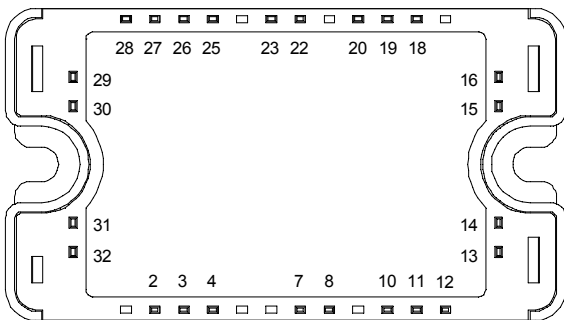
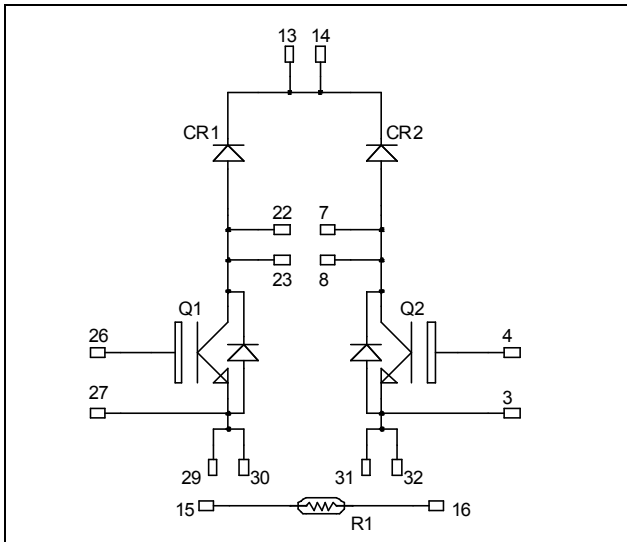


**Dual Boost chopper
High speed Trench + Field Stop IGBT4
Power Module**

**$V_{CES} = 1200V$
 $I_C = 40A @ T_c = 80^\circ C$**



All multiple inputs and outputs must be shorted together
 Example: 13/14 ; 29/30 ; 22/23 ...

All ratings @ $T_j = 25^\circ C$ unless otherwise specified

Q1, Q2 Absolute maximum ratings (per IGBT)

Symbol	Parameter	Max ratings	Unit
V_{CES}	Collector - Emitter Breakdown Voltage	1200	V
I_C	Continuous Collector Current	$T_c = 25^\circ C$	75
		$T_c = 80^\circ C$	40
I_{CM}	Pulsed Collector Current	$T_c = 25^\circ C$	160
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	250	W
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$	80A @ 1100V

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

Application

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction

Features

- **High speed Trench + Field Stop IGBT 4 Technology**
 - Low voltage drop
 - Low leakage current
 - Low switching losses
 - RBSOA and SCSOA rated
- **Chopper SiC Schottky Diode (CR1, CR2)**
 - Zero reverse recovery
 - Zero forward recovery
 - Temperature Independent switching behavior
 - Positive temperature coefficient on VF
- Kelvin emitter for easy drive
- Very low stray inductance
 - Symmetrical design
- High level of integration
- Internal thermistor for temperature monitoring

Benefits

- Stable temperature behavior
- Very rugged
- Solderable terminals for easy PCB mounting
- 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, Q2 Electrical Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
I _{CES}	Zero Gate Voltage Collector Current	V _{GE} = 0V, V _{CE} = 1200V			100	μA	
V _{CE(sat)}	Collector Emitter Saturation Voltage	V _{GE} = 15V I _C = 40A	T _j = 25°C T _j = 150°C	1.7 2.6	2.4	V	
V _{GE(th)}	Gate Threshold Voltage	V _{GE} = V _{CE} , I _C = 1 mA		5.0	5.8	6.5	V
I _{GES}	Gate – Emitter Leakage Current	V _{GE} = 20V, V _{CE} = 0V			120	nA	

Q1, Q2 Dynamic Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C _{ies}	Input Capacitance	V _{GE} = 0V		2300		pF
C _{oes}	Output Capacitance	V _{CE} = 25V		150		
C _{res}	Reverse Transfer Capacitance	f = 1MHz		135		
Q _G	Gate charge	V _{GE} = 15V, I _C = 40A V _{CE} = 960V		185		nC
T _{d(on)}	Turn-on Delay Time	Inductive Switching (25°C) V _{GE} = ±15V V _{Bus} = 600V I _C = 40A R _G = 12Ω		30		ns
T _r	Rise Time			57		
T _{d(off)}	Turn-off Delay Time			290		
T _f	Fall Time			16		
T _{d(on)}	Turn-on Delay Time	Inductive Switching (150°C) V _{GE} = ±15V V _{Bus} = 600V I _C = 40A R _G = 12Ω		30		ns
T _r	Rise Time			49		
T _{d(off)}	Turn-off Delay Time			366		
T _f	Fall Time			48		
E _{on}	Turn on Energy	V _{GE} = ±15V V _{Bus} = 600V I _C = 40A	T _j = 25°C	1.9		mJ
E _{off}	Turn off Energy		T _j = 150°C	2.25		
		R _G = 12Ω	T _j = 25°C	1.2		
T _j = 150°C	2.25					
I _{sc}	Short Circuit data	V _{GE} ≤ 15V ; V _{Bus} = 600V t _p ≤ 10μs ; T _j = 150°C		150		A
R _{thJC}	Junction to Case Thermal Resistance				0.6	°C/W

CR1, CR2 chopper SiC diode ratings and characteristics (per diode)

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	T _j = 25°C T _j = 175°C	150 300	600 3000	μA
I _F	DC Forward Current			15		A
V _F	Diode Forward Voltage	I _F = 15A	T _j = 25°C	1.6	1.8	V
			T _j = 175°C	2.6	3	
Q _C	Total Capacitive Charge	I _F = 15A, V _R = 600V di/dt = 1000A/μs		42		nC
C	Total Capacitance	f = 1MHz, V _R = 200V		135		pF
		f = 1MHz, V _R = 400V		99		
R _{thJC}	Junction to Case Thermal Resistance				1	°C/W

IGBT protection diode ratings and characteristics (per diode)

<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				250	μA
I _F	DC Forward Current	T _c = 80°C			25		A
V _F	Diode Forward Voltage	I _F = 25A			2.6	3.1	V
		I _F = 50A			3.2		
		I _F = 25A	T _j = 125°C		1.8		
t _{rr}	Reverse Recovery Time	I _F = 25A V _R = 667V di/dt = 200A/μs	T _j = 25°C		320		ns
	T _j = 125°C			360			
Q _{rr}	Reverse Recovery Charge		T _j = 25°C		480		nC
			T _j = 125°C		1800		
R _{thJC}	Junction to Case Thermal Resistance					1.4	°C/W

Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
R ₂₅	Resistance @ 25°C		50		kΩ
ΔR ₂₅ /R ₂₅			5		%
B _{25/85}	T ₂₅ = 298.15 K		3952		K
ΔB/B		T _C =100°C		4	%

$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

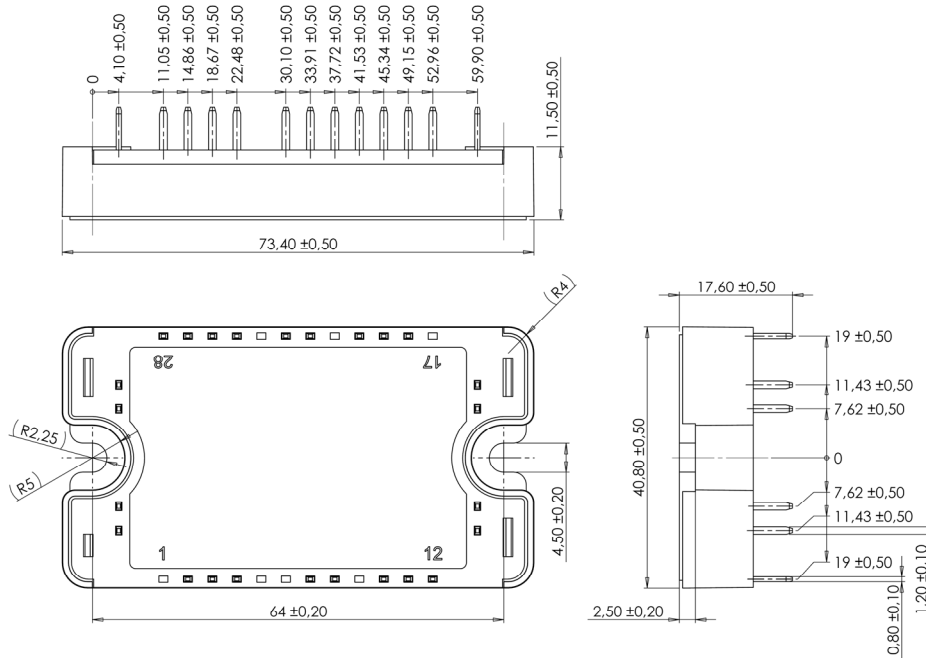
T: Thermistor temperature
R_T: Thermistor value at T

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

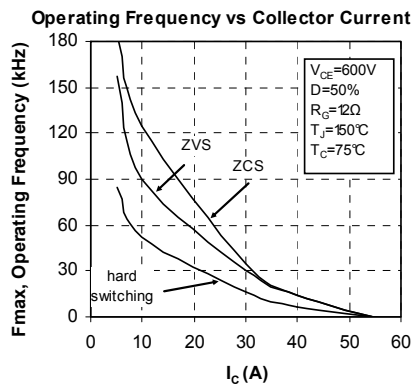
* T_J = 150°C for the IGBT protection diode

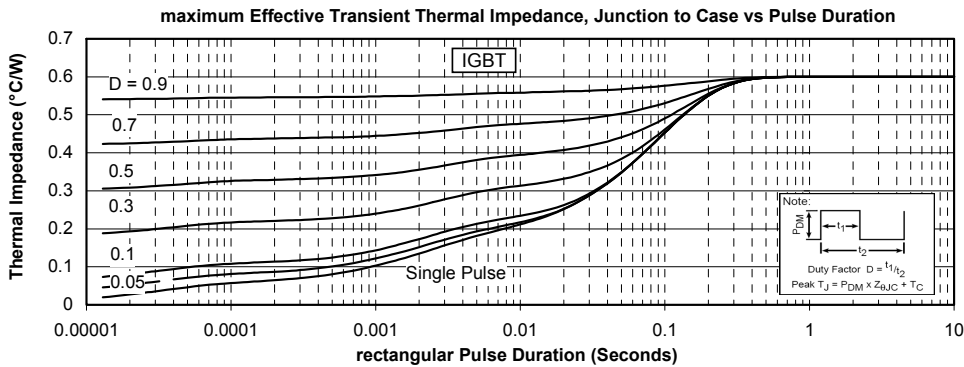
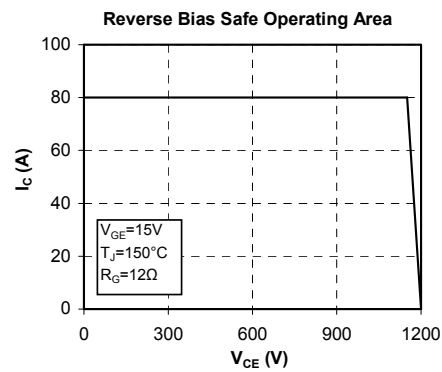
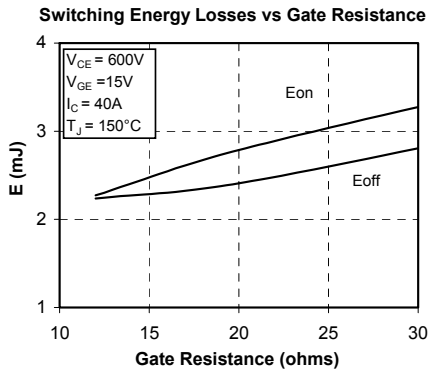
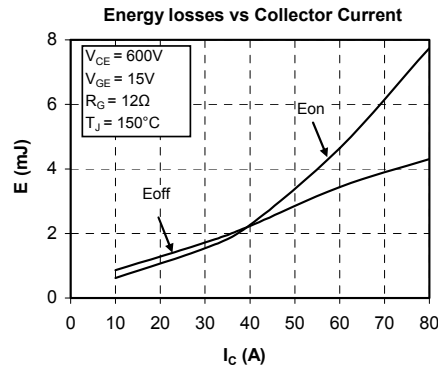
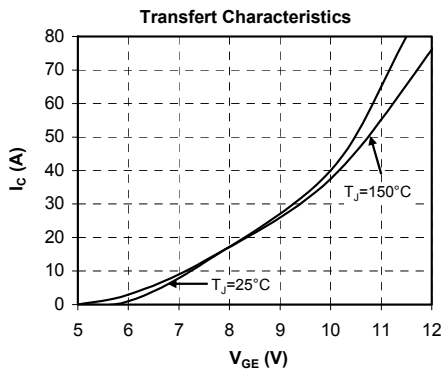
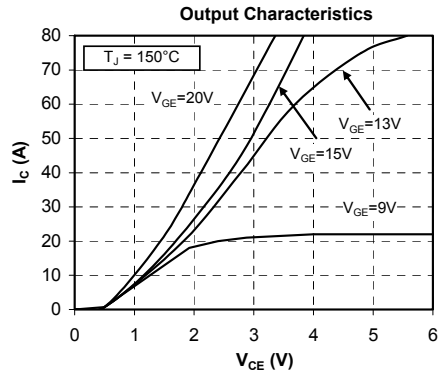
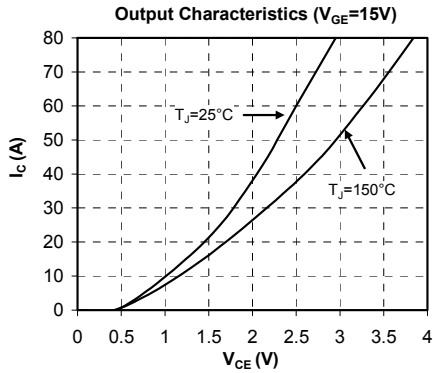
SP3 Package outline (dimensions in mm)

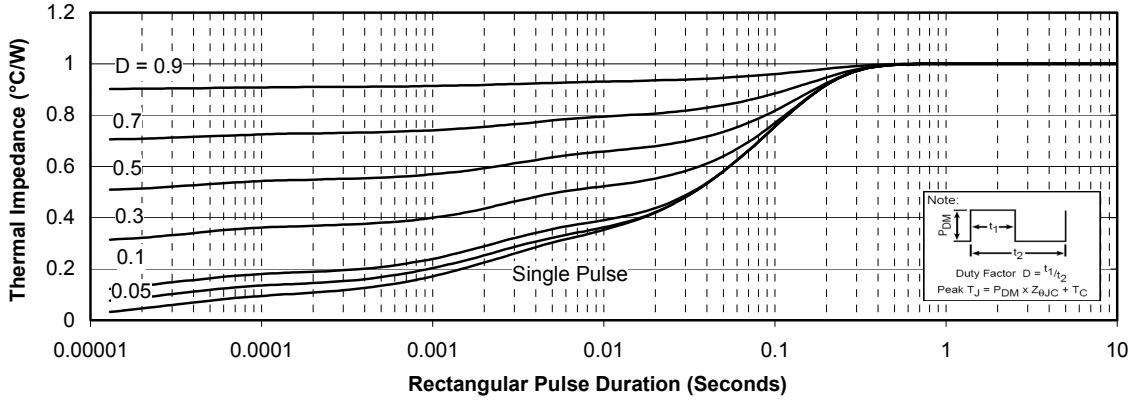
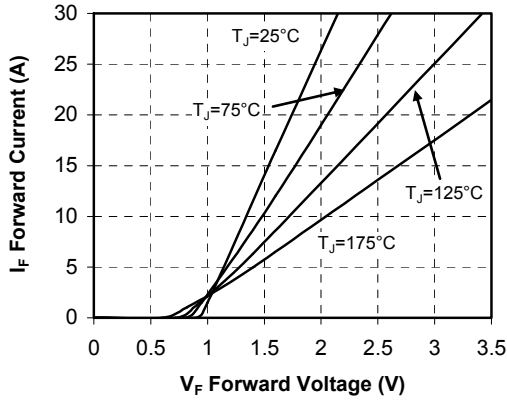
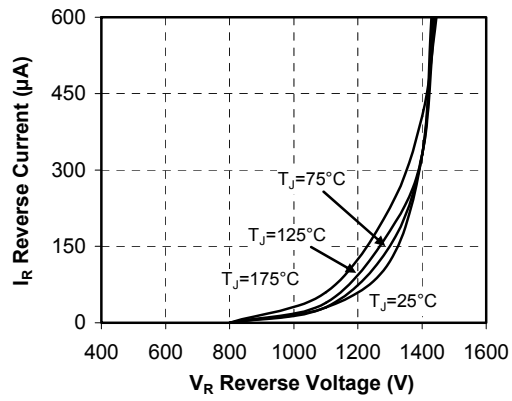
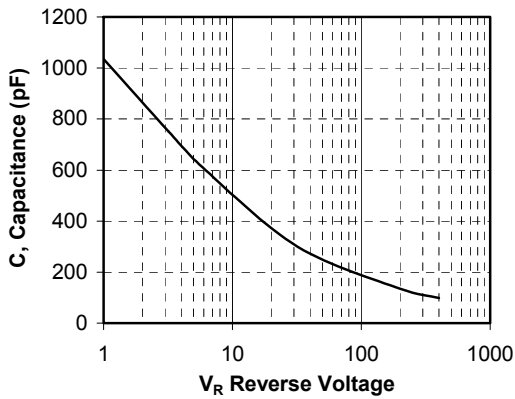


See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

Typical Performance Curve
IGBT





Chopper SiC diode
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration

Forward Characteristics

Reverse Characteristics

Capacitance vs. Reverse Voltage


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