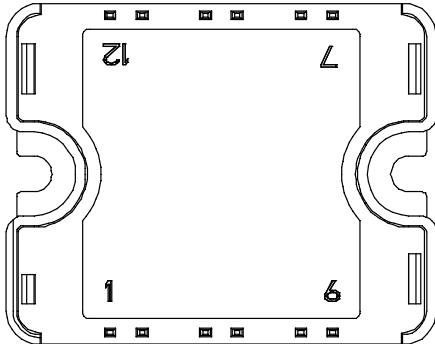
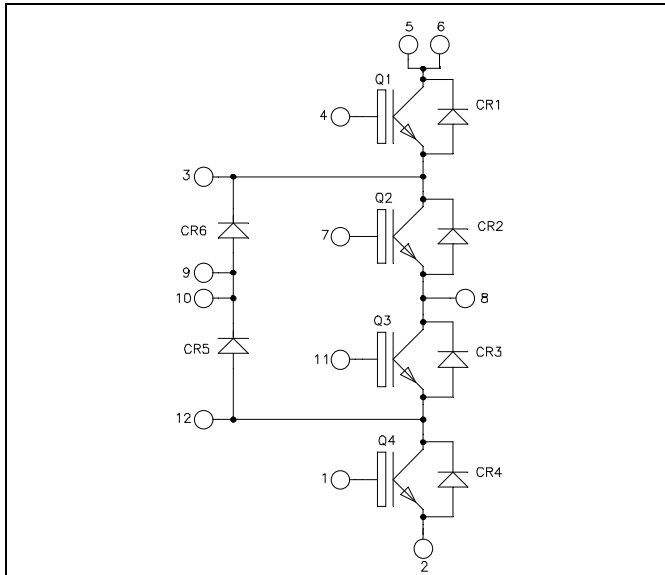


**Three level inverter
Trench + Field Stop IGBT
Power Module**

$$V_{CES} = 600V$$

$$I_C = 50A @ T_C = 80^{\circ}C$$



All multiple inputs and outputs must be shorted together
5/6 ; 9/10

Application

- Solar converter
- Uninterruptible Power Supplies

Features

- Trench + Field Stop IGBT 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
- Very low stray inductance
- 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	600	V
I_C	Continuous Collector Current	$T_C = 25^{\circ}C$	A
		$T_C = 80^{\circ}C$	
I_{CM}	Pulsed Collector Current	$T_C = 25^{\circ}C$	100
V_{GE}	Gate – Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_C = 25^{\circ}C$	176
RBSOA	Reverse Bias Safe Operating Area	$T_J = 150^{\circ}C$	100A @ 550V

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	$V_{GE} = 0V, V_{CE} = 600V$			250	μA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 50A$	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	1.5 1.7	1.9	V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 600\mu\text{A}$	5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			600	nA

Q1 to Q4 Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0V$		3150		pF
C_{oes}	Output Capacitance	$V_{CE} = 25V$		200		
C_{res}	Reverse Transfer Capacitance	$f = 1\text{MHz}$		95		
Q_G	Gate charge	$V_{GE} = \pm 15V, I_C = 50A$ $V_{CE} = 300V$		0.5		μC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 50A$ $R_G = 8.2\Omega$		110		ns
T_r	Rise Time			45		
$T_{d(off)}$	Turn-off Delay Time			200		
T_f	Fall Time			40		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 50A$ $R_G = 8.2\Omega$		120		ns
T_r	Rise Time			50		
$T_{d(off)}$	Turn-off Delay Time			250		
T_f	Fall Time			60		
E_{on}	Turn-on Switching Energy	$V_{GE} = \pm 15V$ $V_{Bus} = 300V$	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	0.3 0.43		mJ
E_{off}	Turn-off Switching Energy	$I_C = 50A$ $R_G = 8.2\Omega$	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	1.35 1.75		
I_{sc}	Short Circuit data	$V_{GE} \leq 15V; V_{Bus} = 360V$ $t_p \leq 6\mu\text{s}; T_j = 150^\circ\text{C}$		250		A
R_{thJC}	Junction to Case Thermal Resistance				0.85	$^\circ\text{C/W}$

CR1 to CR4 diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			600			V
I_{RM}	Maximum Reverse Leakage Current	$V_R=600V$	$T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$			150 350	μA
I_F	DC Forward Current		$T_c = 80^{\circ}C$		30		A
V_F	Diode Forward Voltage	$I_F = 30A$ $V_{GE} = 0V$	$T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$		1.6 1.5	2	V
t_{rr}	Reverse Recovery Time	$I_F = 30A$ $V_R = 300V$ $di/dt = 1800A/\mu s$	$T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$		100 150		ns
Q_{rr}	Reverse Recovery Charge		$T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$		1.5 3.1		μC
E_{rr}	Reverse Recovery Energy		$T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$		0.34 0.75		mJ
R_{thJC}	Junction to Case Thermal Resistance					2.45	$^{\circ}C/W$

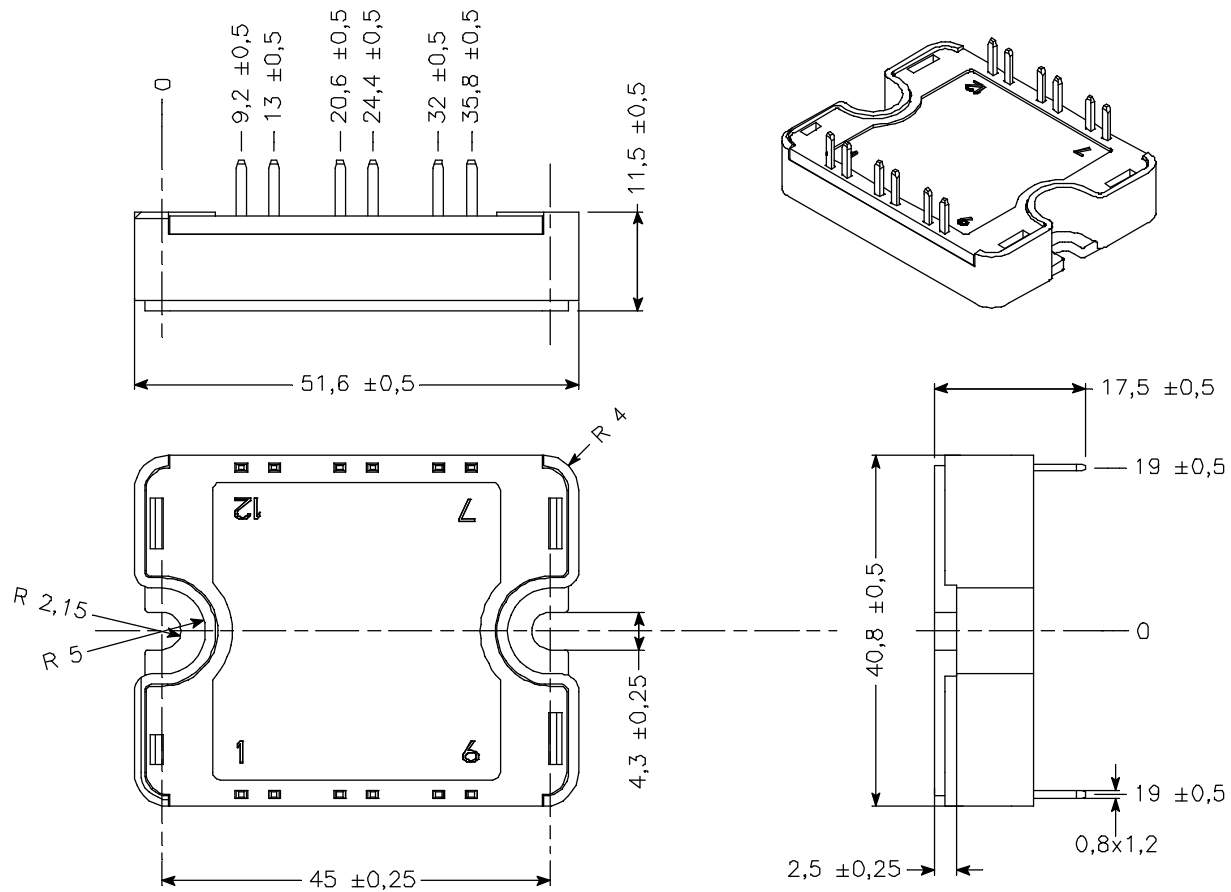
CR5 & CR6 diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			600			V
I_{RM}	Maximum Reverse Leakage Current	$V_R=600V$	$T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$			150 350	μA
I_F	DC Forward current		$T_c = 80^{\circ}C$		50		A
V_F	Diode Forward Voltage	$I_F = 50A$ $V_{GE} = 0V$	$T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$		1.6 1.5	2	V
t_{rr}	Reverse Recovery Time	$I_F = 50A$ $V_R = 300V$ $di/dt = 1800A/\mu s$	$T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$		100 150		ns
Q_{rr}	Reverse Recovery Charge		$T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$		2.6 5.4		μC
E_{rr}	Reverse Recovery Energy		$T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$		0.60 1.20		mJ
R_{thJC}	Junction to Case Thermal Resistance					1.42	$^{\circ}C/W$

Thermal and package characteristics

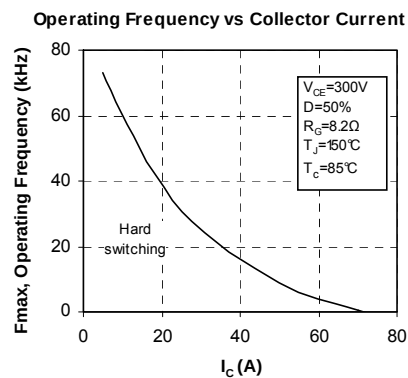
Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case $t = 1$ min, $I_{isol} < 1mA$, 50/60Hz			2500			V
T_j	Operating junction temperature range			-40		175	$^{\circ}C$
T_{STG}	Storage Temperature Range			-40		125	
T_c	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M4	2.5		4.7	N.m
Wt	Package Weight					80	g

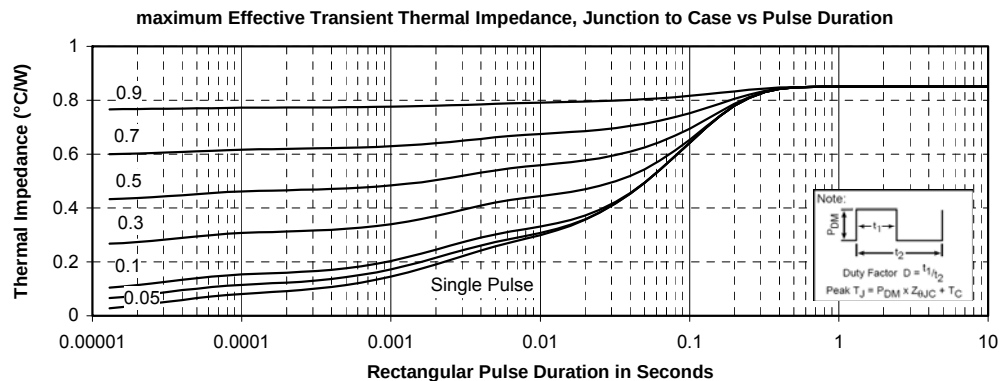
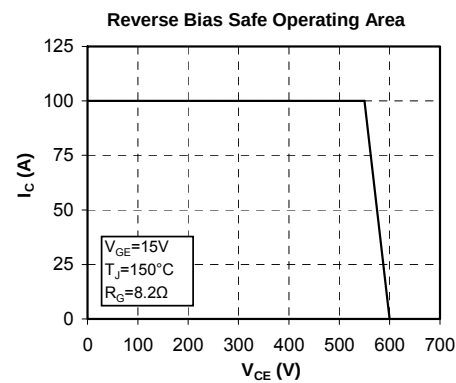
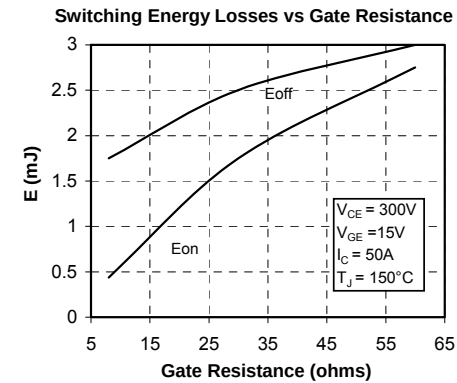
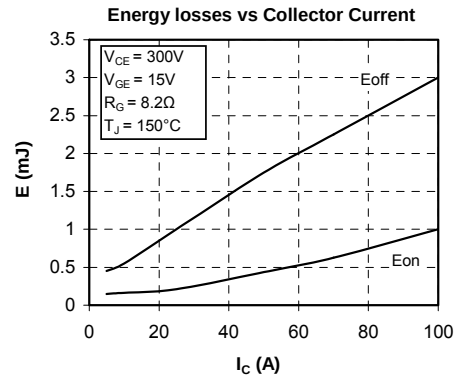
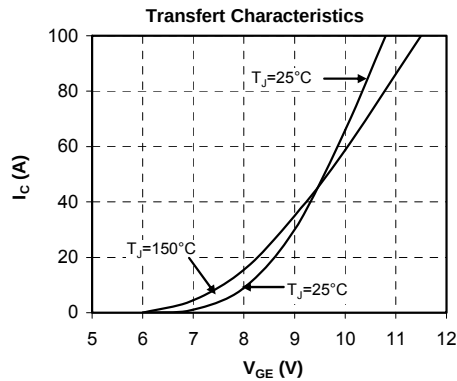
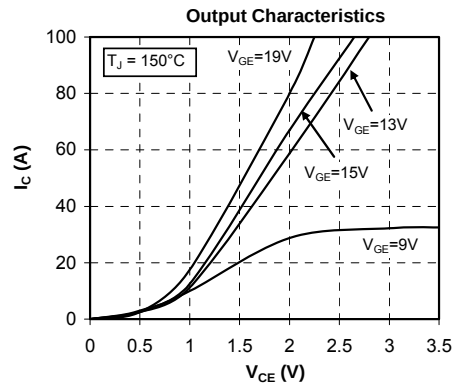
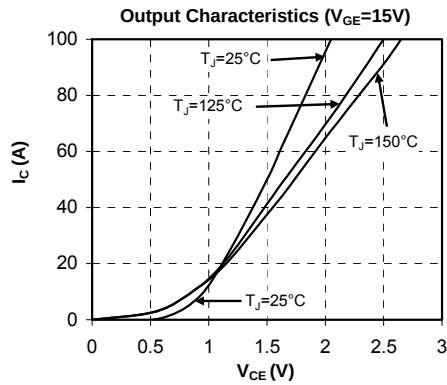
SP1 Package outline (dimensions in mm)

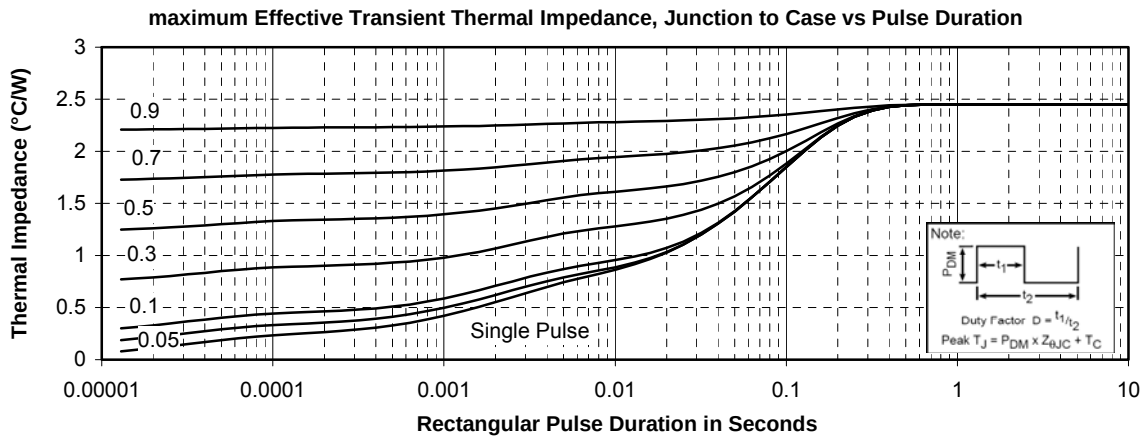
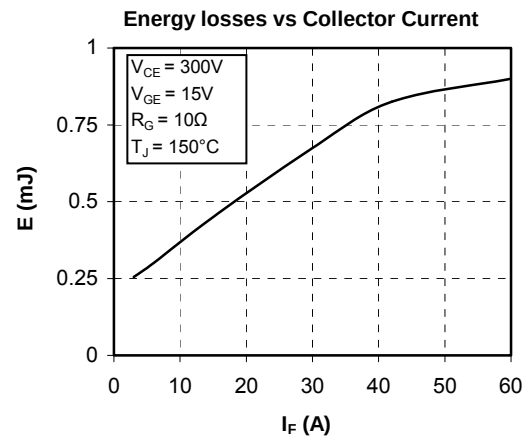
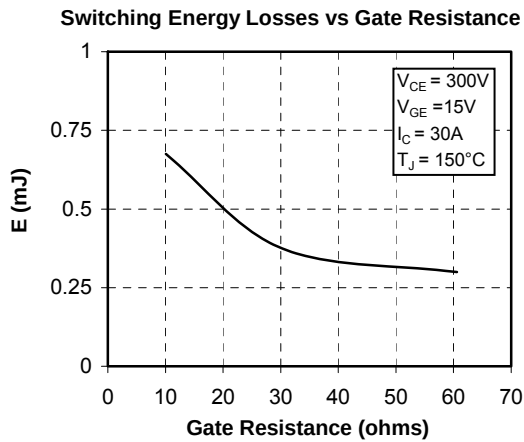
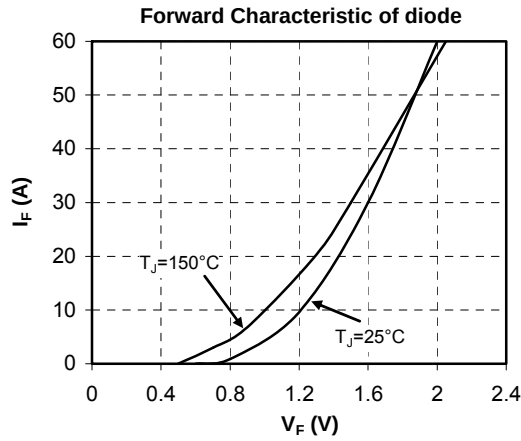


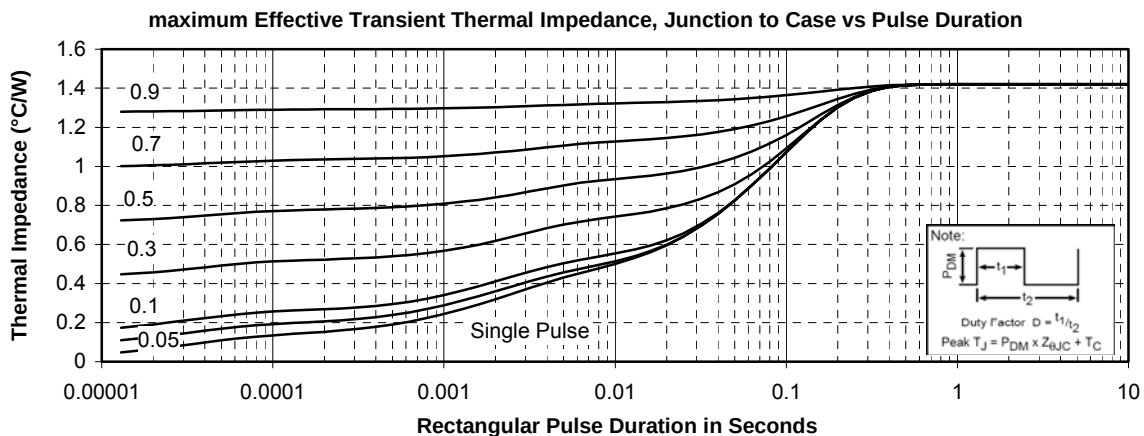
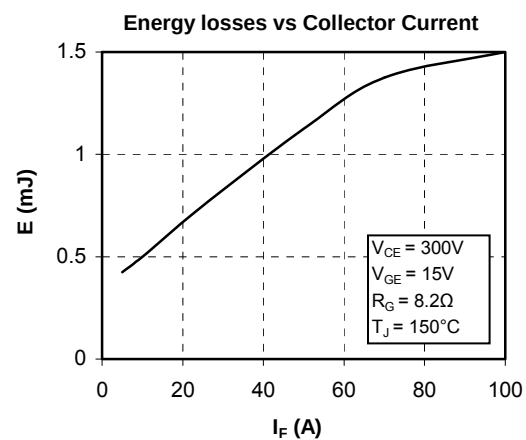
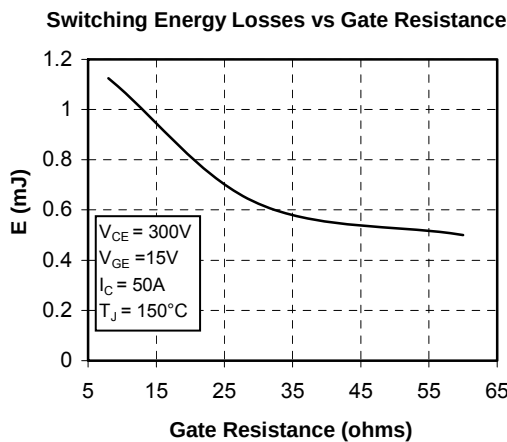
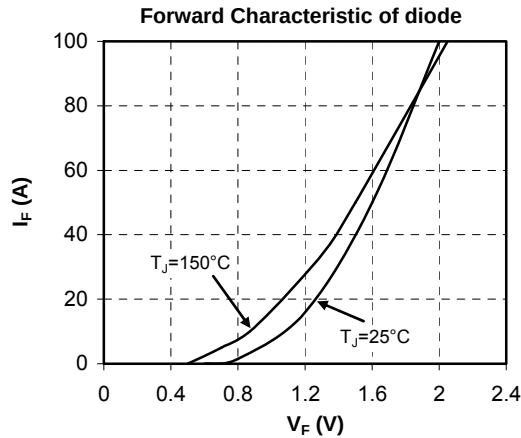
See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

Q1 to Q4 Typical performance curve





CR1 to CR4 Typical performance curve


CR5 & CR6 Typical performance curve


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