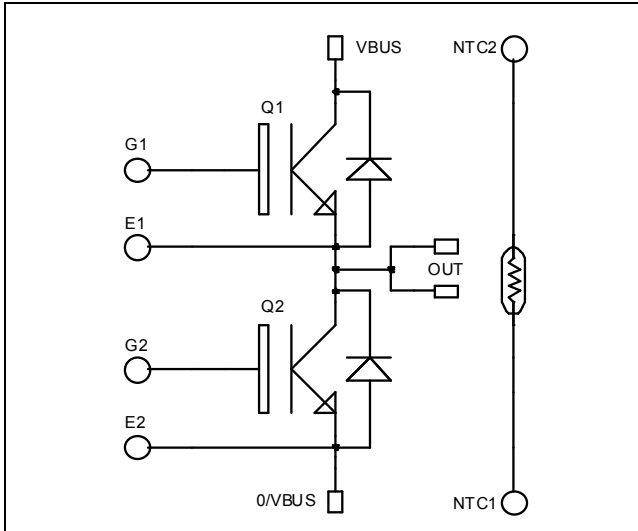


**Phase leg  
High speed Trench + Field Stop IGBT4  
Power Module**

**$V_{CES} = 1200V$   
 $I_C = 150A @ T_c = 80^\circ C$**


**Application**

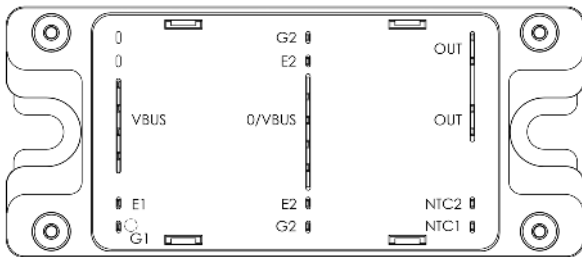
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

**Features**

- **High speed Trench + Field Stop IGBT 4 Technology**
  - Low voltage drop
  - Low leakage current
  - Low switching losses
- Kelvin emitter for easy drive
- Very low stray inductance
- Lead frames for power connections
- 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



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

**Absolute maximum ratings (Per IGBT)**

Symbol	Parameter	Max ratings	Unit
$V_{CES}$	Collector - Emitter Voltage	1200	V
$I_C$	Continuous Collector Current	$T_C = 25^\circ C$	250
		$T_C = 80^\circ C$	150
$I_{CM}$	Pulsed Collector Current	$T_C = 25^\circ C$	480
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Power Dissipation	750	W

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

**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	$\mu A$
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 150A$	1.78	$T_j = 25^\circ C$ 2.05	2.4	V
		$T_j = 150^\circ C$		2.6		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 5.2 mA$	5.3	5.8	6.3	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			240	nA

**Dynamic Characteristics (Per IGBT)**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1MHz$		8.8		nF
$C_{oes}$	Output Capacitance			0.5		
$C_{res}$	Reverse Transfer Capacitance			0.45		
$Q_G$	Gate charge	$V_{GE} = 15V, I_C = 150A$ $V_{CE} = 960V$		645		nC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{Bus} = 600V$ $I_C = 150A$ $R_G = 3.5\Omega$		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) $V_{GE} = \pm 15V$ $V_{Bus} = 600V$ $I_C = 150A$ $R_G = 3.5\Omega$		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	$V_{GE} = \pm 15V$ $V_{Bus} = 600V$ $I_C = 150A$	$T_j = 150^\circ C$	13		mJ
$E_{off}$	Turn off Energy	$R_G = 3.5\Omega$		8		
$R_G$	Integrated gate resistor			5		$\Omega$
$I_{sc}$	Short Circuit data	$V_{GE} \leq 15V; V_{Bus} = 600V$ $t_p \leq 10\mu s; T_j = 150^\circ C$		525		A
$R_{thJC}$	Junction to Case Thermal Resistance				0.20	$^\circ C/W$

**Diode ratings and characteristics (per diode)**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Peak Repetitive Reverse Voltage				1200	V
$I_{RM}$	Reverse Leakage Current	$V_R = 1200V$			400	$\mu A$
$I_F$	DC Forward Current	$T_c = 60^\circ C$		120		A
$V_F$	Diode Forward Voltage	$I_F = 120A$		2.6	3.5	V
		$I_F = 240A$		3.2		
		$I_F = 120A$	$T_j = 125^\circ C$	1.8		
$t_{rr}$	Reverse Recovery Time	$I_F = 120A$ $V_R = 800V$ $di/dt = 800A/\mu s$	$T_j = 25^\circ C$	300		ns
			$T_j = 125^\circ C$	380		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 120A$ $V_R = 800V$ $di/dt = 800A/\mu s$	$T_j = 25^\circ C$	1.44		$\mu C$
			$T_j = 125^\circ C$	6.8		
$R_{thJC}$	Junction to Case Thermal Resistance				0.33	$^\circ C/W$

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

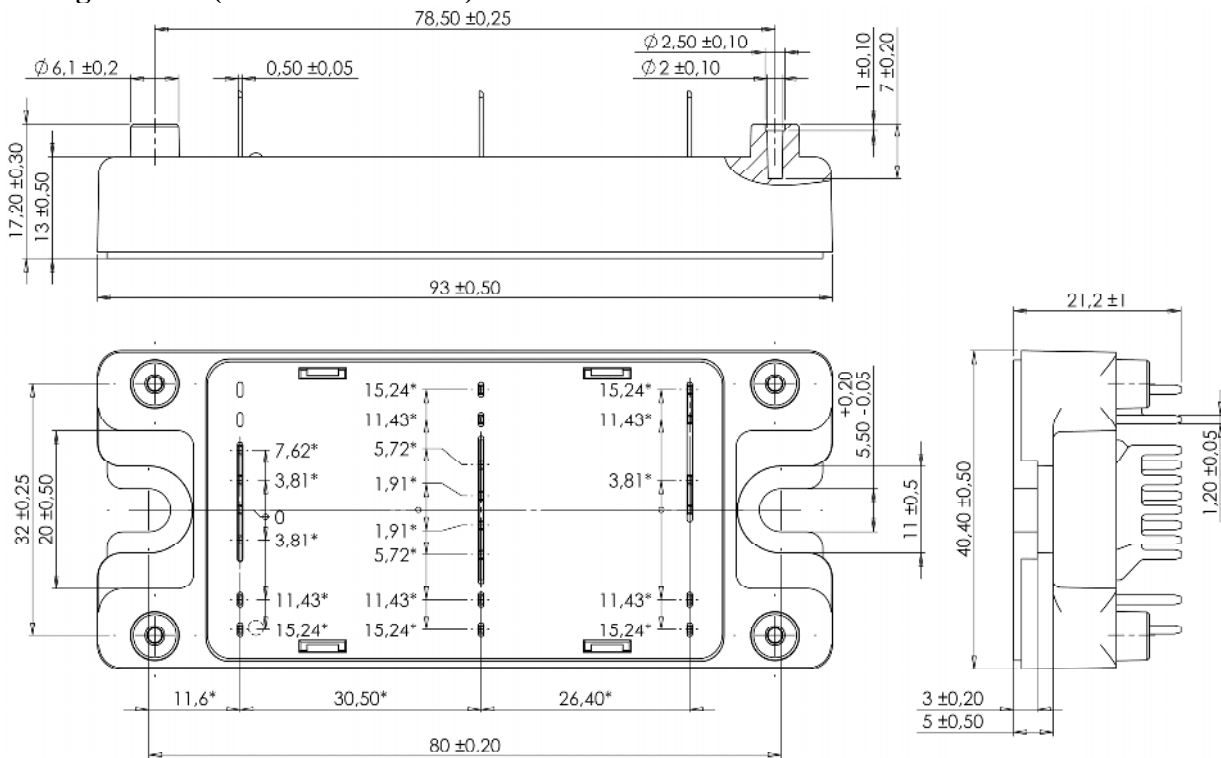
Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
ΔR <sub>25</sub> /R <sub>25</sub>			5		%
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K
ΔB/B	T <sub>C</sub> = 100°C		4		%

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

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

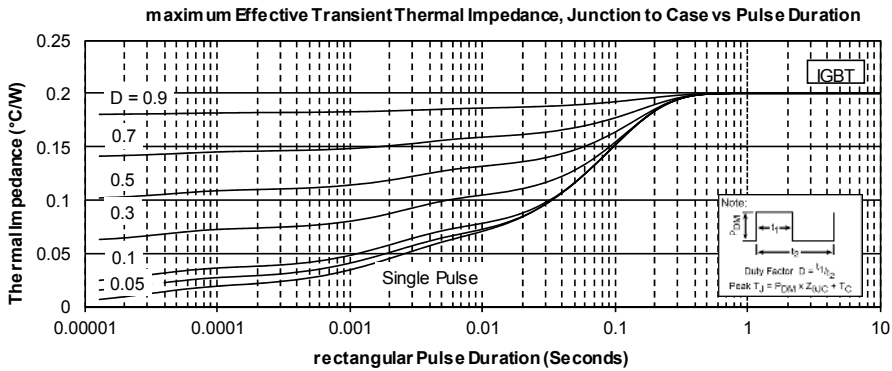
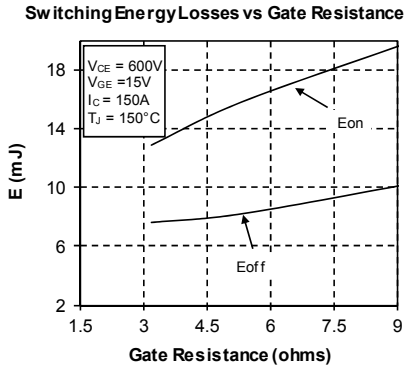
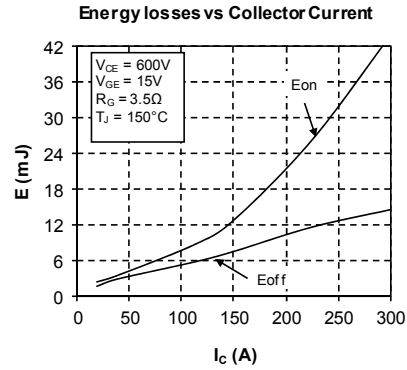
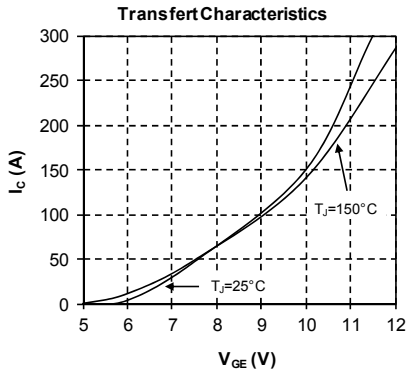
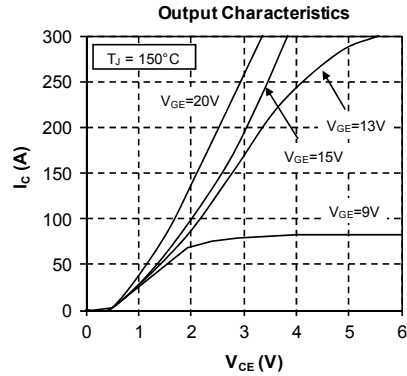
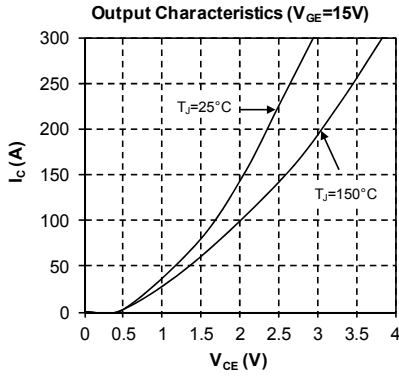
**Thermal and package characteristics**

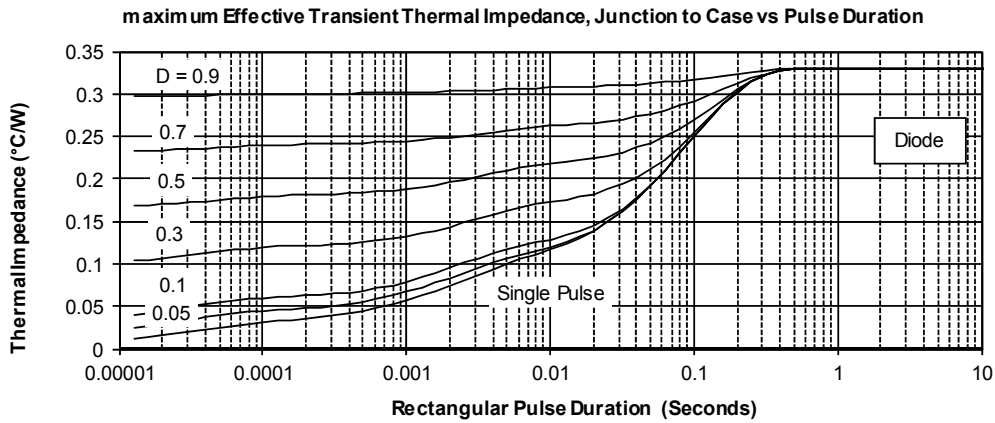
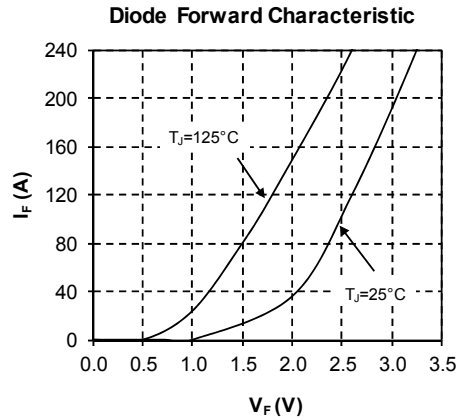
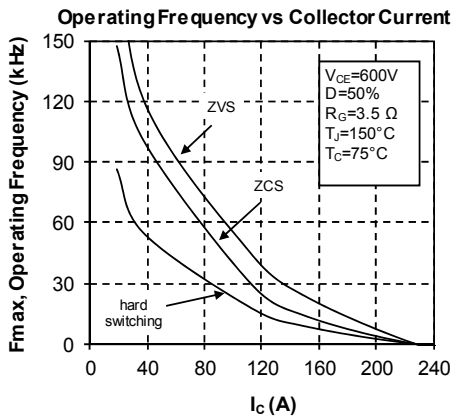
Symbol	Characteristic	Min	Max	Unit		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000		V		
T <sub>J</sub>	Operating junction temperature range	-40	175	°C		
T <sub>JOP</sub>	Recommended junction temperature under switching conditions	-40	T <sub>Jmax</sub> -25			
T <sub>STG</sub>	Storage Temperature Range	-40	125			
T <sub>C</sub>	Operating Case Temperature	-40	125			
Torque	Mounting torque	To heatsink	M5	2.5	4.7	N.m
Wt	Package Weight				160	g

**Package outline (dimensions in mm)**

 ALL DIMENSIONS MARKED "\*" ARE TOLERANCED AS:  $\pm \phi 1$ 

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

## Typical performance curve





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