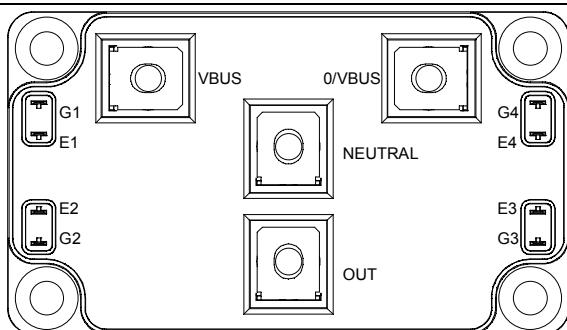
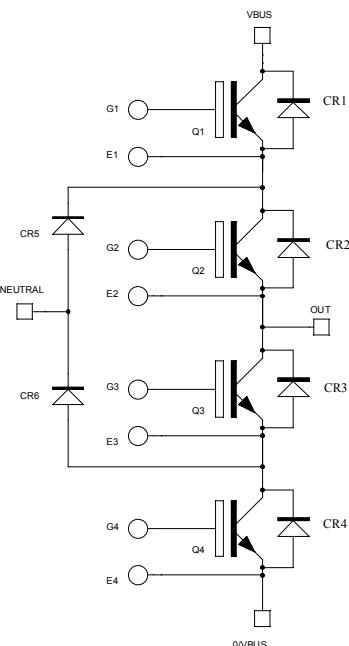


*Three level inverter  
Trench + Field Stop IGBT3  
Power Module*

**V<sub>CES</sub> = 600V  
I<sub>C</sub> = 150A @ T<sub>c</sub> = 80°C**



**Q1 to Q4 Absolute maximum ratings**

Symbol	Parameter	Max ratings	Unit
V <sub>CES</sub>	Collector - Emitter Breakdown Voltage	600	V
I <sub>C</sub>	Continuous Collector Current	T <sub>c</sub> = 25°C	A
		T <sub>c</sub> = 80°C	
I <sub>CM</sub>	Pulsed Collector Current	T <sub>c</sub> = 25°C	300
V <sub>GE</sub>	Gate – Emitter Voltage	±20	V
P <sub>D</sub>	Maximum Power Dissipation	T <sub>c</sub> = 25°C	480
RBSOA	Reverse Bias Safe Operating Area	T <sub>j</sub> = 150°C	300A @ 550V

 **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)

**Application**

- Solar converter
- Uninterruptible Power Supplies

**Features**

- Trench + Field Stop IGBT3 Technology
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 20 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - 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

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	$V_{GE} = 0\text{V}$ , $V_{CE} = 600\text{V}$				250	$\mu\text{A}$
$V_{CE(\text{sat})}$	Collector Emitter Saturation Voltage	$V_{GE} = 15\text{V}$	$T_j = 25^\circ\text{C}$		1.5	1.9	V
		$I_C = 150\text{A}$	$T_j = 150^\circ\text{C}$		1.7		
$V_{GE(\text{th})}$	Gate Threshold Voltage	$V_{GE} = V_{CE}$ , $I_C = 2.5\text{ mA}$		5.0	5.8	6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}$ , $V_{CE} = 0\text{V}$				400	$\text{nA}$

**Q1 to Q4 Dynamic Characteristics**

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0\text{V}$ $V_{CE} = 25\text{V}$ $f = 1\text{MHz}$		9200			pF
$C_{oes}$	Output Capacitance			580			
$C_{res}$	Reverse Transfer Capacitance			270			
$Q_G$	Gate charge	$V_{GE} = \pm 15\text{V}$ , $I_C = 150\text{A}$ $V_{CE} = 300\text{V}$			1.6		$\mu\text{C}$
$T_{d(on)}$	Turn-on Delay Time	$V_{GE} = \pm 15\text{V}$ $V_{CE} = 300\text{V}$ $I_C = 150\text{A}$ $R_G = 3.3\Omega$	Inductive Switching (25°C)	115			ns
$T_r$	Rise Time			45			
$T_{d(off)}$	Turn-off Delay Time			225			
$T_f$	Fall Time			55			
$T_{d(on)}$	Turn-on Delay Time	$V_{GE} = \pm 15\text{V}$ $V_{CE} = 300\text{V}$ $I_C = 150\text{A}$ $R_G = 3.3\Omega$	Inductive Switching (150°C)	130			ns
$T_r$	Rise Time			50			
$T_{d(off)}$	Turn-off Delay Time			300			
$T_f$	Fall Time			70			
$E_{on}$	Turn on Energy	$V_{GE} = \pm 15\text{V}$ $V_{CE} = 300\text{V}$ $I_C = 150\text{A}$	$T_j = 25^\circ\text{C}$	0.85			mJ
$E_{off}$	Turn off Energy		$T_j = 150^\circ\text{C}$	1.5			
$I_{sc}$	Short Circuit data	$V_{GE} \leq 15\text{V}$ ; $V_{CE} = 360\text{V}$ $t_p \leq 6\mu\text{s}$ ; $T_j = 150^\circ\text{C}$			750		A
$R_{thJC}$	Junction to Case Thermal Resistance					0.31	$^\circ\text{C/W}$

**CR1 to CR4 diode ratings and characteristics**

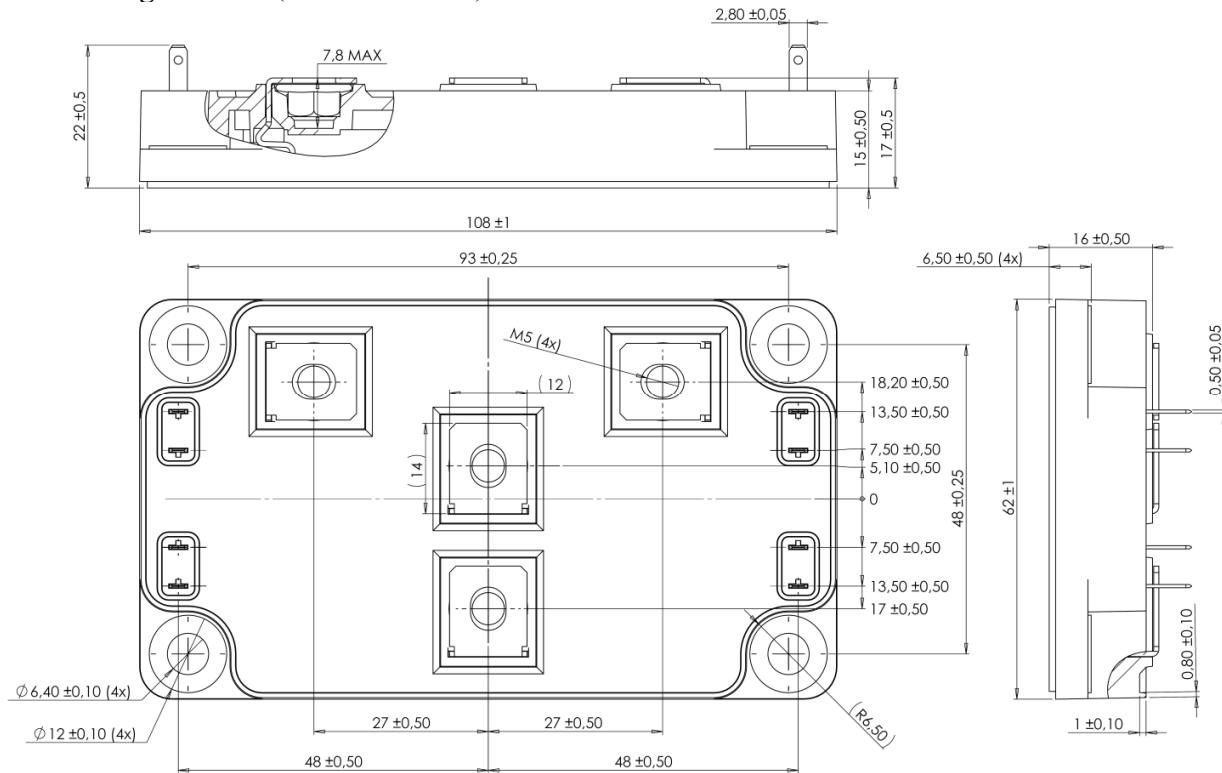
Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit	
V <sub>RRM</sub>	Maximum Peak Repetitive Reverse Voltage			600			V	
I <sub>RM</sub>	Maximum Reverse Leakage Current	V <sub>R</sub> =600V	T <sub>j</sub> = 25°C			150	μA	
			T <sub>j</sub> = 150°C			350		
I <sub>F</sub>	DC Forward Current		T <sub>c</sub> = 80°C		100		A	
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 100A V <sub>GE</sub> = 0V	T <sub>j</sub> = 25°C		1.6	2	V	
			T <sub>j</sub> = 150°C		1.5			
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 100A V <sub>R</sub> = 300V di/dt = 2000A/μs	T <sub>j</sub> = 25°C		125		ns	
			T <sub>j</sub> = 150°C		220			
Q <sub>rr</sub>	Reverse Recovery Charge		T <sub>j</sub> = 25°C		4.7		μC	
			T <sub>j</sub> = 150°C		9.9			
E <sub>rr</sub>	Reverse Recovery Energy		T <sub>j</sub> = 25°C		1.1		mJ	
			T <sub>j</sub> = 150°C		2.4			
R <sub>thJC</sub>	Junction to Case Thermal Resistance					0.77	°C/W	

**CR5 & CR6 diode ratings and characteristics**

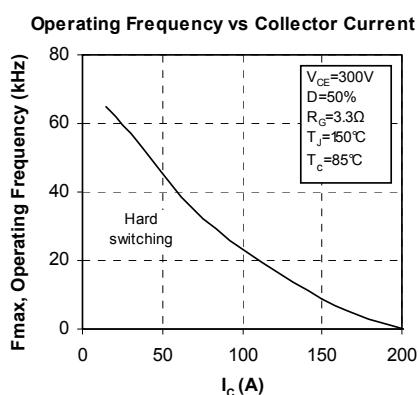
Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit	
V <sub>RRM</sub>	Maximum Peak Repetitive Reverse Voltage			600			V	
I <sub>RM</sub>	Maximum Reverse Leakage Current	V <sub>R</sub> =600V	T <sub>j</sub> = 25°C			150	μA	
			T <sub>j</sub> = 150°C			350		
I <sub>F</sub>	DC Forward Current		T <sub>c</sub> = 80°C		150		A	
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 150A V <sub>GE</sub> = 0V	T <sub>j</sub> = 25°C		1.6	2	V	
			T <sub>j</sub> = 150°C		1.5			
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 150A V <sub>R</sub> = 300V di/dt = 3000A/μs	T <sub>j</sub> = 25°C		130		ns	
			T <sub>j</sub> = 150°C		225			
Q <sub>rr</sub>	Reverse Recovery Charge		T <sub>j</sub> = 25°C		6.9		μC	
			T <sub>j</sub> = 150°C		14.5			
E <sub>rr</sub>	Reverse Recovery Energy		T <sub>j</sub> = 25°C		1.6		mJ	
			T <sub>j</sub> = 150°C		3.5			
R <sub>thJC</sub>	Junction to Case Thermal Resistance					0.52	°C/W	

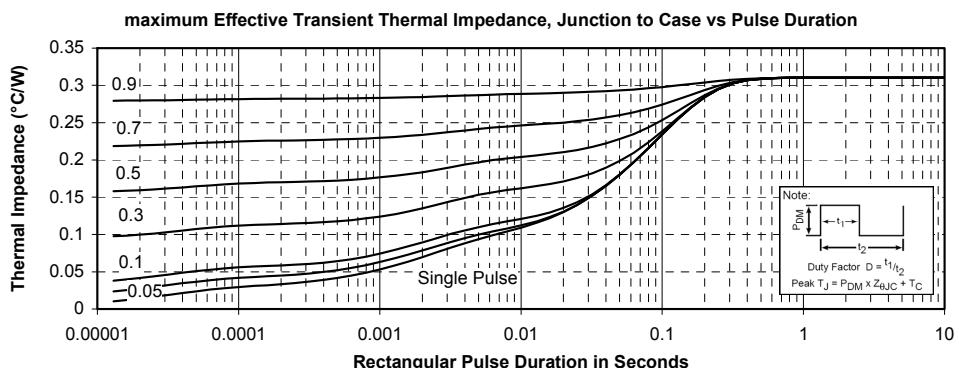
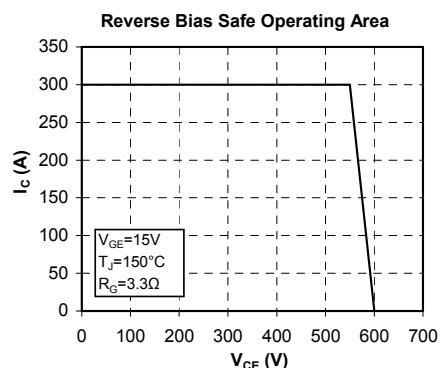
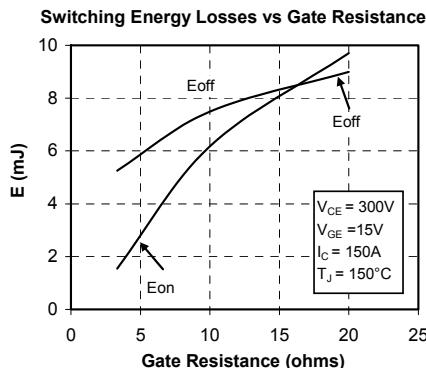
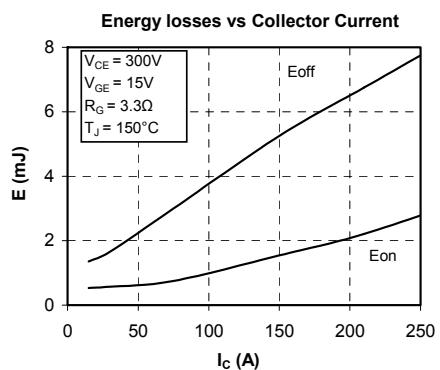
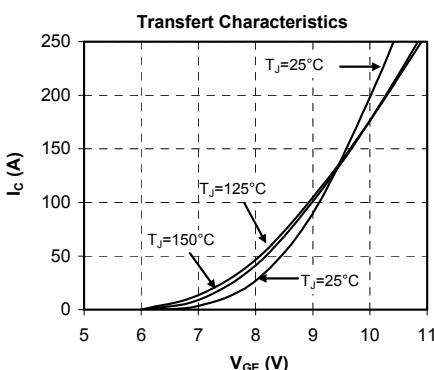
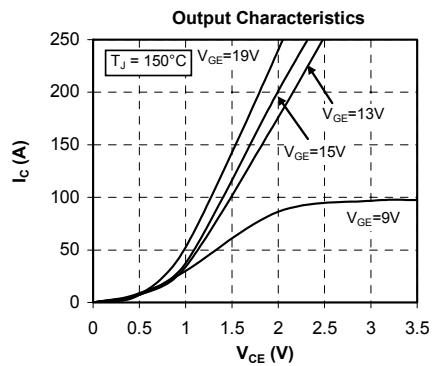
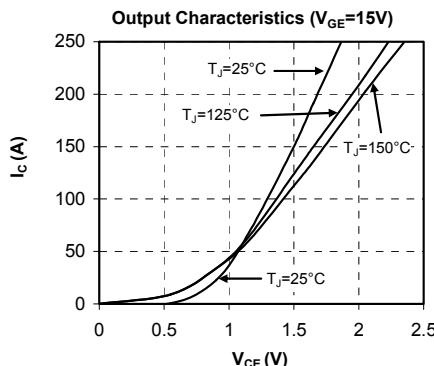
**Thermal and package characteristics**

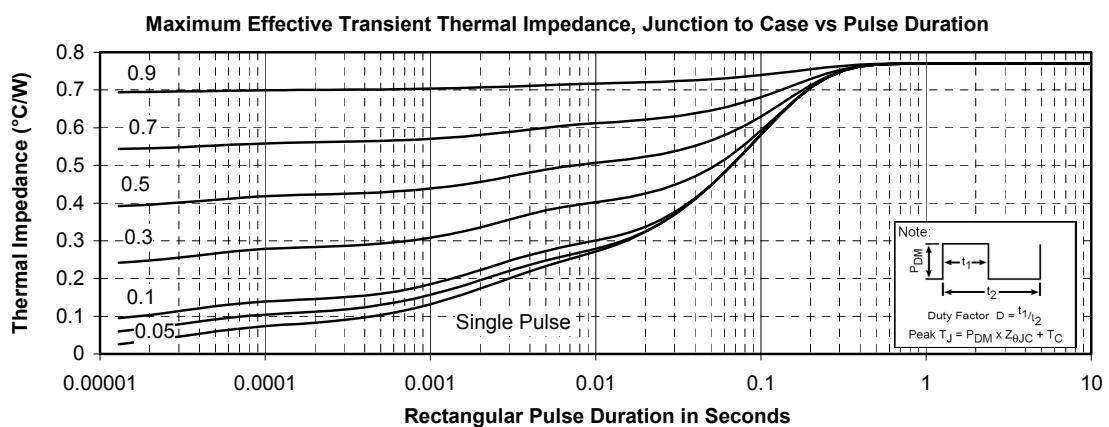
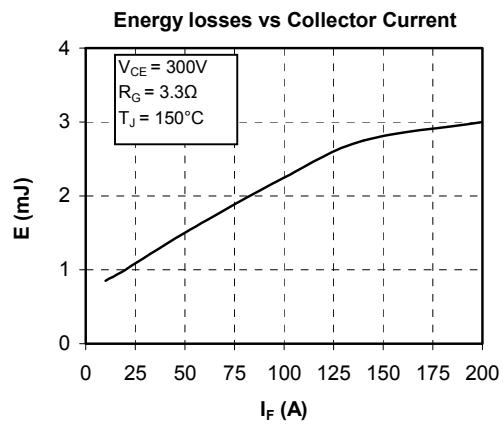
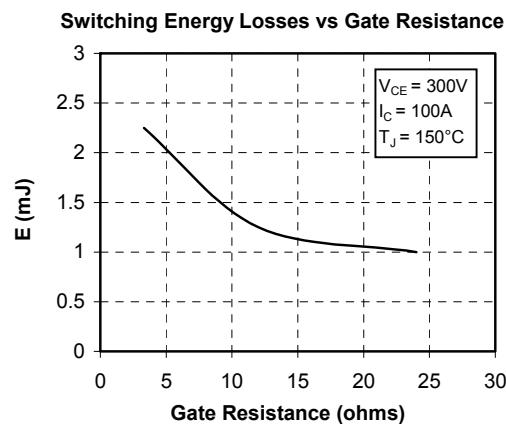
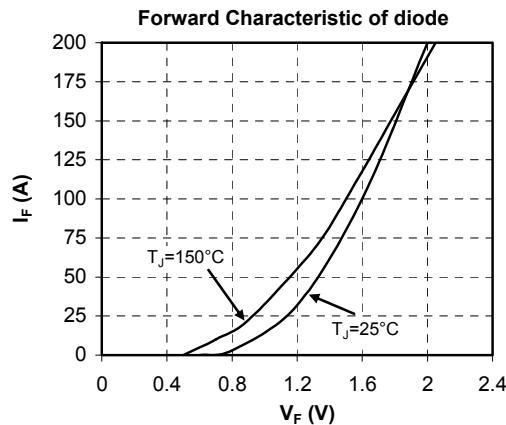
Symbol	Characteristic			Min	Typ	Max	Unit
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz			4000			V
T <sub>J</sub>	Operating junction temperature range			-40		175	°C
T <sub>STG</sub>	Storage Temperature Range			-40		125	
T <sub>C</sub>	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
		For terminals	M5	2		3.5	
Wt	Package Weight					300	g

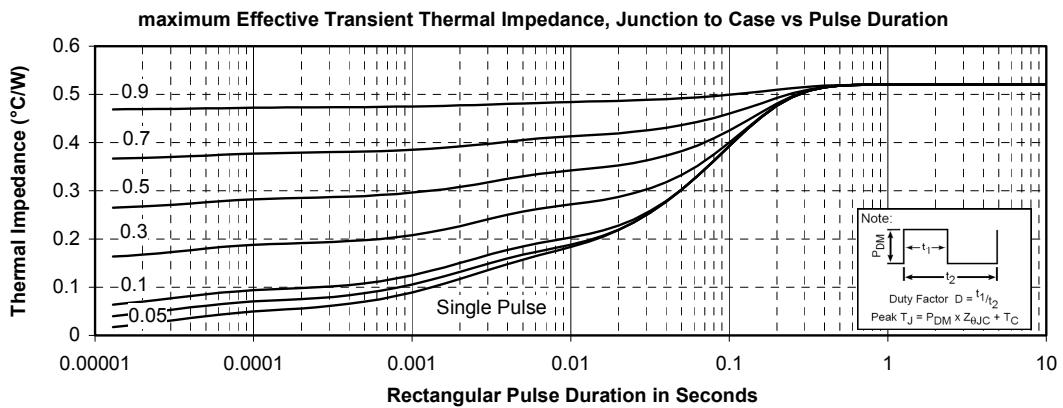
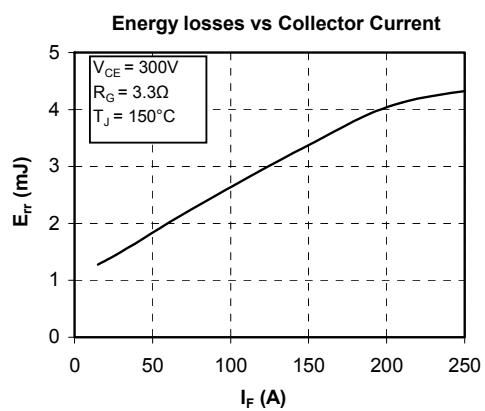
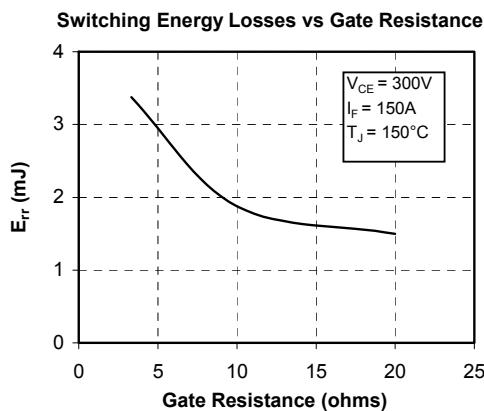
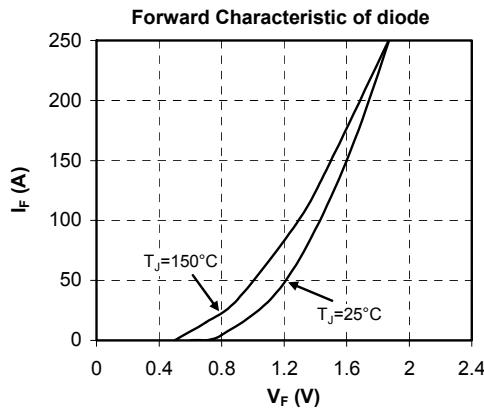
**SP6 Package outline** (dimensions in mm)


See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

**Q1 to Q4 Typical performance curve**




**CR1 to CR4 Typical performance curve**


**CR5 & CR6 Typical performance curve**


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