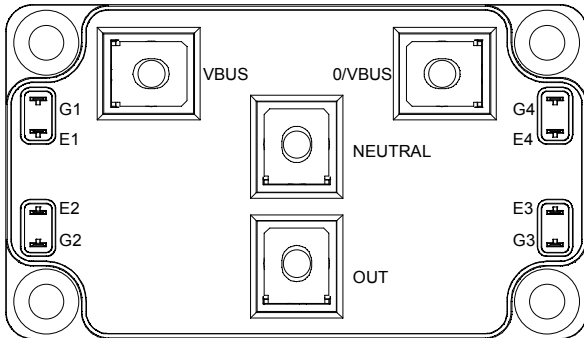
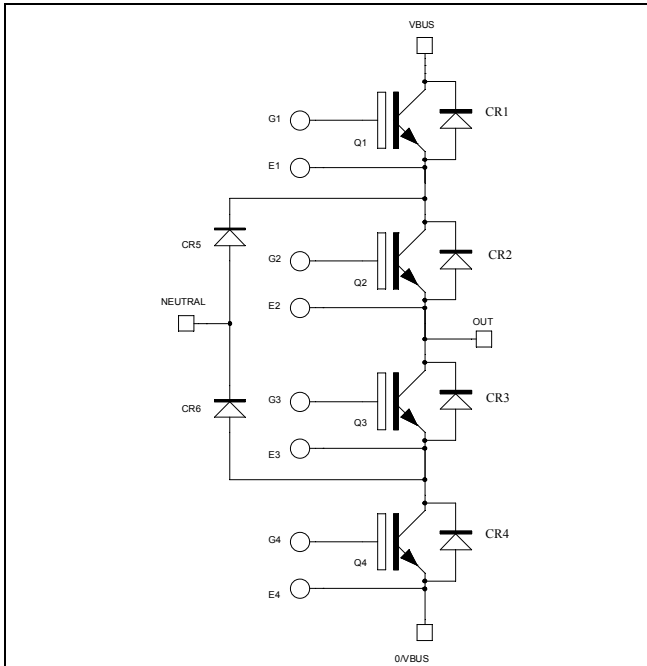


**Three level inverter
Trench + Field Stop IGBT4
Power Module**

**$V_{CES} = 1200V$
 $I_C = 240A @ T_c = 80^\circ C$**



Application

- Solar converter
- Uninterruptible Power Supplies

Features

- Trench + Field Stop IGBT 4 Technology
 - Low voltage drop
 - Low leakage current
 - Low switching losses
 - Soft recovery parallel diodes
 - Low diode VF
 - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
 - Symmetrical design
 - M5 power connectors
- High level of integration

Benefits

- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat
- Low profile
- RoHS Compliant

Q1 to Q4 Absolute maximum ratings

| Symbol | Parameter | Max ratings | Unit |
|-----------|---------------------------------------|---------------------|--------------|
| V_{CES} | Collector - Emitter Breakdown Voltage | 1200 | V |
| I_C | Continuous Collector Current | $T_c = 25^\circ C$ | 305 |
| | | $T_c = 80^\circ C$ | 240 |
| I_{CM} | Pulsed Collector Current | $T_c = 25^\circ C$ | 400 |
| V_{GE} | Gate - Emitter Voltage | ± 20 | V |
| P_D | Maximum Power Dissipation | $T_c = 25^\circ C$ | 1000 |
| RBSOA | Reverse Bias Safe Operating Area | $T_j = 150^\circ C$ | 400A @ 1150V |

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

Q1 to Q4 Electrical Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|---------------|--------------------------------------|---|---------------------------|-----|-----|------|
| I_{CES} | Zero Gate Voltage Collector Current | $V_{GE} = 0V$; $V_{CE} = 1200V$ | | | 2 | mA |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15V$ $I_C = 200A$ | $T_j = 25^\circ\text{C}$ | 1.8 | 2.2 | V |
| | | | $T_j = 150^\circ\text{C}$ | 2.2 | | |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE} = V_{CE}$, $I_C = 5\text{ mA}$ | 5 | 5.8 | 6.5 | V |

Q1 to Q4 Dynamic Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|--------------|-------------------------------------|---|---------------------------|------|------|--------------------|
| C_{ies} | Input Capacitance | $V_{GE} = 0V$ | | 12.3 | | nF |
| C_{oes} | Output Capacitance | $V_{CE} = 25V$ | | 0.8 | | |
| C_{res} | Reverse Transfer Capacitance | $f = 1\text{MHz}$ | | 0.69 | | |
| Q_G | Gate charge | $V_{GE} = \pm 15V$ | | 1.7 | | μC |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{CE} = 600V$ $I_C = 200A$ $R_G = 3.6\Omega$ | | 160 | | ns |
| T_r | Rise Time | | | 30 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | 340 | | |
| T_f | Fall Time | | | 80 | | |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (150°C) $V_{GE} = \pm 15V$ $V_{CE} = 600V$ $I_C = 200A$ $R_G = 3.6\Omega$ | | 170 | | ns |
| T_r | Rise Time | | | 40 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | 450 | | |
| T_f | Fall Time | | | 170 | | |
| E_{on} | Turn-on Switching Energy | $V_{GE} = \pm 15V$ $V_{CE} = 600V$ $I_C = 200A$ | $T_j = 25^\circ\text{C}$ | 10.4 | | mJ |
| | | | $T_j = 150^\circ\text{C}$ | 21 | | |
| E_{off} | Turn-off Switching Energy | $R_G = 3.6\Omega$ | $T_j = 25^\circ\text{C}$ | 11 | | mJ |
| | | | $T_j = 150^\circ\text{C}$ | 18.6 | | |
| I_{SC} | Short circuit current | $V_{GE} \leq 15V$; $V_{CC} = 900V$ $t_p \leq 10\mu\text{s}$; $T_j = 150^\circ\text{C}$ | | 1000 | | A |
| R_{thJC} | Junction to Case Thermal Resistance | | | | 0.15 | $^\circ\text{C/W}$ |

CR1 to CR4 diode ratings and characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|------------|---|---|---------------------------|------|------|--------------------|
| V_{RRM} | Maximum Peak Repetitive Reverse Voltage | | 1200 | | | V |
| I_{RM} | Maximum Reverse Leakage Current | $V_R = 1200V$ | | | 150 | μA |
| | | | | | 400 | |
| I_F | DC Forward Current | | | 180 | | A |
| V_F | Diode Forward Voltage | $I_F = 150A$ $V_{GE} = 0V$ | $T_j = 25^\circ\text{C}$ | 1.7 | 2.2 | V |
| | | | $T_j = 150^\circ\text{C}$ | 1.65 | | |
| t_{rr} | Reverse Recovery Time | $I_F = 150A$ $V_R = 600V$ $di/dt = 3800A/\mu\text{s}$ | $T_j = 25^\circ\text{C}$ | 155 | | ns |
| | | | $T_j = 150^\circ\text{C}$ | 300 | | |
| Q_{rr} | Reverse Recovery Charge | | $T_j = 25^\circ\text{C}$ | 14.6 | | μC |
| | | | $T_j = 150^\circ\text{C}$ | 30.4 | | |
| E_{rr} | Reverse Recovery Energy | | $T_j = 25^\circ\text{C}$ | 5.2 | | mJ |
| | | | $T_j = 150^\circ\text{C}$ | 11 | | |
| R_{thJC} | Junction to Case Thermal Resistance | | | | 0.32 | $^\circ\text{C/W}$ |

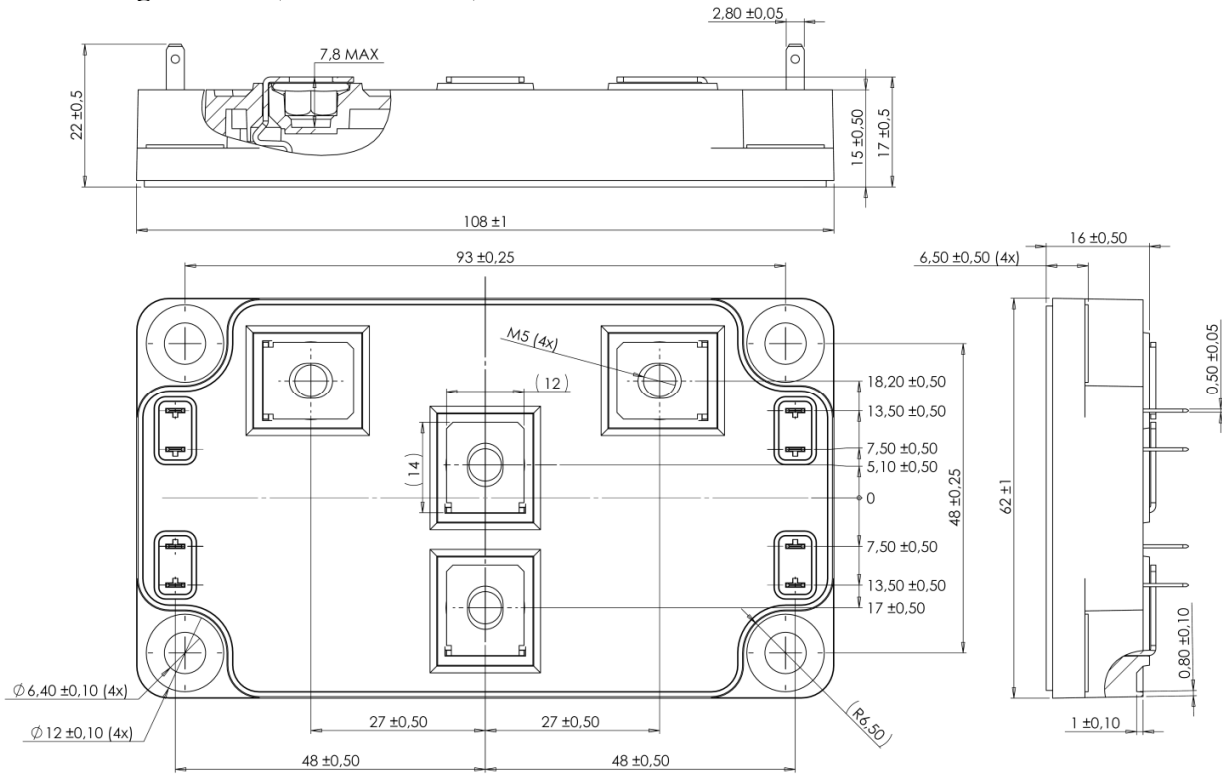
CR5 & CR6 diode ratings and characteristics

| <i>Symbol</i> | <i>Characteristic</i> | <i>Test Conditions</i> | | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |
|-------------------|---|--|------------------------|------------|------------|------------|-------------|
| V _{RRM} | Maximum Peak Repetitive Reverse Voltage | | | 1200 | | | V |
| I _{RM} | Maximum Reverse Leakage Current | V _R =1200V | T _j = 25°C | | | 150 | μA |
| | | | T _j = 150°C | | | 400 | |
| I _F | DC Forward Current | | T _c = 80°C | | 240 | | A |
| V _F | Diode Forward Voltage | I _F = 200A V _{GE} = 0V | T _j = 25°C | | 1.9 | 2.4 | V |
| | | | T _j = 150°C | | 1.85 | | |
| t _{rr} | Reverse Recovery Time | I _F = 200A V _R = 600V di/dt = 4000A/μs | T _j = 25°C | | 155 | | ns |
| | | | T _j = 150°C | | 300 | | |
| Q _{rr} | Reverse Recovery Charge | I _F = 200A V _R = 600V di/dt = 4000A/μs | T _j = 25°C | | 18.6 | | μC |
| | | | T _j = 150°C | | 39 | | |
| E _{rr} | Reverse Recovery Energy | I _F = 200A V _R = 600V di/dt = 4000A/μs | T _j = 25°C | | 8.2 | | mJ |
| | | | T _j = 150°C | | 16 | | |
| R _{thJC} | Junction to Case Thermal Resistance | | | | | 0.25 | °C/W |

Thermal and package characteristics

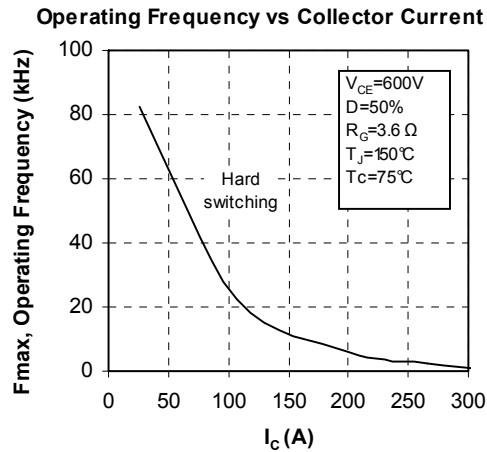
| <i>Symbol</i> | <i>Characteristic</i> | | | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |
|-------------------|--|---------------|----|------------|------------|------------|-------------|
| V _{ISOL} | RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz | | | 4000 | | | V |
| T _J | Operating junction temperature range | | | -40 | | 175 | °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 |
| | | For terminals | M5 | 2 | | 3.5 | |
| Wt | Package Weight | | | | | 300 | g |

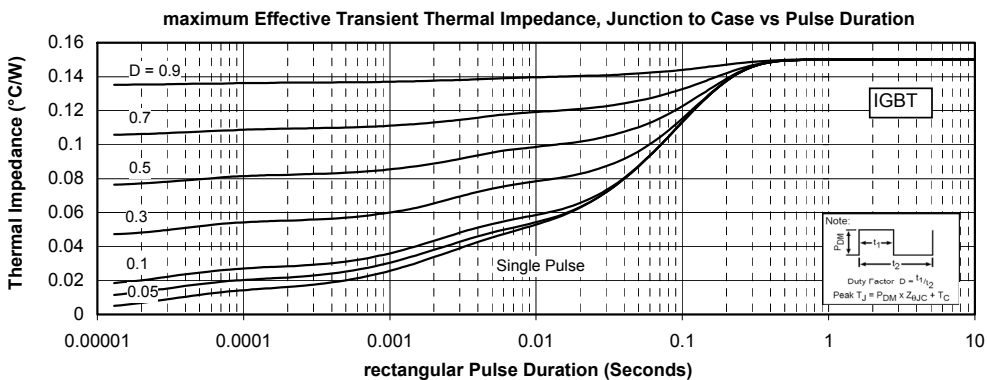
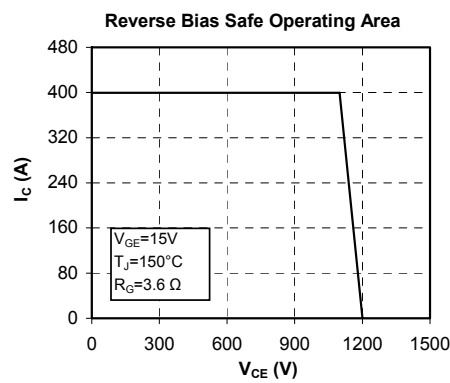
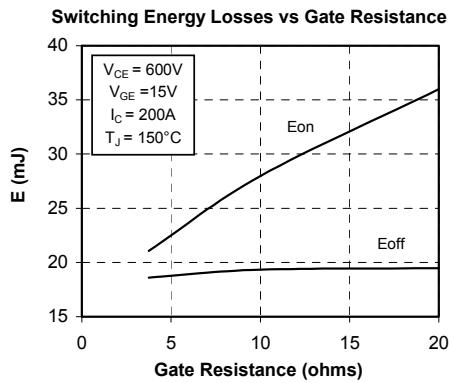
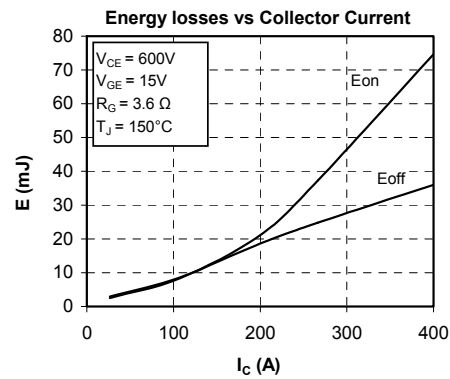
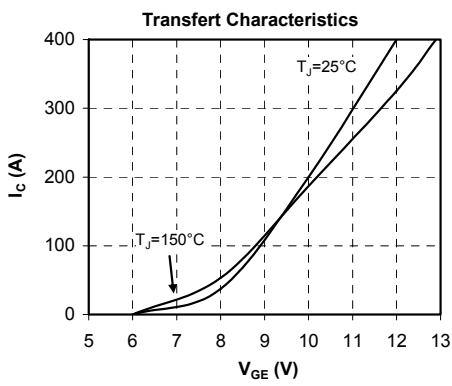
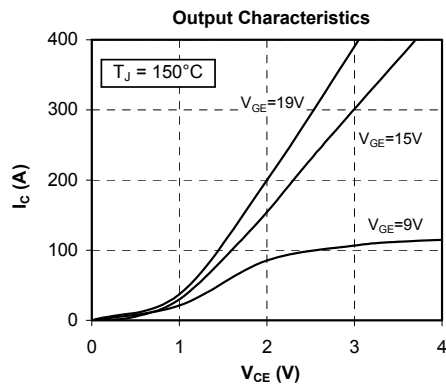
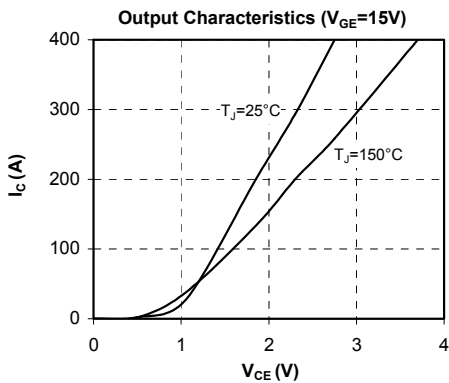
SP6 Package outline (dimensions in mm)

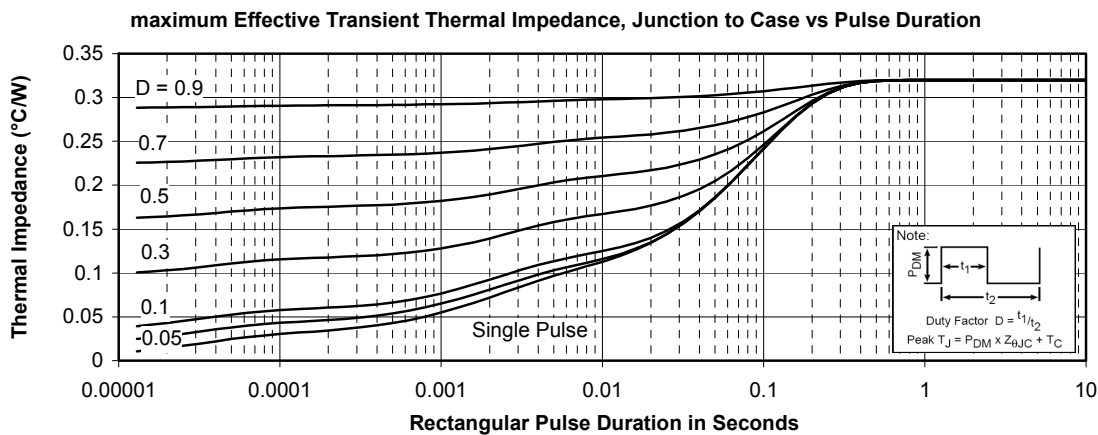
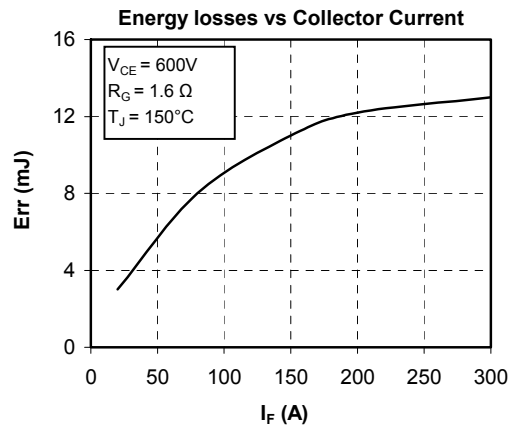
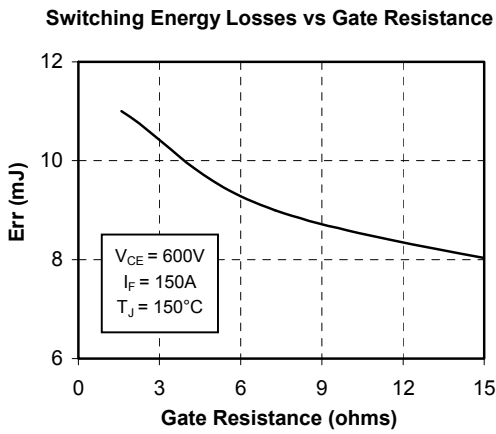
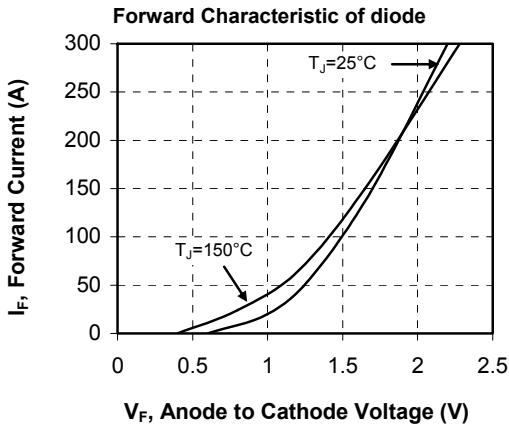


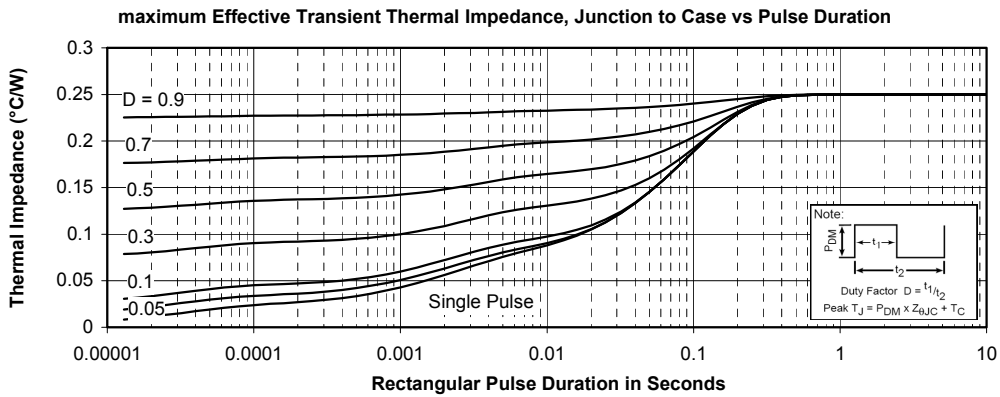
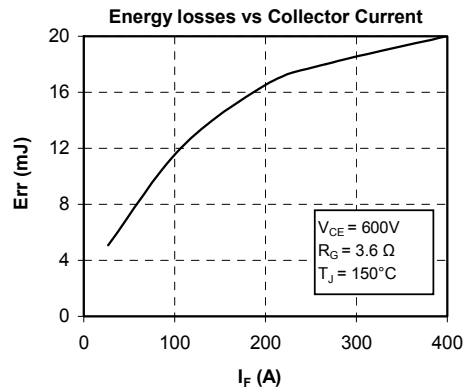
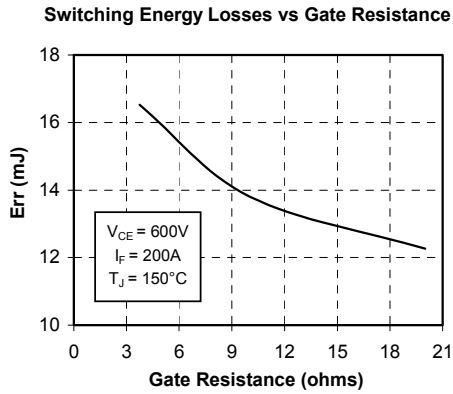
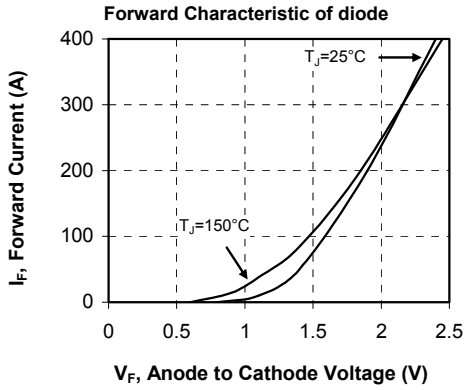
See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

Q1 to Q4 Typical performance curve





CR1 to CR4 Typical performance curve


CR5 & CR6 Typical performance curve


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