

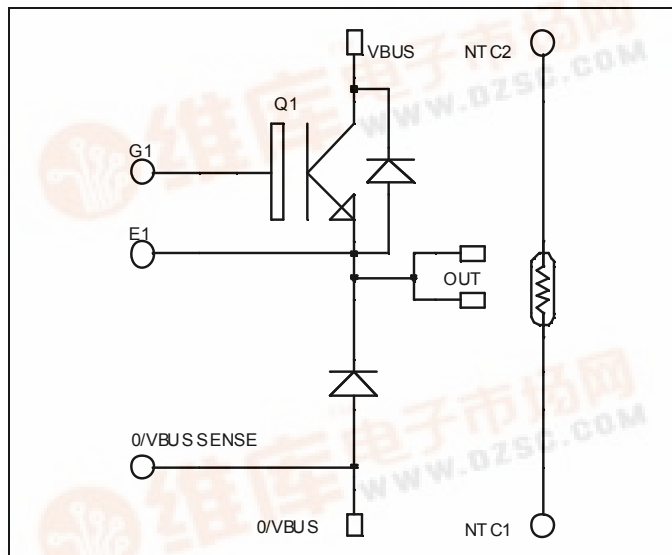


APTGF180SK60TG

Buck chopper NPT IGBT Power Module

$$V_{CES} = 600V$$

$$I_C = 180A @ T_c = 80^{\circ}C$$

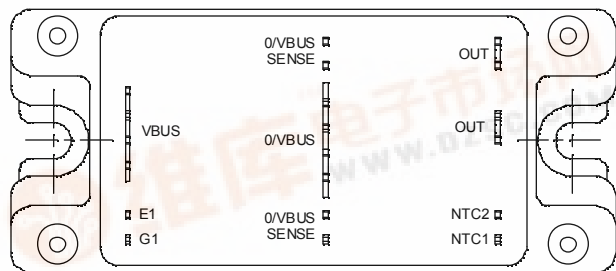


Application

- AC and DC motor control
- Switched Mode Power Supplies

Features

- Non Punch Through (NPT) Fast IGBT®
 - Low voltage drop
 - Low tail current
 - Switching frequency up to 100 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 TC of VCEsat
- 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	$T_c = 25^{\circ}C$	A
		$T_c = 80^{\circ}C$	
I_{CM}	Pulsed Collector Current	$T_c = 25^{\circ}C$	630
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_c = 25^{\circ}C$	833
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^{\circ}C$	400A @ 600V

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	$V_{GE} = 0\text{V}$ $V_{CE} = 600\text{V}$	$T_j = 25^\circ\text{C}$		300	μA
			$T_j = 125^\circ\text{C}$		1000	
$V_{CE(sat)}$	Collector Emitter saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 180\text{A}$	$T_j = 25^\circ\text{C}$	2.0	2.5	V
			$T_j = 125^\circ\text{C}$	2.2		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 2\text{mA}$	3		5	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$			± 200	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0\text{V}$		8.6		nF
C_{oes}	Output Capacitance	$V_{CE} = 25\text{V}$		0.94		
C_{res}	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.8		
Q_g	Total gate Charge	$V_{GS} = 15\text{V}$		660		nC
Q_{ge}	Gate – Emitter Charge	$V_{Bus} = 300\text{V}$		580		
Q_{gc}	Gate – Collector Charge	$I_C = 180\text{A}$		400		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C)		26		ns
T_r	Rise Time	$V_{GE} = 15\text{V}$		25		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400\text{V}$		150		
T_f	Fall Time	$I_C = 180\text{A}$ $R_G = 2.5\ \Omega$		30		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C)		26		ns
T_r	Rise Time	$V_{GE} = 15\text{V}$		25		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400\text{V}$		170		
T_f	Fall Time	$I_C = 180\text{A}$ $R_G = 2.5\ \Omega$		40		
E_{on}	Turn-on Switching Energy	$V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$	$T_j = 125^\circ\text{C}$	8.6		mJ
E_{off}	Turn-off Switching Energy	$I_C = 180\text{A}$ $R_G = 2.5\ \Omega$	$T_j = 125^\circ\text{C}$	7		

Chopper 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	$V_R = 600\text{V}$	$T_j = 25^\circ\text{C}$		350	μA
			$T_j = 125^\circ\text{C}$		750	
I_F	DC Forward Current		$T_c = 80^\circ\text{C}$	200		A
V_F	Diode Forward Voltage	$I_F = 200\text{A}$		1.6	1.8	V
		$I_F = 400\text{A}$		1.9		
		$I_F = 200\text{A}$ $T_j = 125^\circ\text{C}$		1.4		
t_{rr}	Reverse Recovery Time	$I_F = 200\text{A}$ $V_R = 400\text{V}$	$T_j = 25^\circ\text{C}$	180		ns
		$di/dt = 400\text{A}/\mu\text{s}$	$T_j = 125^\circ\text{C}$	220		
Q_{rr}	Reverse Recovery Charge		$T_j = 25^\circ\text{C}$	780		nC
			$T_j = 125^\circ\text{C}$	2900		

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R _{thJC}	Junction to Case Thermal Resistance			IGBT		0.15	°C/W
				Diode		0.32	
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		150	°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

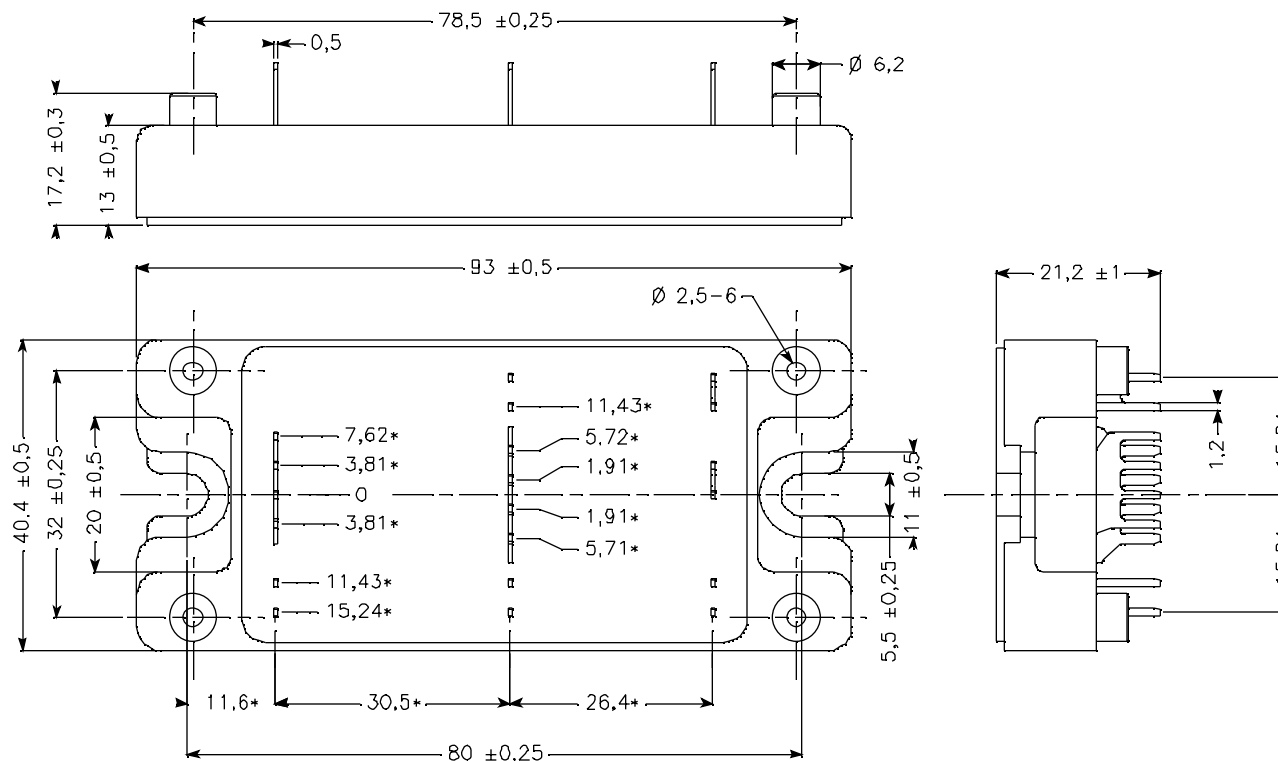
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
B _{25/85}	T ₂₅ = 298.15 K		3952		K

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

T: Thermistor temperature
 R_T: Thermistor value at T

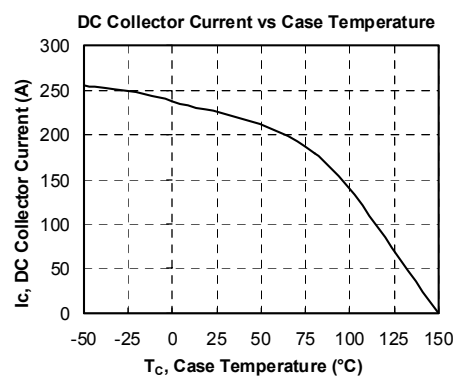
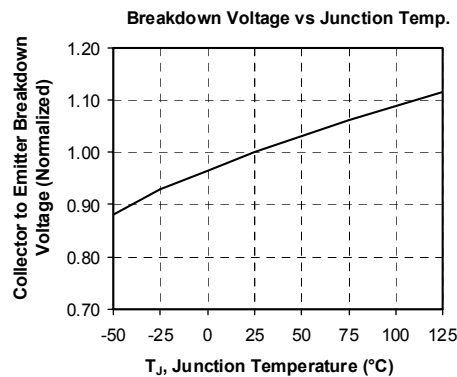
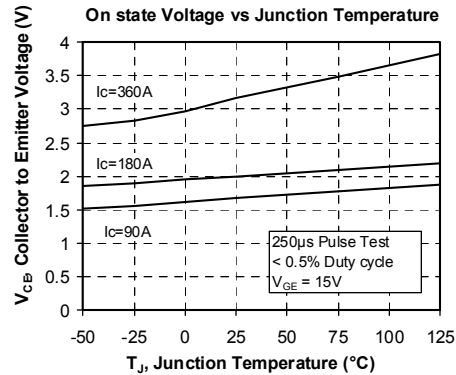
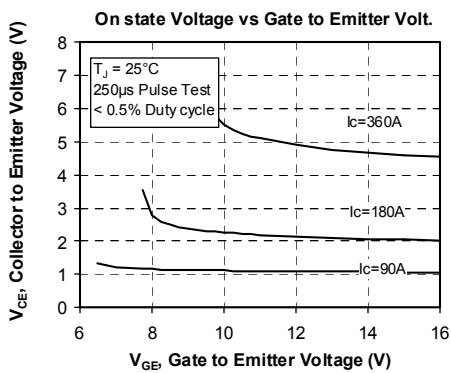
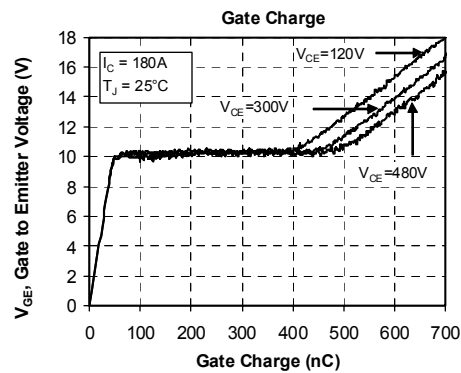
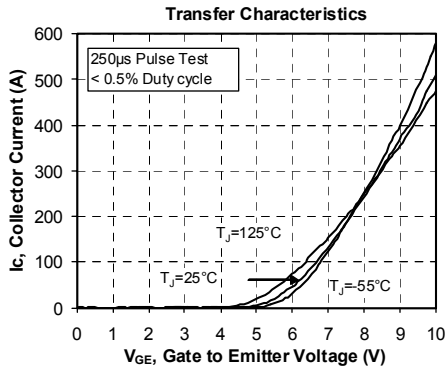
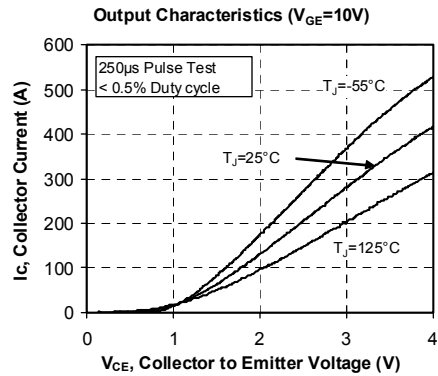
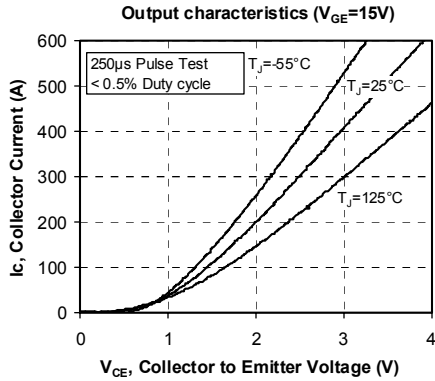
SP4 Package outline (dimensions in mm)

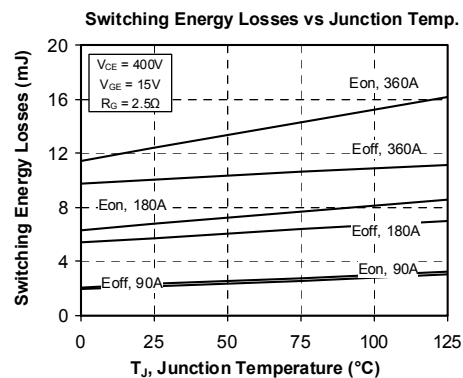
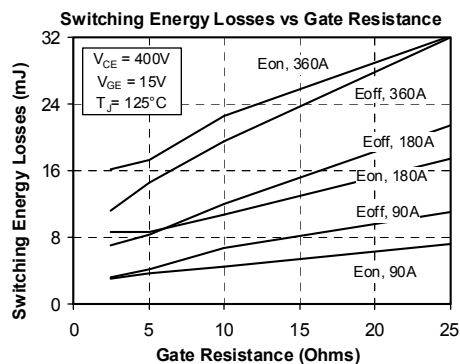
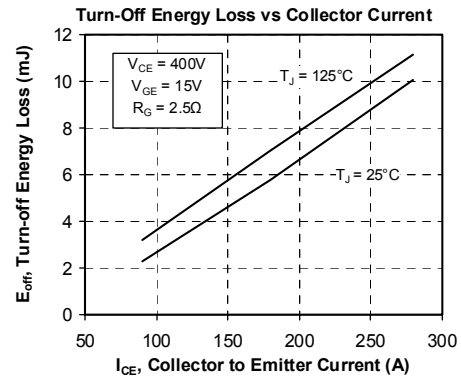
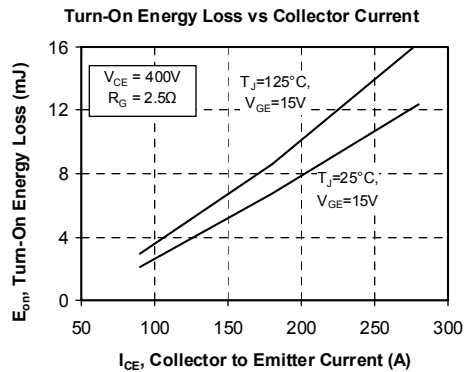
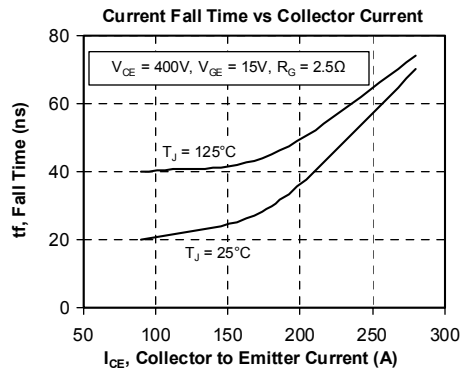
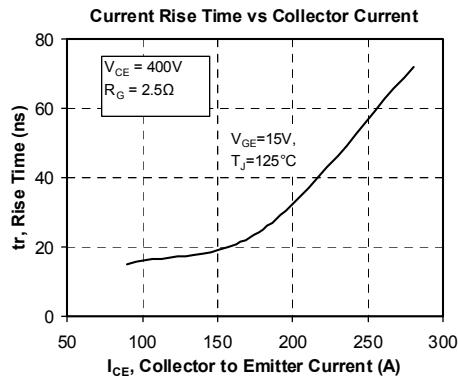
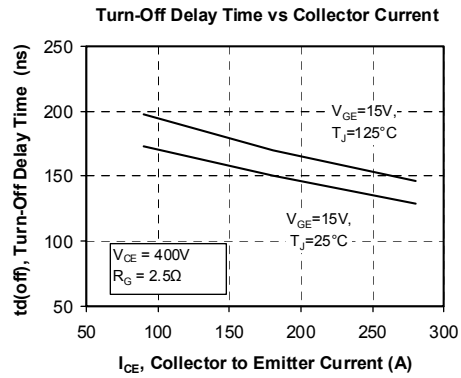
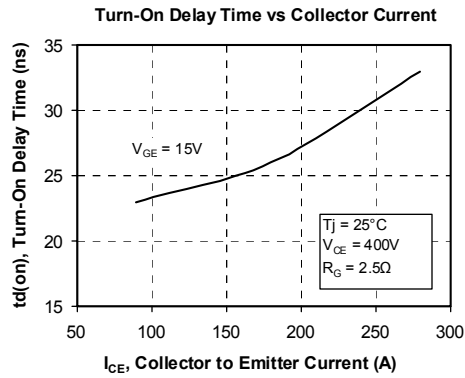


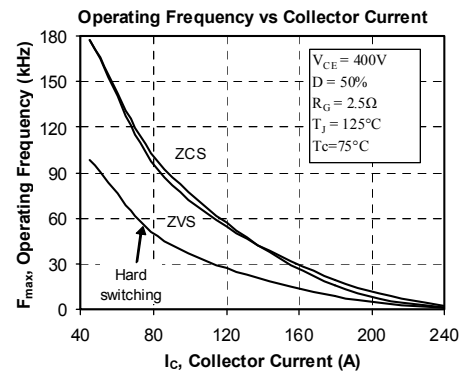
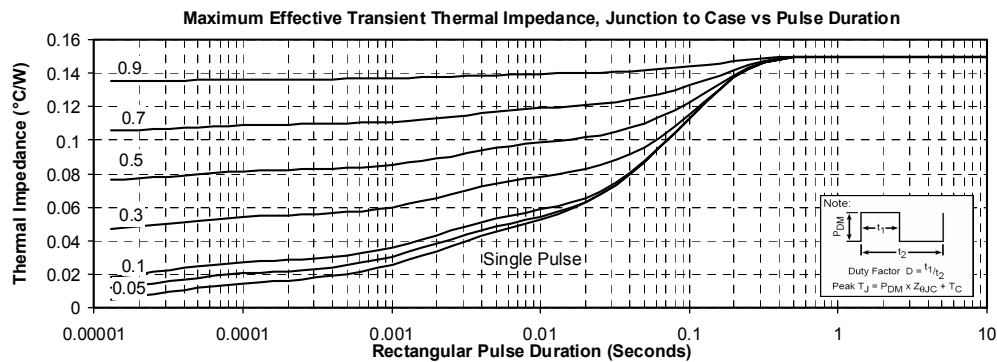
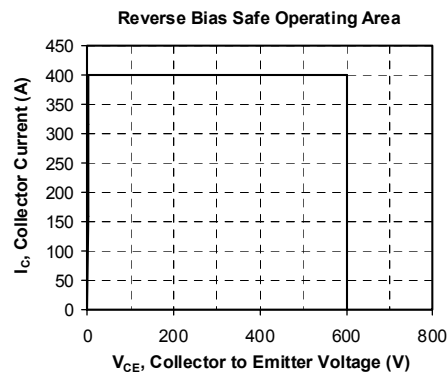
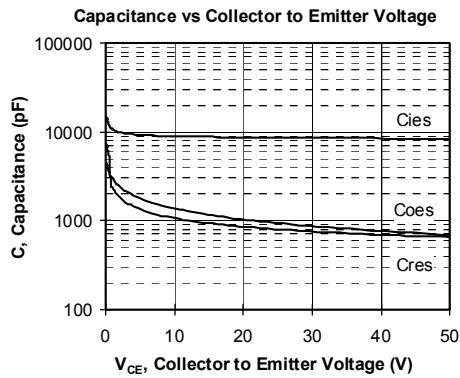
ALL DIMENSIONS MARKED "*" ARE TOLERANCED AS: ± 0.1

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

Typical Performance Curve







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