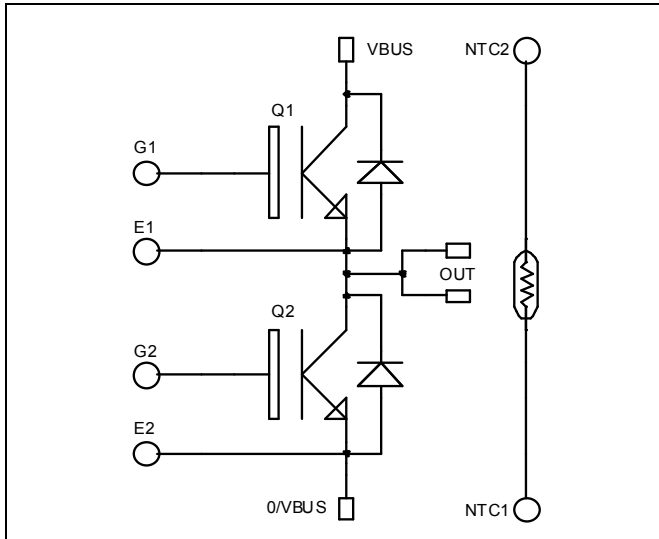


*Phase leg
Trench + Field Stop IGBT
Power Module*

**$V_{CES} = 600V$
 $I_C = 300A @ T_c = 80^\circ C$**

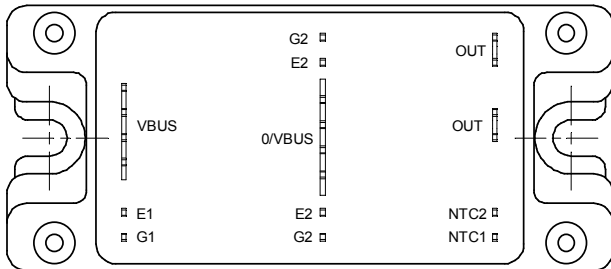


Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

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
- Kelvin emitter for easy drive
- Very low stray inductance
 - Symmetrical design
 - Lead frames for power connections
- 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 T_C of V_{CEsat}
- Low profile
- RoHS Compliant

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{CES}	Collector - Emitter Breakdown Voltage	600	V
I_C	Continuous Collector Current	$T_C = 25^\circ C$	430
		$T_C = 80^\circ C$	300
I_{CM}	Pulsed Collector Current	$T_C = 25^\circ C$	450
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_C = 25^\circ C$	935
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$	600A @ 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

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{CES}	Zero Gate Voltage Collector Current	$V_{GE} = 0V, V_{CE} = 600V$			350	μA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 300A$	$T_j = 25^\circ\text{C}$	1.5	1.9	V
			$T_j = 150^\circ\text{C}$	1.7		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1.5\text{ mA}$	5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			500	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0V$		18.4		nF
C_{oes}	Output Capacitance	$V_{CE} = 25V$		1.16		
C_{res}	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.54		
Q_G	Gate charge	$V_{GE} = \pm 15V, I_C = 300A$ $V_{CE} = 300V$		3.2		μC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 300A$ $R_G = 2.2\Omega$		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) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 300A$ $R_G = 2.2\Omega$		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	$V_{GE} = \pm 15V$ $V_{Bus} = 300V$	$T_j = 25^\circ\text{C}$	1.7		mJ
			$T_j = 150^\circ\text{C}$	3		
E_{off}	Turn off Energy	$I_C = 300A$ $R_G = 2.2\Omega$	$T_j = 25^\circ\text{C}$	8.2		mJ
			$T_j = 150^\circ\text{C}$	10.6		
I_{sc}	Short Circuit data	$V_{GE} \leq 15V ; V_{Bus} = 360V$ $t_p \leq 6\mu\text{s} ; T_j = 150^\circ\text{C}$		1500		A

Reverse 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	$V_R = 600V$	$T_j = 25^\circ\text{C}$		150	μA
			$T_j = 150^\circ\text{C}$		400	
I_F	DC Forward Current		$T_c = 80^\circ\text{C}$	300		A
V_F	Diode Forward Voltage	$I_F = 300A$ $V_{GE} = 0V$	$T_j = 25^\circ\text{C}$	1.6	2	V
			$T_j = 150^\circ\text{C}$	1.5		
t_{rr}	Reverse Recovery Time	$I_F = 300A$ $V_R = 300V$ $di/dt = 4000A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	130		ns
			$T_j = 150^\circ\text{C}$	225		
Q_{rr}	Reverse Recovery Charge		$T_j = 25^\circ\text{C}$	13.7		μC
			$T_j = 150^\circ\text{C}$	29		
E_r	Reverse Recovery Energy		$T_j = 25^\circ\text{C}$	3.2		mJ
			$T_j = 150^\circ\text{C}$	7		

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

Symbol	Characteristic	Min	Typ	Max	Unit
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		%

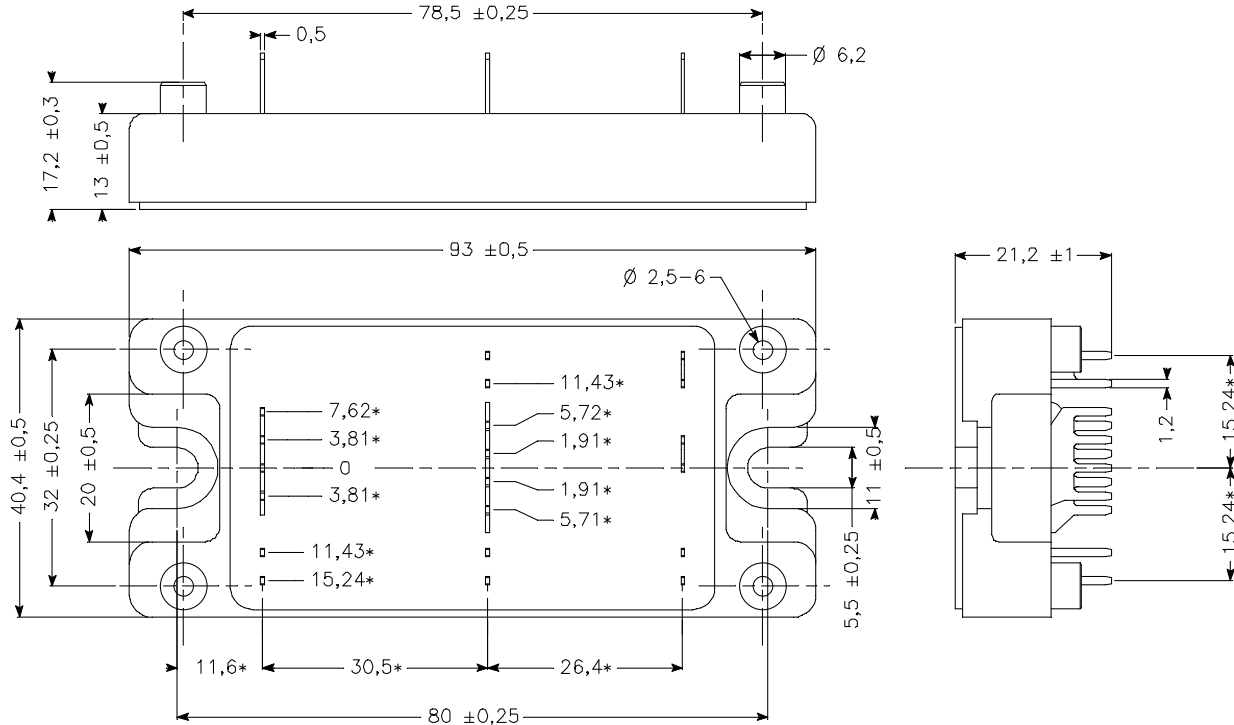
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
 R_T: Thermistor value at T

Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R _{thJC}	Junction to Case Thermal Resistance	IGBT		0.16	°C/W	
		Diode		0.29		
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	°C	
T _{STG}	Storage Temperature Range	-40		125		
T _C	Operating Case Temperature	-40		100		
Torque	Mounting torque	To Heatsink	M5	2.5	4.7	N.m
Wt	Package Weight				160	g

SP4 Package outline (dimensions in mm)

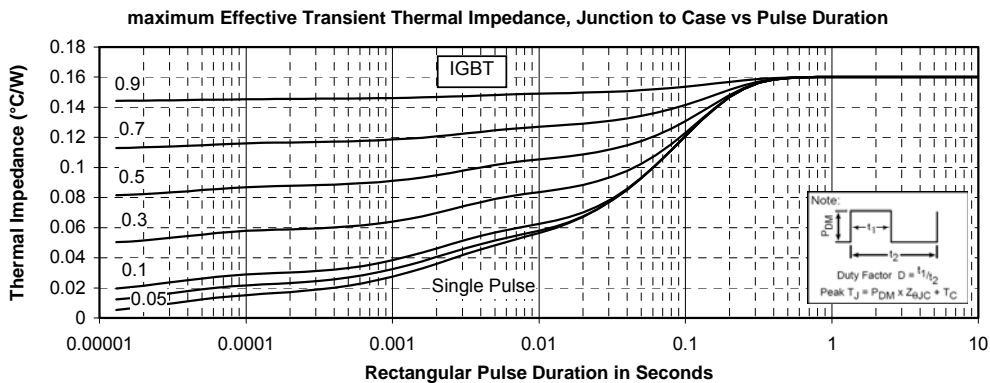
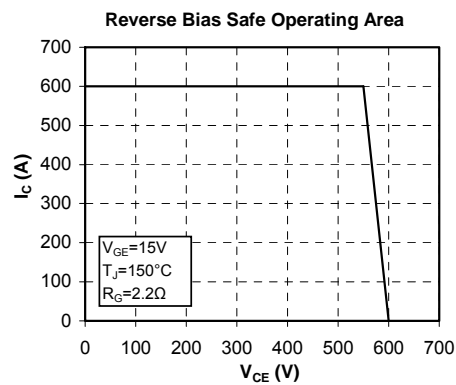
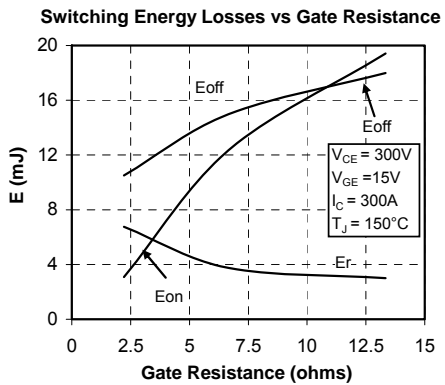
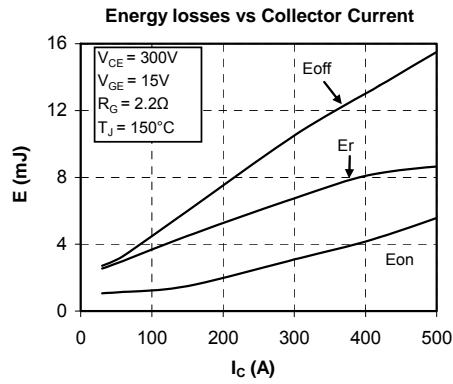
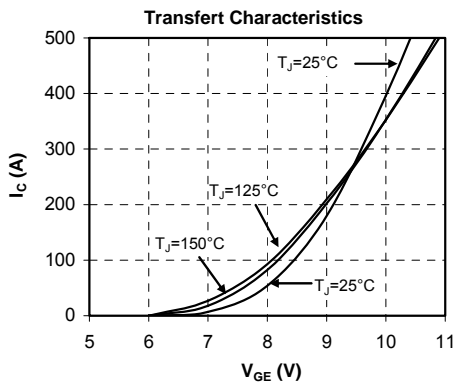
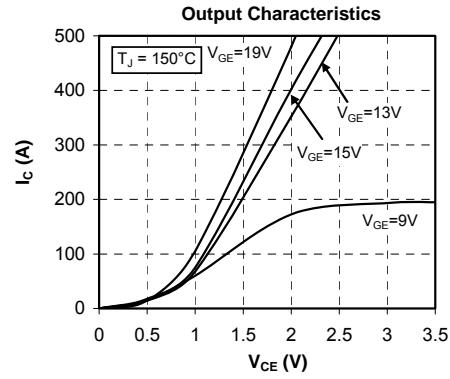
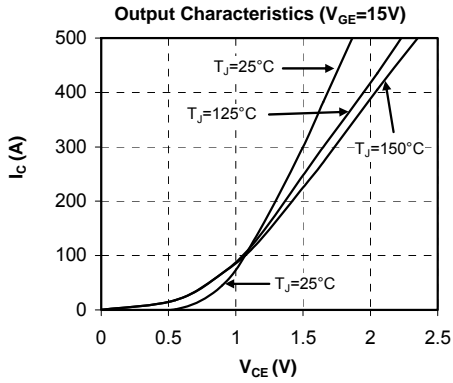


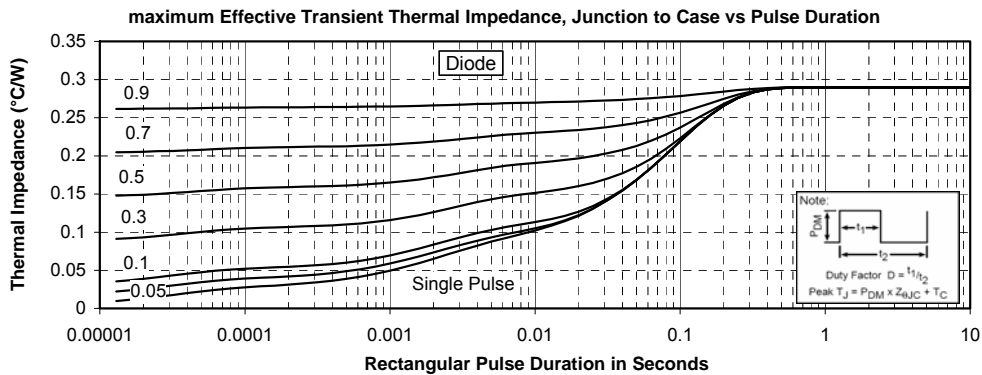
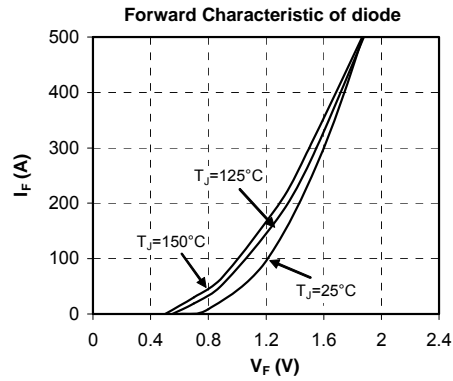
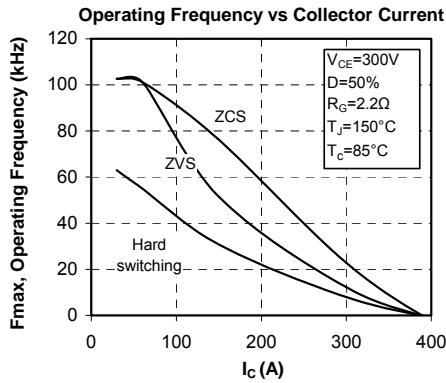
ALL DIMENSIONS MARKED "*" ARE TOLERENCED AS: $\text{⌀} \pm 0,1$

application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

See

Typical Performance Curve





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