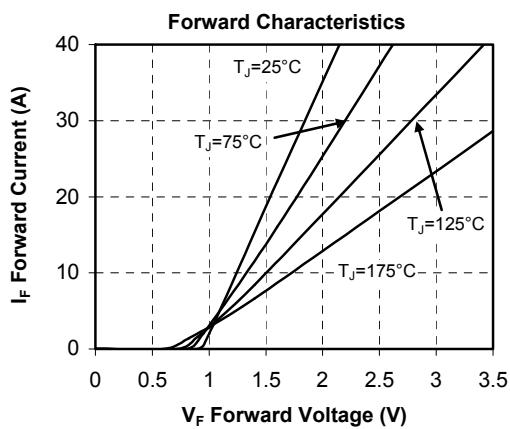
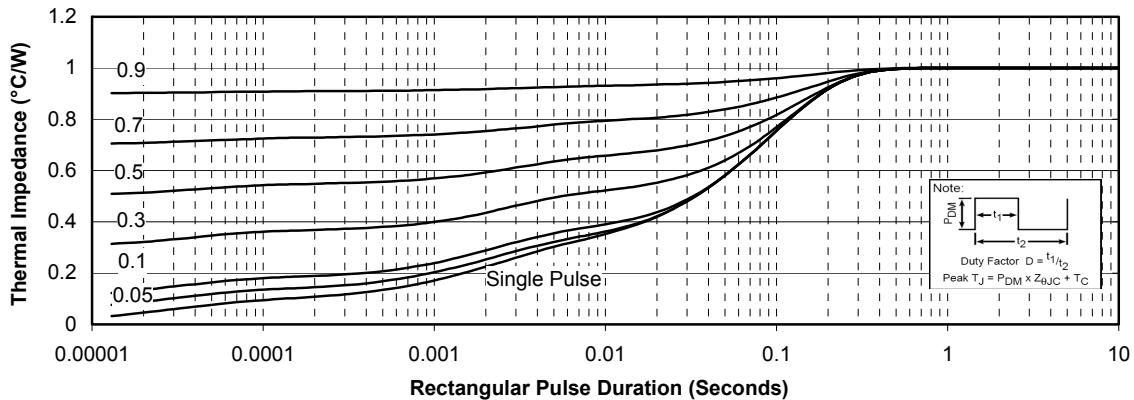




**Typical series diode Performance Curve**


Typical SiC parallel diode Performance Curve

Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



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