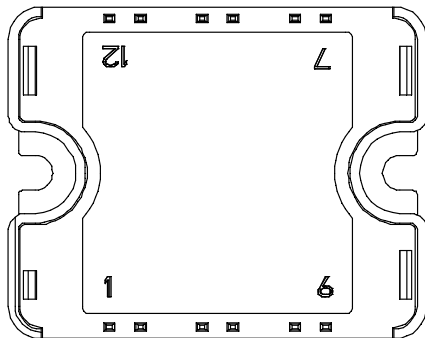
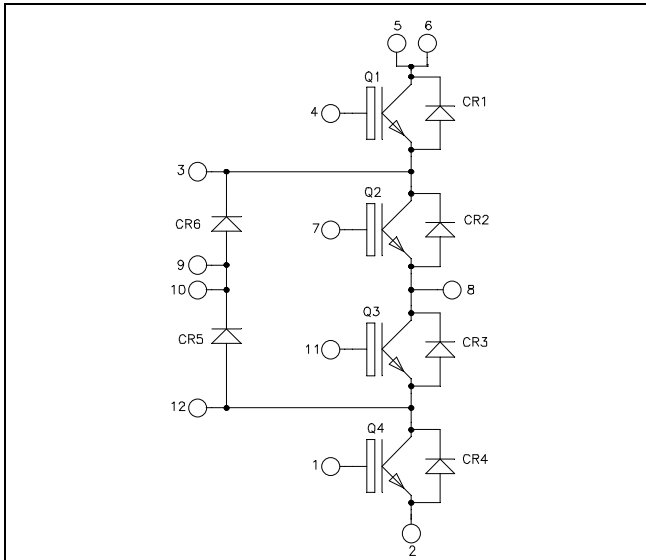


*Three level inverter
Trench + Field Stop IGBT3
Power Module*

**$V_{CES} = 600V$
 $I_C = 20A @ T_c = 80^\circ C$**



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

Application

- Solar converter
- Uninterruptible Power Supplies

Features

- Trench + Field Stop 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
- 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 V_{CES}at
- 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	$T_C = 25^\circ C$	32
		$T_C = 80^\circ C$	20
I_{CM}	Pulsed Collector Current	$T_C = 25^\circ C$	40
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_C = 25^\circ C$	62
RBSOA	Reverse Bias Safe Operating Area	$T_J = 150^\circ C$	40A @ 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	$V_{GE} = 15V$ $I_C = 20A$		$T_j = 25^\circ\text{C}$	1.5	1.9	V
				$T_j = 150^\circ\text{C}$		1.7	
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 300\mu\text{A}$	5.0	5.8	6.5	V	
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			300	nA	

Q1 to Q4 Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1\text{MHz}$		1100		pF
C_{oes}	Output Capacitance			70		
C_{res}	Reverse Transfer Capacitance			35		
Q_G	Gate charge	$V_{GE} = \pm 15V, I_C = 20A$ $V_{CE} = 300V$		0.2		μC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 20A$ $R_G = 12\Omega$		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) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 20A$ $R_G = 12\Omega$		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	$V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 20A$ $R_G = 12\Omega$	$T_j = 25^\circ\text{C}$	0.11		mJ
			$T_j = 150^\circ\text{C}$		0.2	
E_{off}	Turn-off Switching Energy	$I_C = 20A$ $R_G = 12\Omega$	$T_j = 25^\circ\text{C}$	0.5		mJ
			$T_j = 150^\circ\text{C}$		0.7	
I_{sc}	Short Circuit data	$V_{GE} \leq 15V; V_{Bus} = 360V$ $t_b \leq 6\mu\text{s}; T_j = 150^\circ\text{C}$		100		A
R_{thJC}	Junction to Case Thermal Resistance				2.4	$^\circ\text{C/W}$

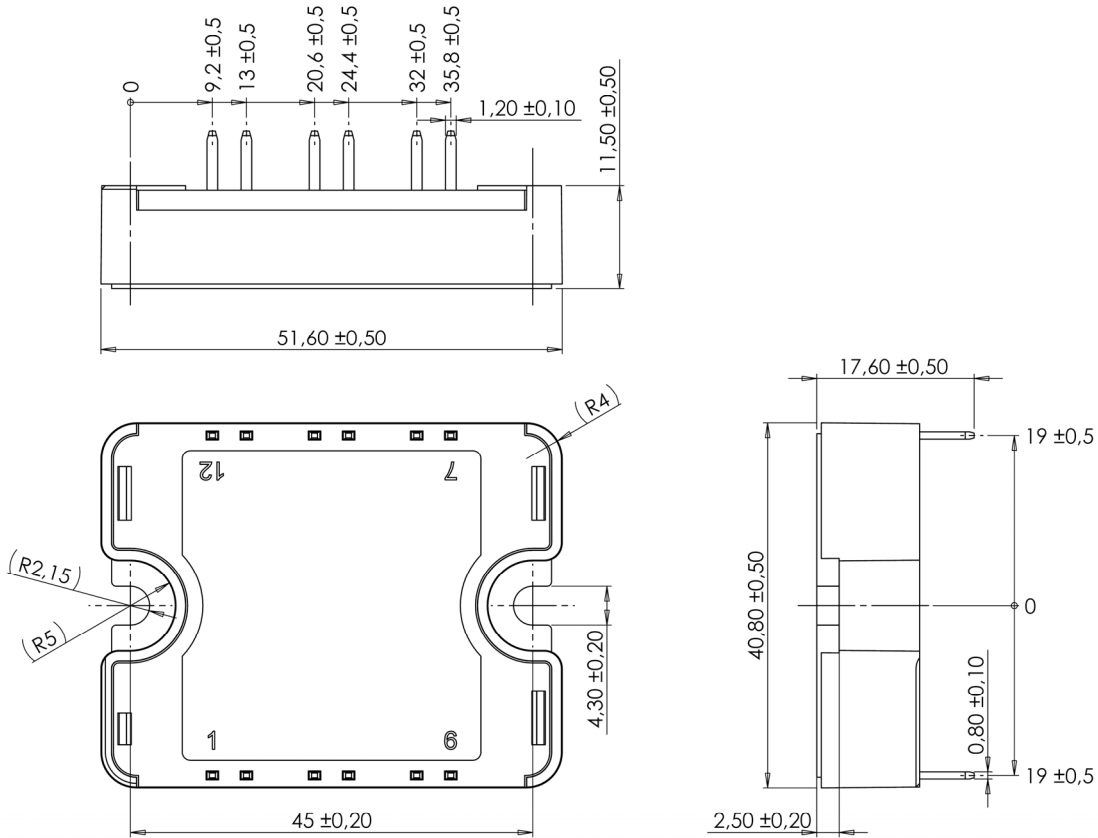
CR1 to CR6 diode ratings and characteristics

<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			600			V
I _{RM}	Maximum Reverse Leakage Current	V _R =600V	T _j = 25°C			150	μA
			T _j = 150°C			350	
I _F	DC Forward Current		T _c = 80°C		20		A
V _F	Diode Forward Voltage	I _F = 20A V _{GE} = 0V	T _j = 25°C		1.6	2	V
			T _j = 150°C		1.5		
t _{rr}	Reverse Recovery Time	I _F = 20A V _R = 300V di/dt = 1600A/μs	T _j = 25°C		100		ns
			T _j = 150°C		150		
Q _{rr}	Reverse Recovery Charge		T _j = 25°C		1.1		μC
			T _j = 150°C		2.3		
E _{rr}	Reverse Recovery Energy		T _j = 25°C		0.23		mJ
			T _j = 150°C		0.50		
R _{thJC}	Junction to Case Thermal Resistance					3.25	°C/W

Thermal and package characteristics

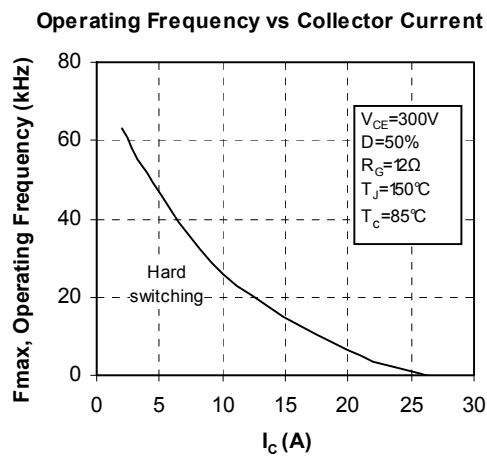
<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000			V	
T _J	Operating junction temperature range	-40		175	°C	
T _{STG}	Storage Temperature Range	-40		125		
T _C	Operating Case Temperature	-40		100		
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

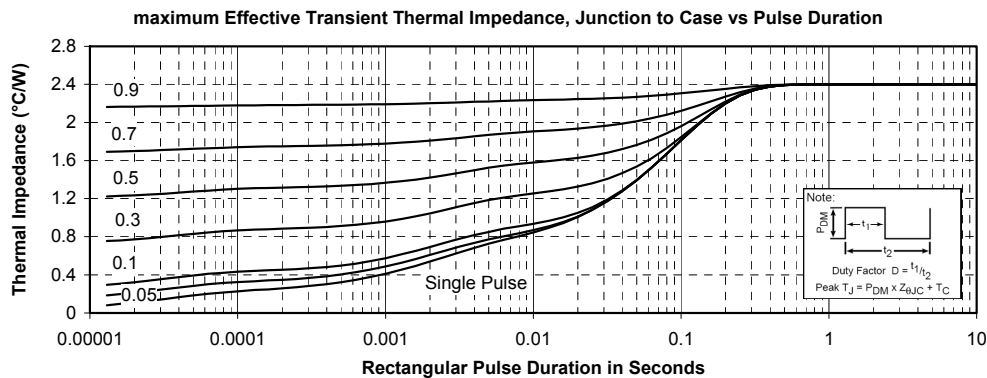
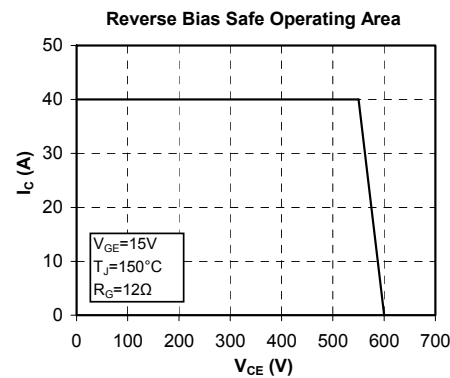
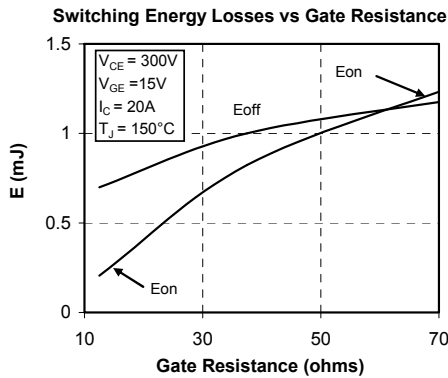
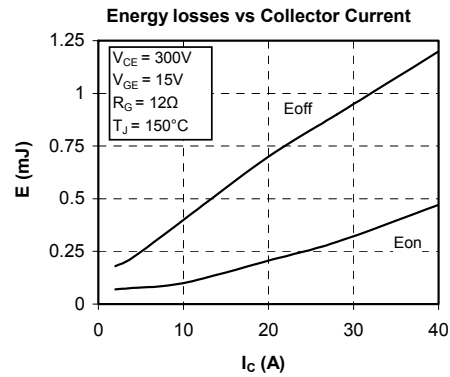
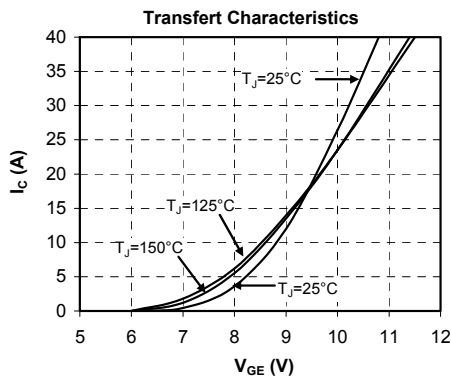
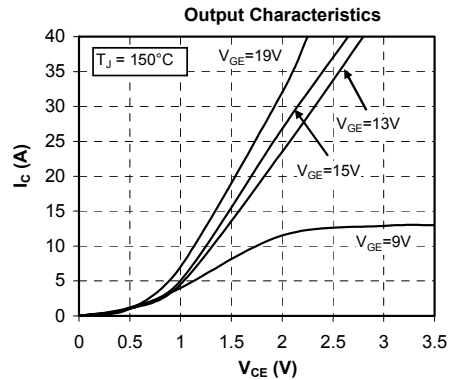
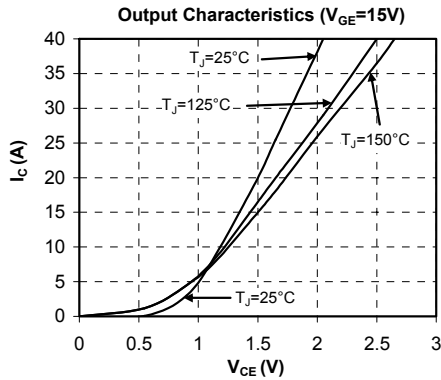
SP1 Package outline (dimensions in mm)



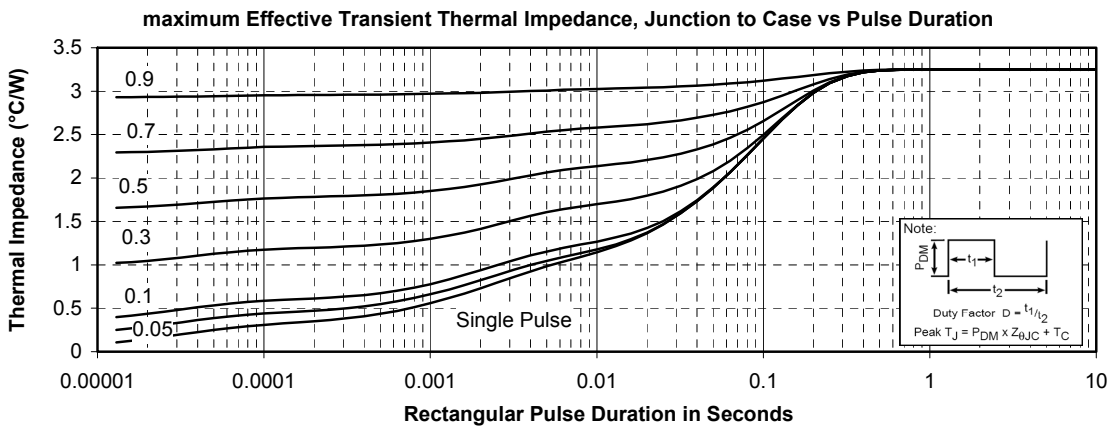
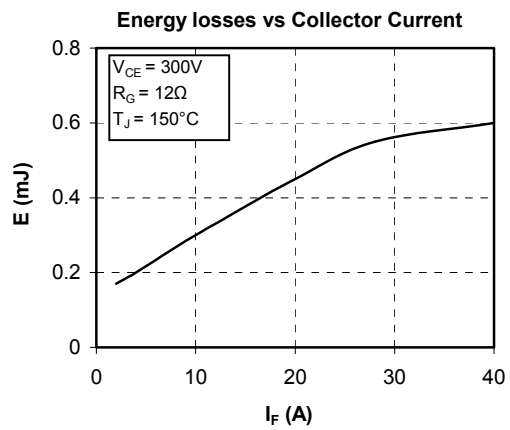
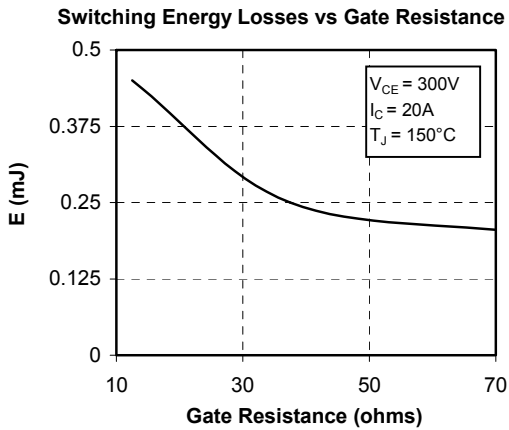
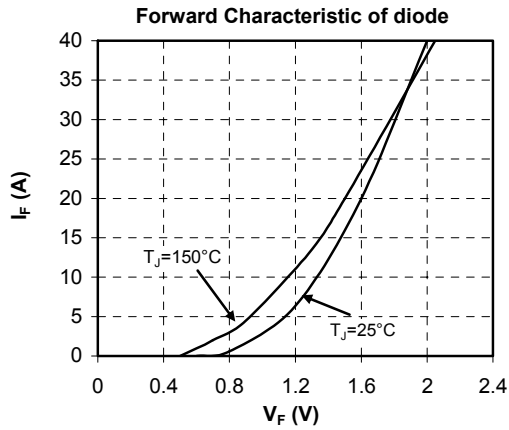
See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

Q1 to Q4 Typical performance curve





CR1 to CR6 Typical performance curve



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