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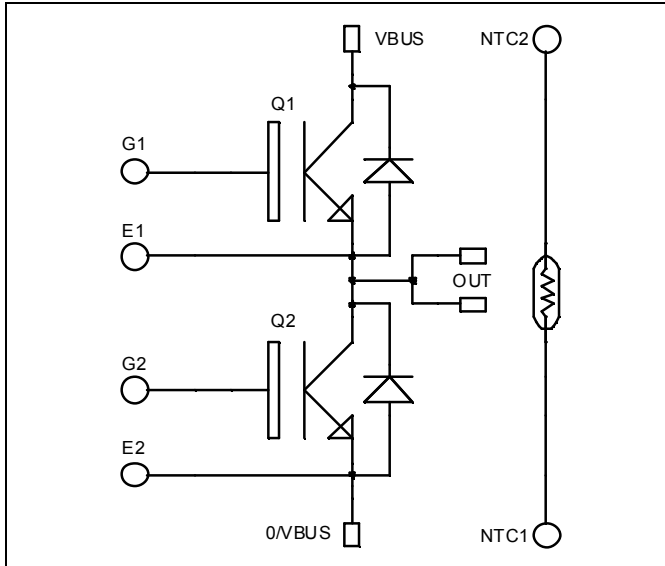
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## Phase leg NPT IGBT Power Module

$V_{CES} = 1200V$   
 $I_C = 50A @ T_c = 80^\circ C$



### Application

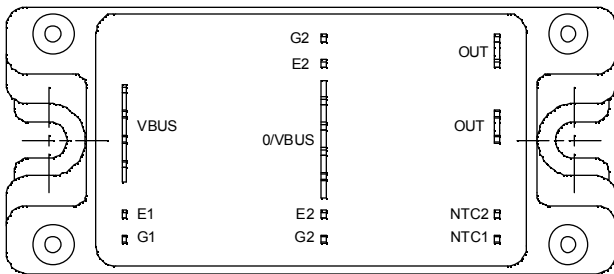
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

### Features

- Non Punch Through (NPT) Fast IGBT®
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 50 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - Avalanche energy rated
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- Internal thermistor for temperature monitoring
- High level of integration

### Benefits

- Outstanding performance at high frequency operation
- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- 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	1200	V
$I_C$	Continuous Collector Current	$T_c = 25^\circ C$	75
		$T_c = 80^\circ C$	50
$I_{CM}$	Pulsed Collector Current	$T_c = 25^\circ C$	150
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	312
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$	100A @ 1200V

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://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	$V_{GE} = 0\text{V}$ $V_{CE} = 1200\text{V}$			250 500	$\mu\text{A}$
$V_{CE(sat)}$	Collector Emitter saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 50\text{A}$		3.2 4.0	3.7	V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1\text{mA}$	4.5		6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$			100	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0\text{V}$		3450		pF
$C_{oes}$	Output Capacitance	$V_{CE} = 25\text{V}$		330		
$C_{res}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		220		
$Q_g$	Total gate Charge	$V_{GS} = 15\text{V}$		330		nC
$Q_{ge}$	Gate – Emitter Charge	$V_{Bus} = 600\text{V}$		35		
$Q_{gc}$	Gate – Collector Charge	$I_C = 50\text{A}$		200		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ )		35		ns
$T_r$	Rise Time	$V_{GE} = 15\text{V}$ $V_{Bus} = 600\text{V}$		65		
$T_{d(off)}$	Turn-off Delay Time	$I_C = 50\text{A}$		320		
$T_f$	Fall Time	$R_G = 5\ \Omega$		30		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $125^\circ\text{C}$ )		35		ns
$T_r$	Rise Time	$V_{GE} = \pm 15\text{V}$ $V_{Bus} = 600\text{V}$		65		
$T_{d(off)}$	Turn-off Delay Time	$I_C = 50\text{A}$		360		
$T_f$	Fall Time	$R_G = 5\ \Omega$		40		
$E_{on}$	Turn-on Switching Energy	$V_{GE} = \pm 15\text{V}$ $V_{Bus} = 600\text{V}$	$T_j = 125^\circ\text{C}$	6.9		mJ
$E_{off}$	Turn-off Switching Energy	$I_C = 50\text{A}$ $R_G = 5\ \Omega$	$T_j = 125^\circ\text{C}$	3.05		

**Reverse diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		1200			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 1200\text{V}$			2500 500	$\mu\text{A}$
$I_F$	DC Forward Current	$T_c = 70^\circ\text{C}$		60		A
$V_F$	Diode Forward Voltage	$I_F = 60\text{A}$		2.0	2.5	V
		$I_F = 120\text{A}$		2.3		
		$I_F = 60\text{A}$ $T_j = 125^\circ\text{C}$		1.8		
$t_{rr}$	Reverse Recovery Time	$I_F = 60\text{A}$ $V_R = 800\text{V}$	$T_j = 25^\circ\text{C}$	370		ns
		$di/dt = 400\text{A}/\mu\text{s}$	$T_j = 125^\circ\text{C}$	500		
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 400\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	1320		nC
			$T_j = 125^\circ\text{C}$	6900		

**Thermal and package characteristics**
*Symbol Characteristic*

		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		0.4	°C/W	
		Diode		0.65		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, I <sub>isol</sub> <1mA, 50/60Hz	2500			V	
T <sub>J</sub>	Operating junction temperature range	-40		150	°C	
T <sub>STG</sub>	Storage Temperature Range	-40		125		
T <sub>C</sub>	Operating Case Temperature	-40		100		
Torque	Mounting torque	To Heatsink	M5	2.5	4.7	N.m
Wt	Package Weight				160	g

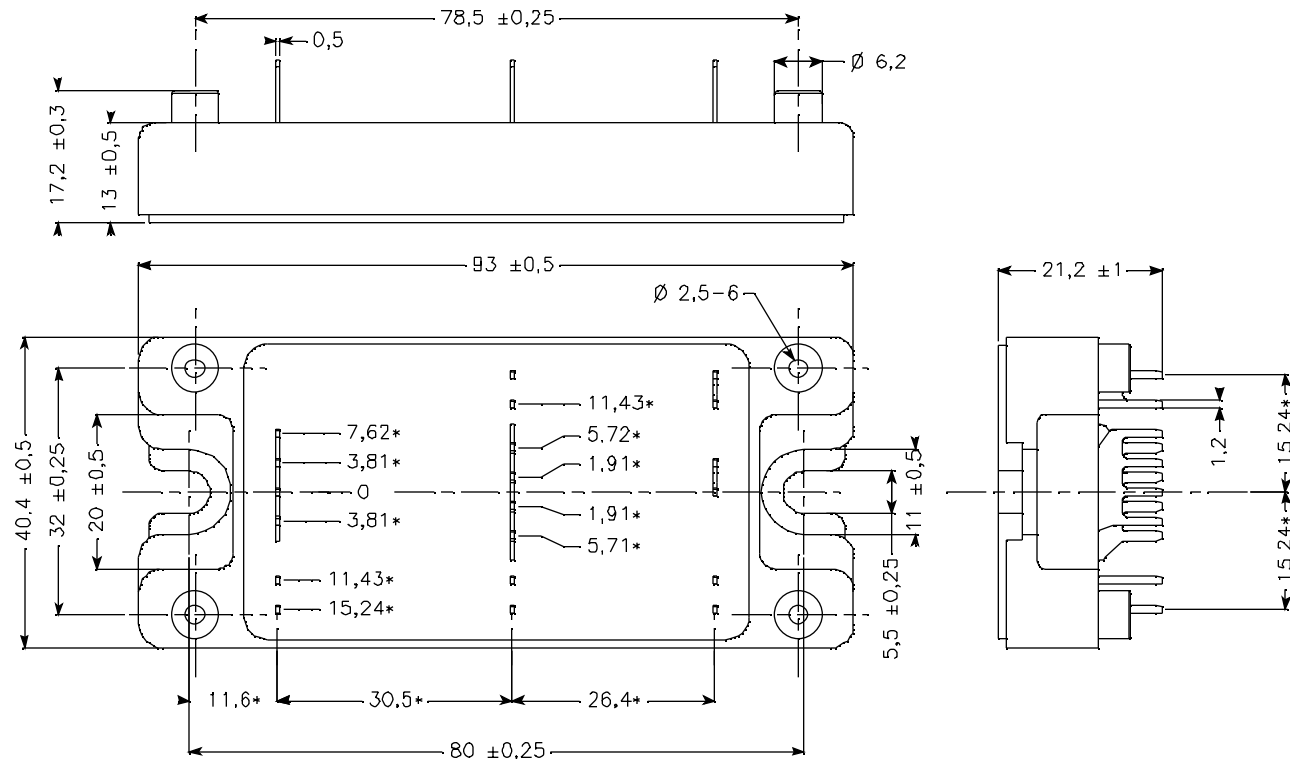
**Temperature sensor NTC** (see application note APT0406 on www.microsemi.com for more information).

*Symbol Characteristic*

		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K

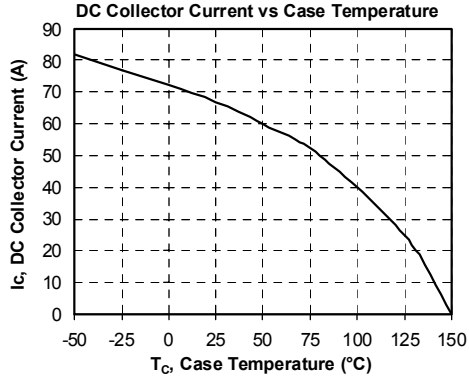
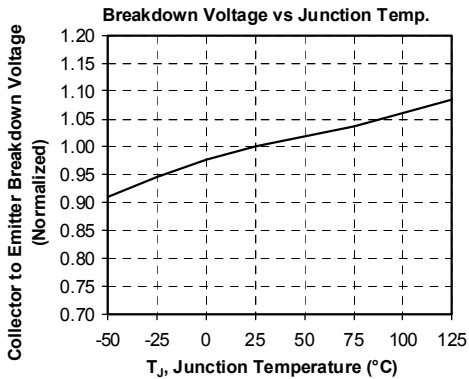
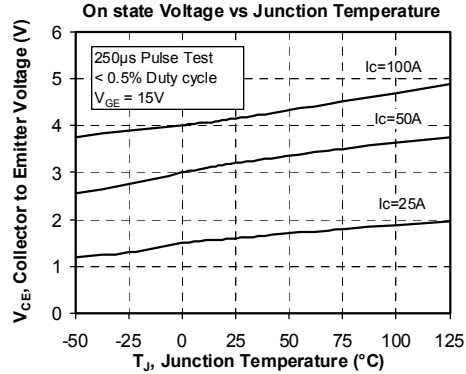
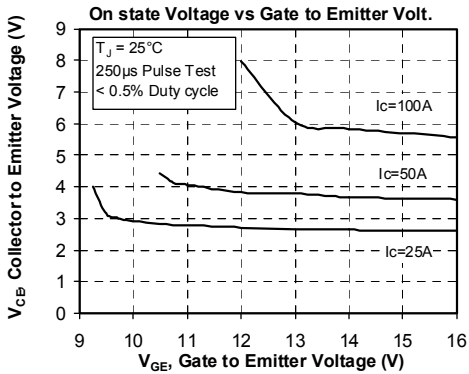
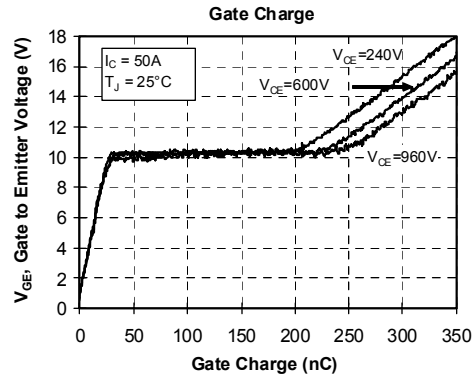
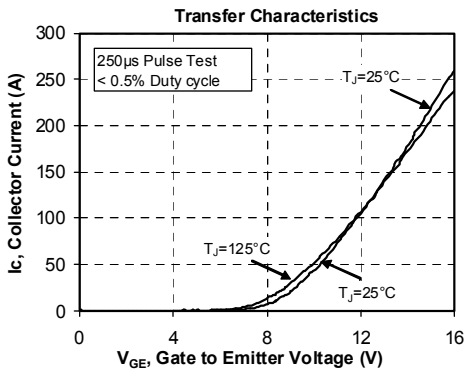
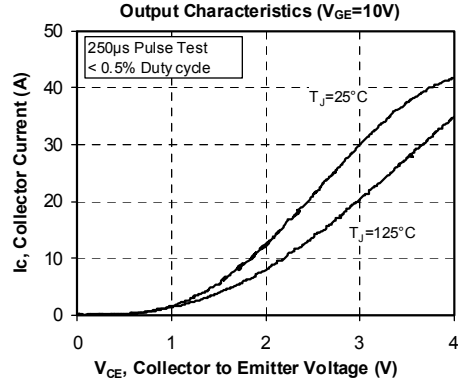
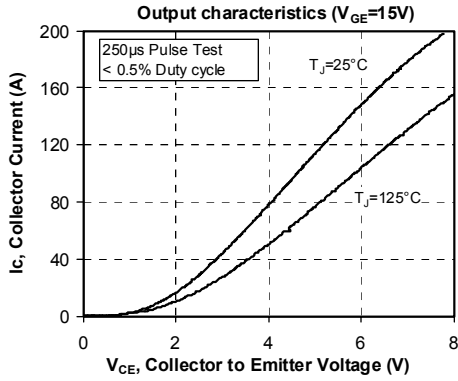
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T} - \frac{1}{T_{25}}\right)\right]}$$

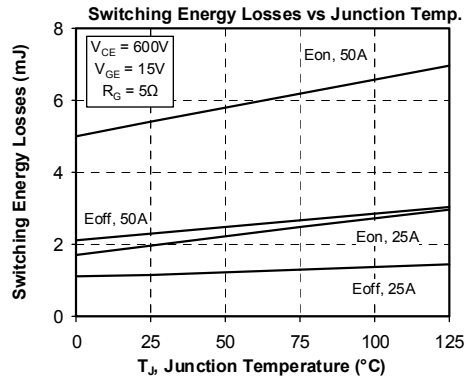
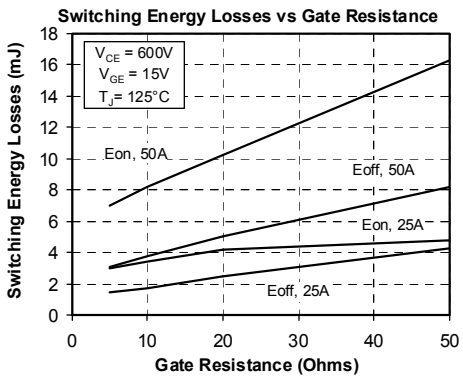
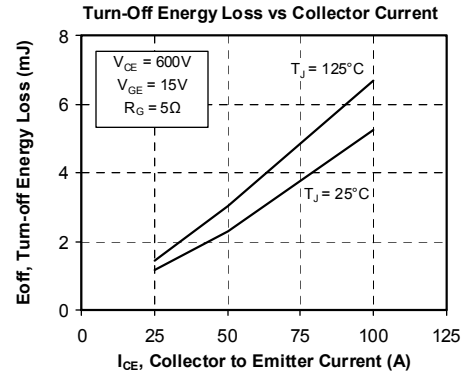
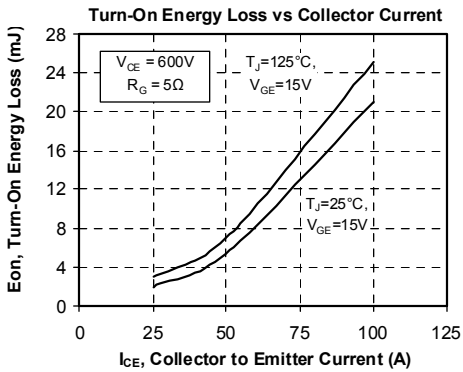
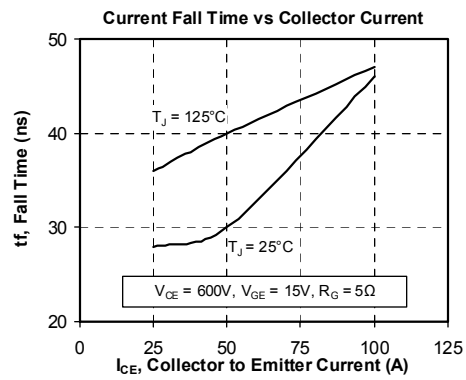
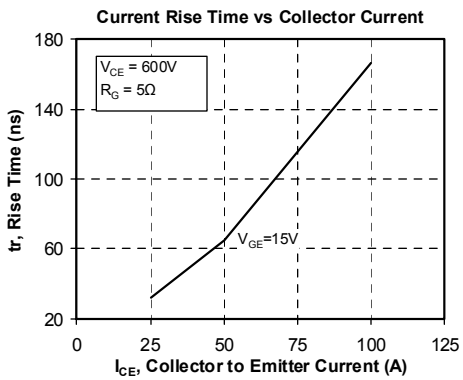
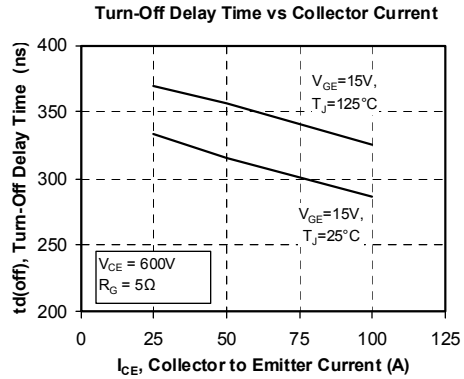
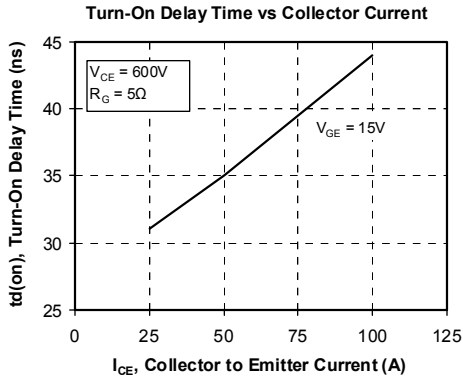
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

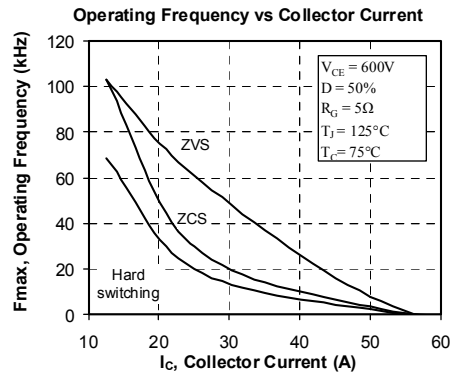
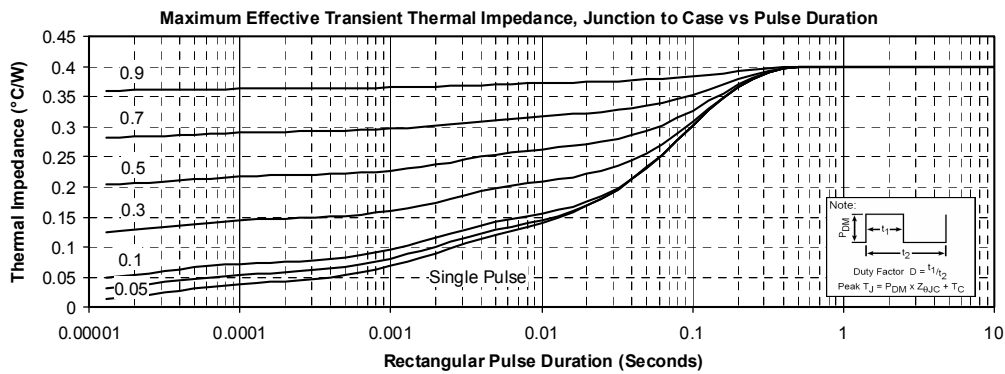
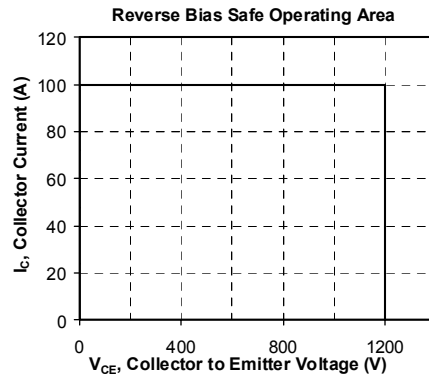
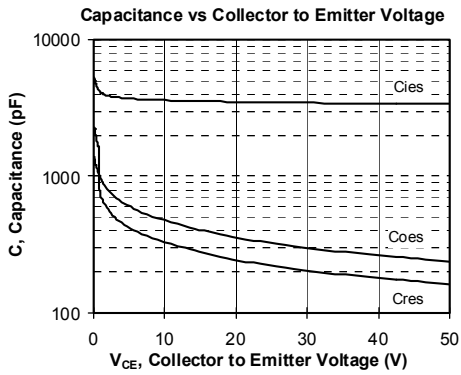
**SP4 Package outline** (dimensions in mm)

 ALL DIMENSIONS MARKED "\*" ARE TOLERANCED AS:  $\oplus \ominus \emptyset 1$ 

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

## Typical Performance Curve







Microsemi reserves the right to change, without notice, the specifications and information contained herein

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