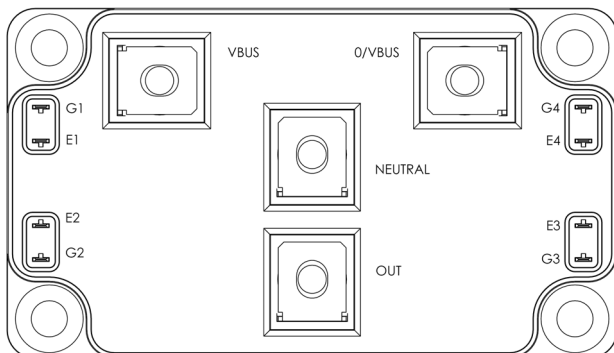
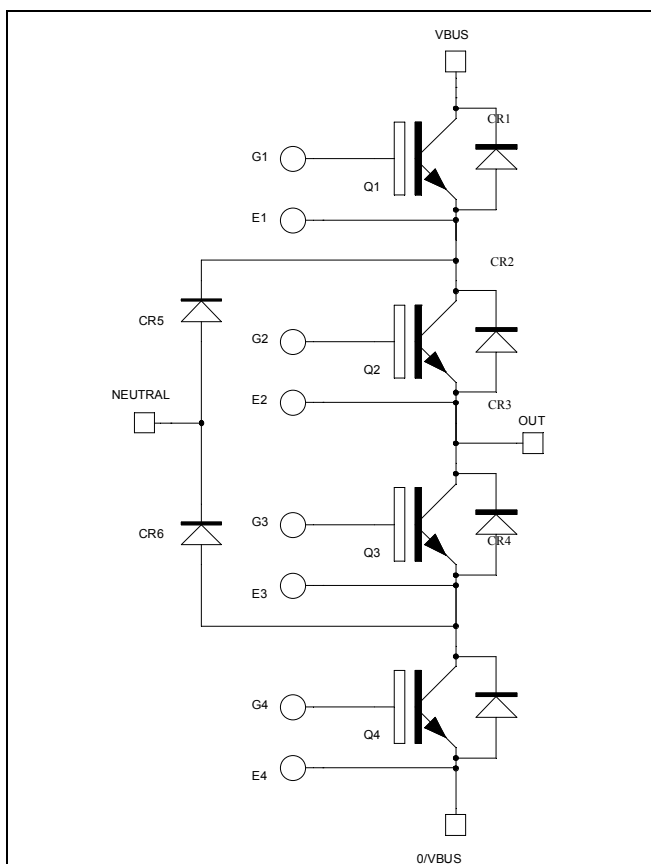


**Three level inverter
Trench + Field Stop IGBT3
Power Module**

**$V_{CES} = 650V$
 $I_C = 400A @ T_c = 80^\circ C$**



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
- 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 @ $T_j = 25^\circ C$ 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

Q1 to Q4 Absolute maximum ratings (per IGBT)

Symbol	Parameter	Max ratings	Unit
V_{CES}	Collector - Emitter Voltage	650	V
I_C	Continuous Collector Current	$T_C = 25^\circ\text{C}$ 500	A
		$T_C = 80^\circ\text{C}$ 400	
I_{CM}	Pulsed Collector Current	$T_C = 25^\circ\text{C}$ 800	
V_{GE}	Gate – Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_C = 25^\circ\text{C}$ 1150	W
RBSOA	Reverse Bias Safe Operating Area	$T_j = 125^\circ\text{C}$ 800A @ 600V	

Q1 to Q4 Electrical Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{CES}	Zero Gate Voltage Collector Current	$V_{GE} = 0\text{V}$, $V_{CE} = 650\text{V}$			250	μA
$V_{CE(sat)}$	Collector Emitter saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 400\text{A}$		1.5	1.9	V
		$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$		1.7		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}$, $I_C = 6.4\text{mA}$	5.1	5.8	6.4	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}$, $V_{CE} = 0\text{V}$			1.2	μA

Q1 to Q4 Dynamic Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0\text{V}$		24		nF
C_{oes}	Output Capacitance	$V_{CE} = 25\text{V}$		1.5		
C_{res}	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.75		
Q_G	Gate charge	$V_{GE} = \pm 15\text{V}$, $I_C = 400\text{A}$ $V_{CE} = 300\text{V}$		4.2		μC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$ $I_C = 400\text{A}$ $R_G = 1.8\Omega$		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	Inductive Switching (150°C) $V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$ $I_C = 400\text{A}$ $R_G = 1.8\Omega$		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	$V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$		2		mJ
E_{off}	Turn off Energy	$I_C = 400\text{A}$ $R_G = 1.8\Omega$		3.6		
		$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$		11.5		
		$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$		14		
I_{sc}	Short Circuit data	$V_{GE} \leq 15\text{V}$; $V_{Bus} = 360\text{V}$ $t_p \leq 6\mu\text{s}$; $T_j = 150^\circ\text{C}$		2000		A
R_{thJC}	Junction to Case Thermal Resistance				0.13	$^\circ\text{C/W}$

CR1 to CR4 diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit	
V _{RRM}	Peak Repetitive Reverse Voltage					650	V	
I _{RM}	Reverse Leakage Current	V _R =650V				150	μA	
I _F	DC Forward Current		T _c = 80°C		300		A	
V _F	Diode Forward Voltage	I _F = 300A V _{GE} = 0V	T _j = 25°C		1.6	2	V	
			T _j = 150°C		1.5			
t _{rr}	Reverse Recovery Time	I _F = 300A V _R = 300V di/dt =4000A/μs	T _j = 25°C		130		ns	
			T _j = 150°C		225			
Q _{rr}	Reverse Recovery Charge		T _j = 25°C		13.7		μC	
			T _j = 150°C		29			
E _{rr}	Reverse Recovery Energy		T _j = 25°C		3.2		mJ	
			T _j = 150°C		7			
R _{thJC}	Junction to Case Thermal Resistance					0.29	°C/W	

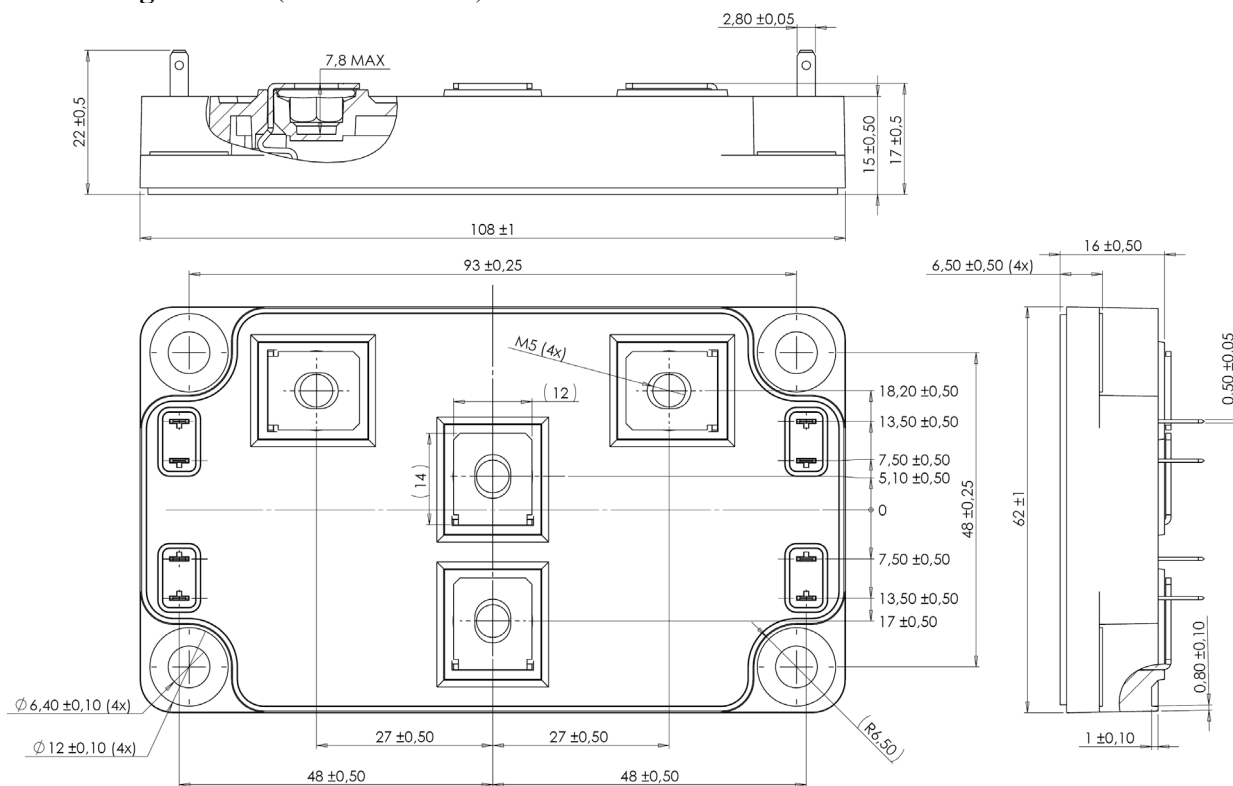
CR5 & CR6 diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit	
V _{RRM}	Peak Repetitive Reverse Voltage					650	V	
I _{RM}	Reverse Leakage Current	V _R =650V				150	μA	
I _F	DC Forward Current		T _c = 80°C		400		A	
V _F	Diode Forward Voltage	I _F = 400A V _{GE} = 0V	T _j = 25°C		1.6	2.0	V	
			T _j = 150°C		1.5			
t _{rr}	Reverse Recovery Time	I _F = 400A V _R = 300V di/dt =4800A/μs	T _j = 25°C		125		ns	
			T _j = 150°C		220			
Q _{rr}	Reverse Recovery Charge		T _j = 25°C		19		μC	
			T _j = 150°C		40			
E _{rr}	Reverse Recovery Energy		T _j = 25°C		4.4		mJ	
			T _j = 150°C		9.6			
R _{thJC}	Junction to Case Thermal Resistance					0.2	°C/W	

Thermal and package characteristics

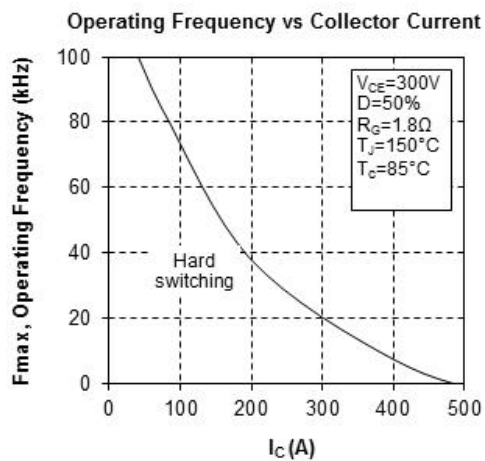
Symbol				Characteristic		Min	Max	Unit
V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz			4000				V
T _J	Operating junction temperature range			-40		175		°C
T _{JOP}	Recommended junction temperature under switching conditions			-40		T _{Jmax} -25		
T _{STG}	Storage Temperature Range			-40		125		
T _C	Operating Case Temperature			-40		100		
Torque	Mounting torque	To heatsink	M6	3		5		N.m
		For terminals	M5	2		3.5		
Wt	Package Weight					300		g

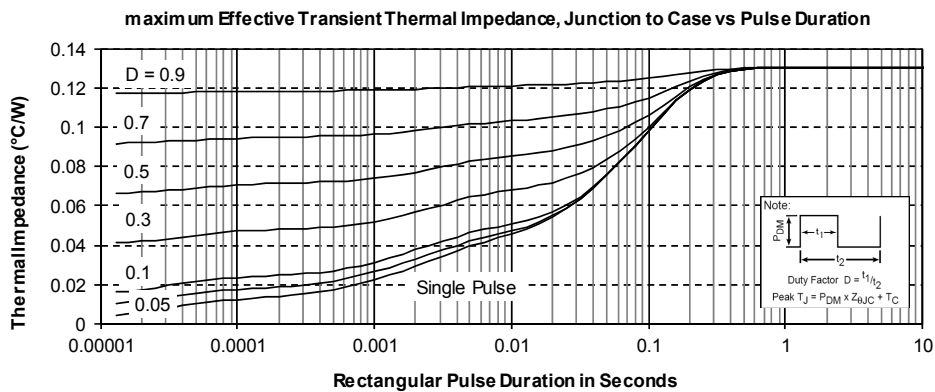
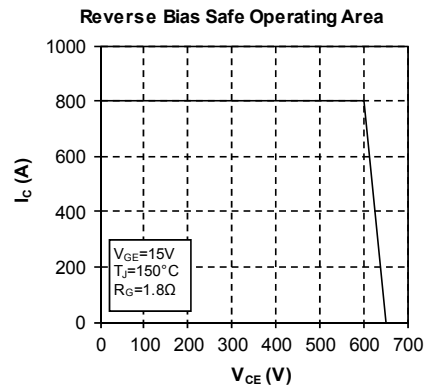
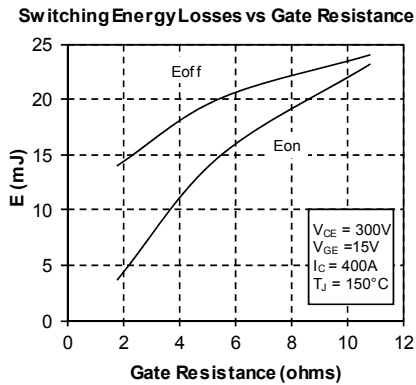
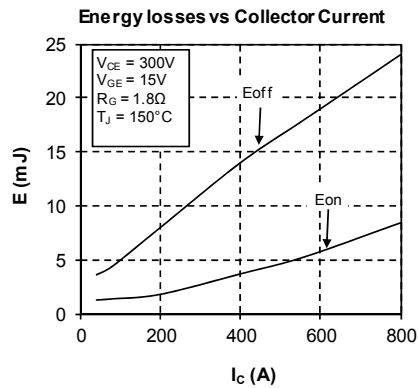
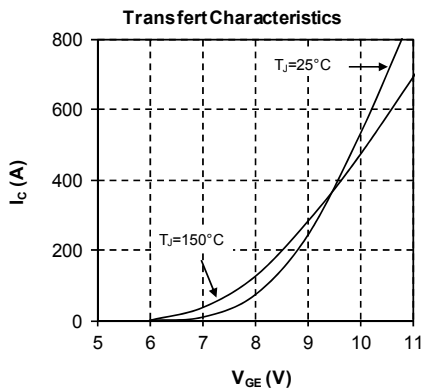
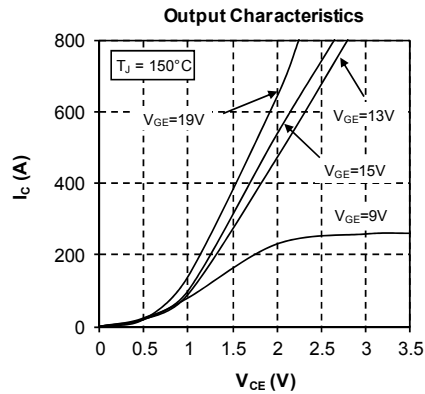
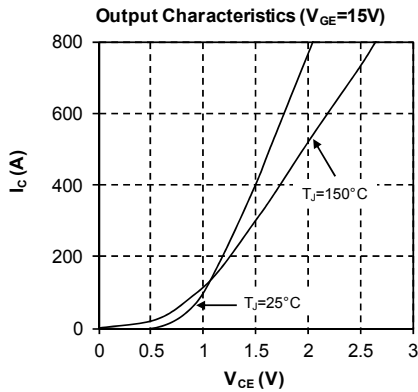
SP6 Package outline (dimensions in mm)

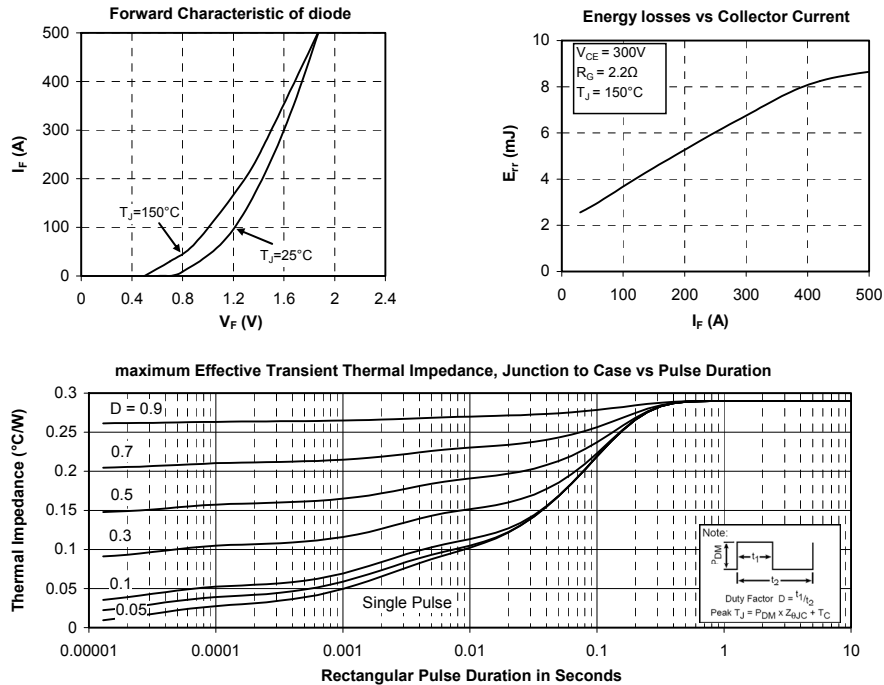
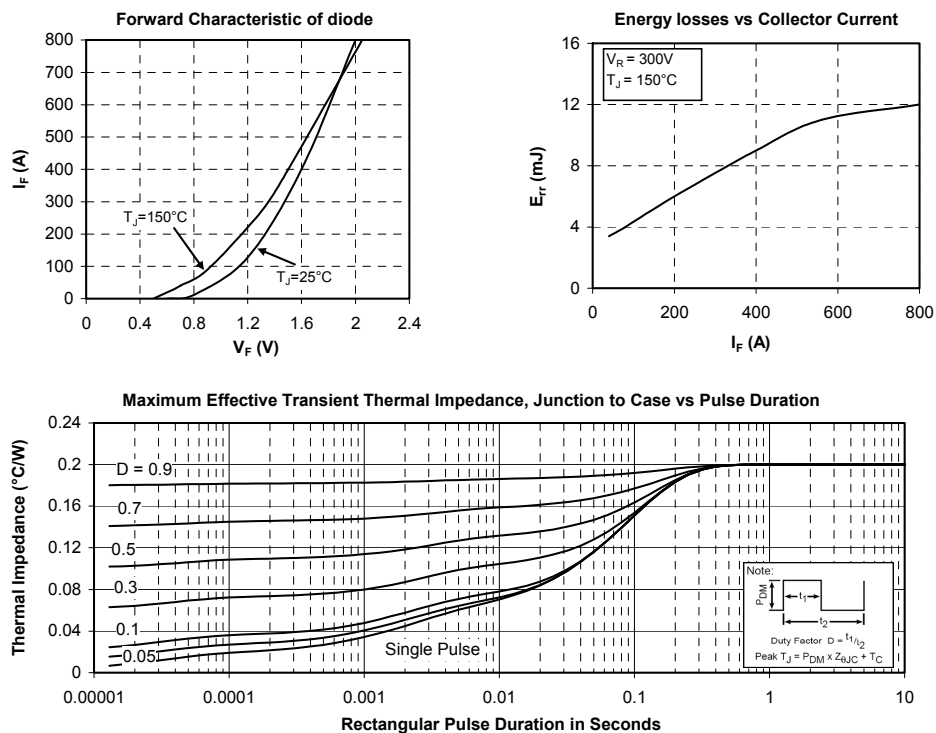


See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

Q1 to Q4 Typical performance curve





CR1 to CR4 Typical performance curve

CR5 & CR6 Typical performance curve


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