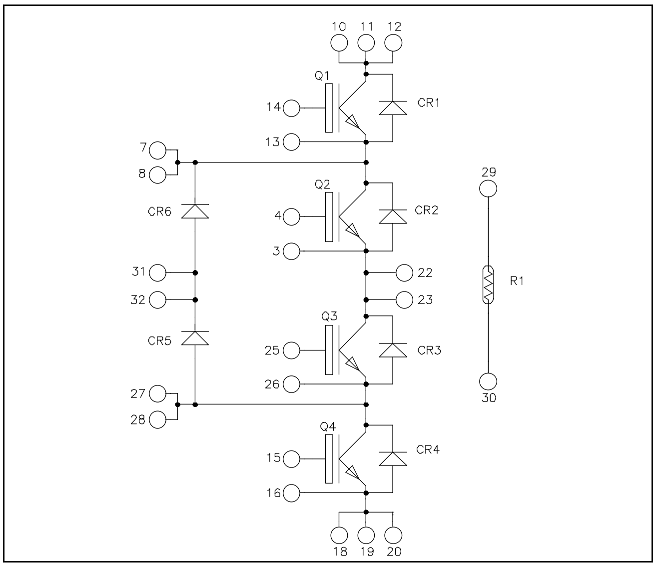
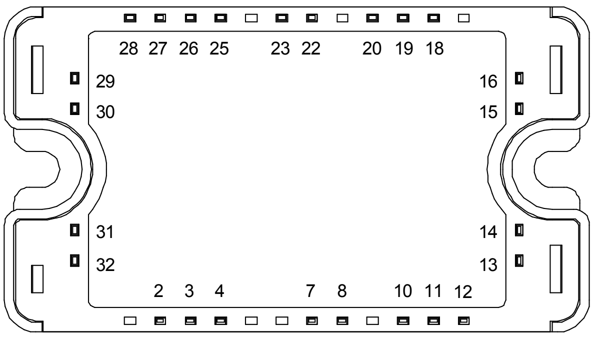
APTGT50TL60T3G

Microsemi POWER PRODUCTS GROUP

Three level inverter
Trench + Field Stop IGBT
Power Module

V_{CES} = 600V
I_C = 50A @ Tc = 80°C





All multiple inputs and outputs must be shorted together
Example: 10/11/12 ; 7/8 …

Application
- Solar converter
- Uninterruptible Power Supplies

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
- High level of integration
- Internal thermistor for temperature monitoring

Benefits
- Stable temperature behavior
- Very rugged
- 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 to Q4 Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Breakdown Voltage		600	V
I_C	Continuous Collector Current	$T_C = 25°C$	80	A
		$T_C = 80°C$	50	
I_{CM}	Pulsed Collector Current	$T_C = 25°C$	100	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	$T_C = 25°C$	176	W
RBSOA	Reverse Bias Safe Operating Area	$T_J = 150°C$	100A @ 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°C unless otherwise specified

Q1 to Q4 Electrical Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V, V_{CE} = 600V				250	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} =15V I_C = 50A	T_j = 25°C		1.5	1.9	V
			T_j = 150°C		1.7		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 600µA		5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				600	nA

Q1 to Q4 Dynamic Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{ies}	Input Capacitance	V_{GE} = 0V V_{CE} = 25V f = 1MHz			3150		pF
C_{oes}	Output Capacitance				200		
C_{res}	Reverse Transfer Capacitance				95		
Q_G	Gate charge	V_{GE}=±15V, I_C=50A V_{CE}=300V			0.5		µC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 50A R_G = 8.2Ω			110		ns
T_r	Rise Time				45		
$T_{d(off)}$	Turn-off Delay Time				200		
T_f	Fall Time				40		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 50A R_G = 8.2Ω			120		ns
T_r	Rise Time				50		
$T_{d(off)}$	Turn-off Delay Time				250		
T_f	Fall Time				60		
E_{on}	Turn-on Switching Energy	V_{GE} = ±15V V_{Bus} = 300V I_C = 50A R_G = 8.2Ω	T_j = 25°C		0.3		mJ
			T_j = 150°C		0.43		
E_{off}	Turn-off Switching Energy		T_j = 25°C		1.35		mJ
			T_j = 150°C		1.75		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 360V t_p ≤ 6µs ; T_j = 150°C			250		A
R_{thJC}	Junction to Case Thermal Resistance					0.85	°C/W

CR1 to CR4 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°C			150	µA
			T_j = 150°C			350	
I_F	DC Forward Current		Tc = 80°C		30		A
V_F	Diode Forward Voltage	I_F = 30A, V_{GE} = 0V	T_j = 25°C		1.6	2	V
			T_j = 150°C		1.5		
t_{rr}	Reverse Recovery Time	I_F = 30A, V_R = 300V, di/dt =1800A/µs	T_j = 25°C		100		ns
			T_j = 150°C		150		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		1.5		µC
			T_j = 150°C		3.1		
E_{rr}	Reverse Recovery Energy		T_j = 25°C		0.34		mJ
			T_j = 150°C		0.75		
R_{thJC}	Junction to Case Thermal Resistance					2.45	°C/W

CR5 & CR6 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°C			150	µA
			T_j = 150°C			350	
I_F	DC Forward current		Tc = 80°C		50		A
V_F	Diode Forward Voltage	I_F = 50A, V_{GE} = 0V	T_j = 25°C		1.6	2	
			T_j = 150°C		1.5		V
t_{rr}	Reverse Recovery Time	I_F = 50A, V_R = 300V, di/dt =1800A/µs	T_j = 25°C		100		ns
			T_j = 150°C		150		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		2.6		µC
			T_j = 150°C		5.4		
E_{rr}	Reverse Recovery Energy		T_j = 25°C		0.60		mJ
			T_j = 150°C		1.20		
R_{thJC}	Junction to Case Thermal Resistance					1.42	°C/W

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
$\Delta R_{25}/R_{25}$				5		%
$B_{25/85}$	T_{25} = 298.15 K			3952		K
ΔB/B		T_C=100°C		4		%

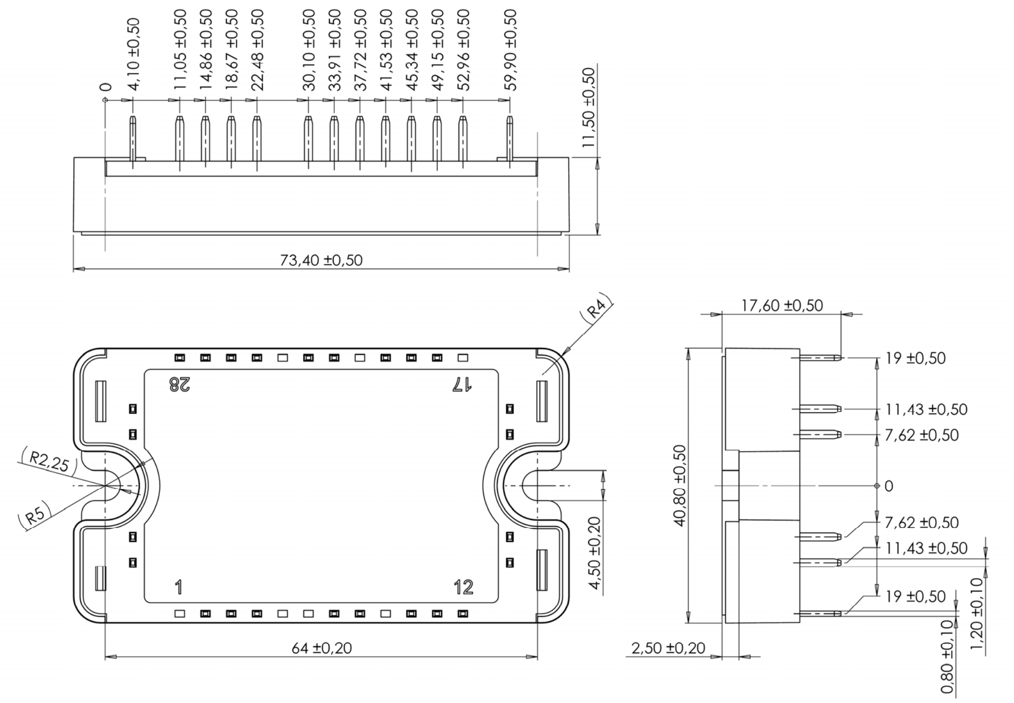
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

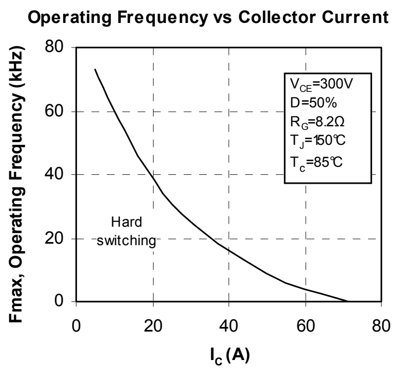
Symbol	Characteristic			Min	Typ	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		175	°C
T_{STG}	Storage Temperature Range			-40		125	°C
T_C	Operating Case Temperature			-40		100	°C
Torque	Mounting torque	To heatsink	M4	2		3	N.m
Wt	Package Weight					110	g

SP3 Package outline (dimensions in mm)

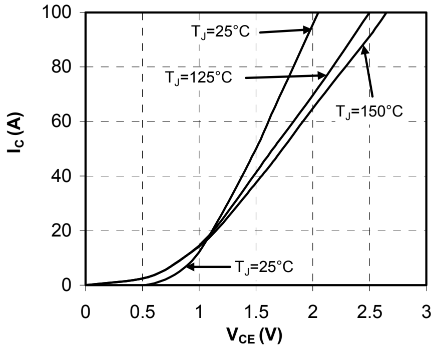


See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

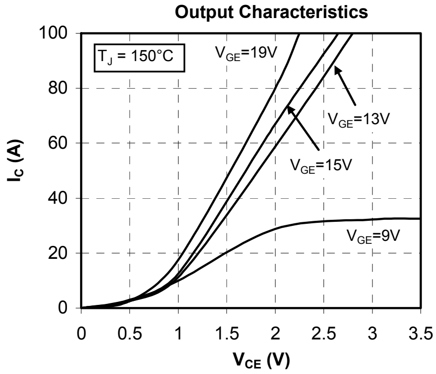
Q1 to Q4 Typical performance curve



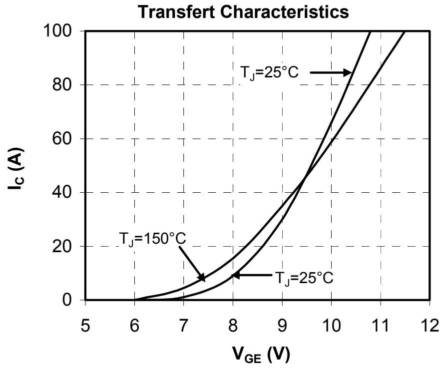
Output Characteristics (V_{GE}=15V)



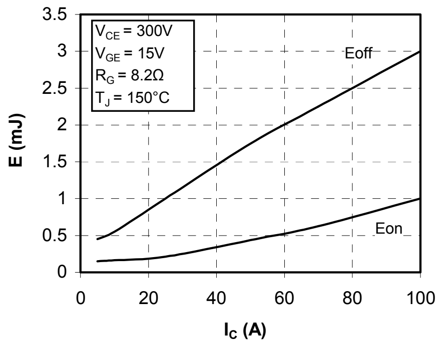
Output Characteristics



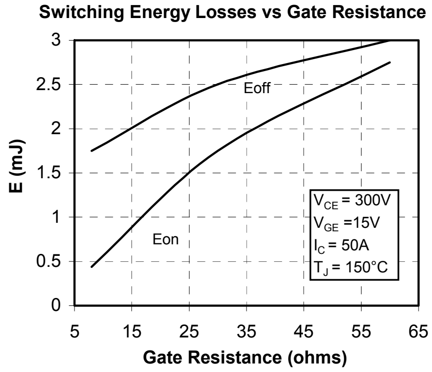
Transfert Characteristics



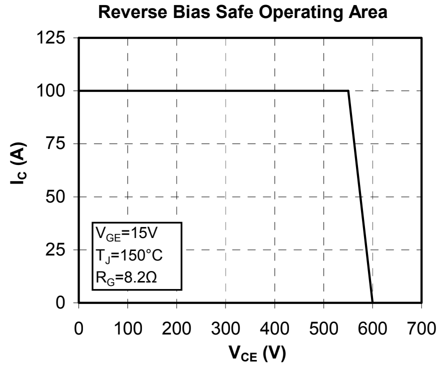
Energy losses vs Collector Current



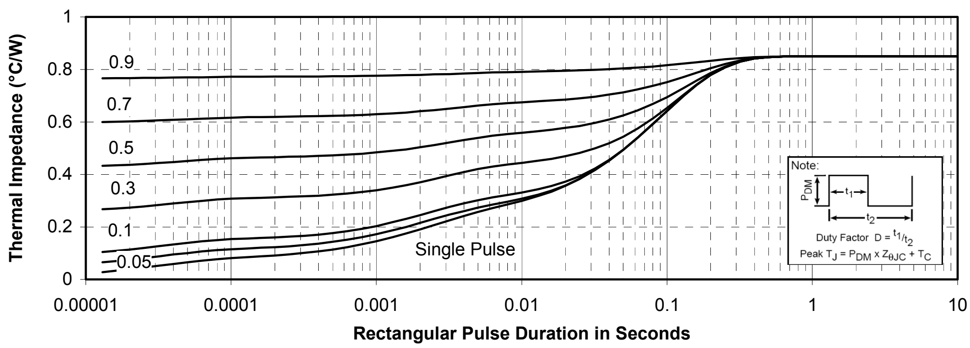
Switching Energy Losses vs Gate Resistance



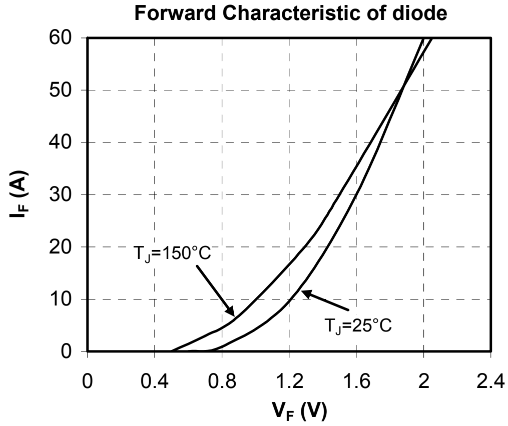
Reverse Bias Safe Operating Area

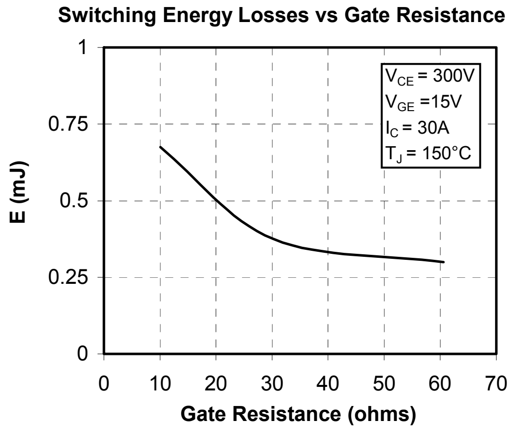


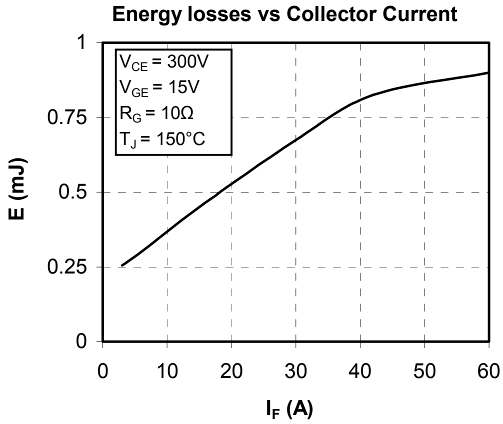
maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration

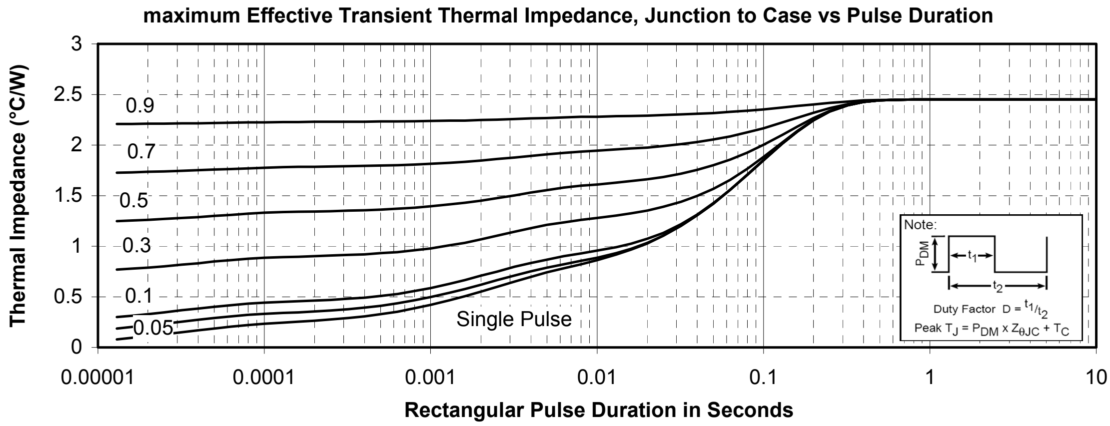


CR1 to CR4 Typical performance curve

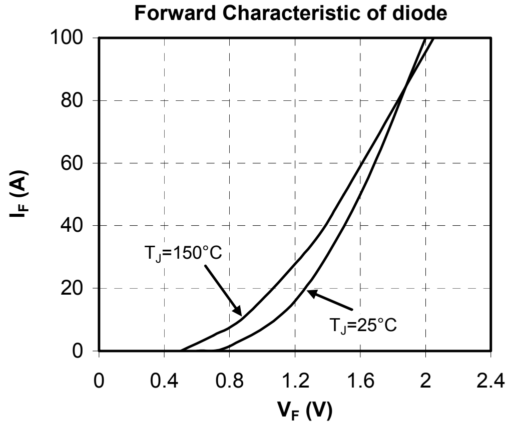


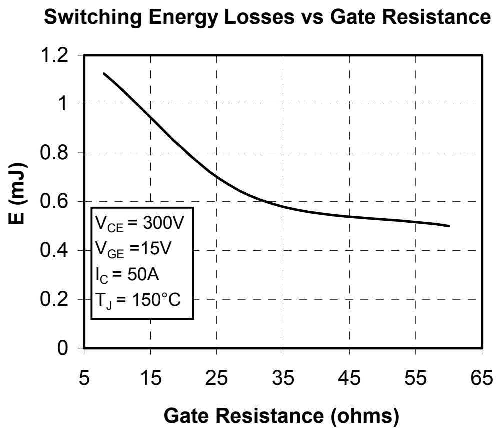


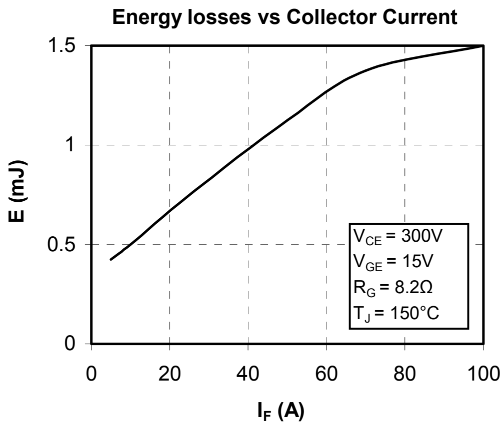


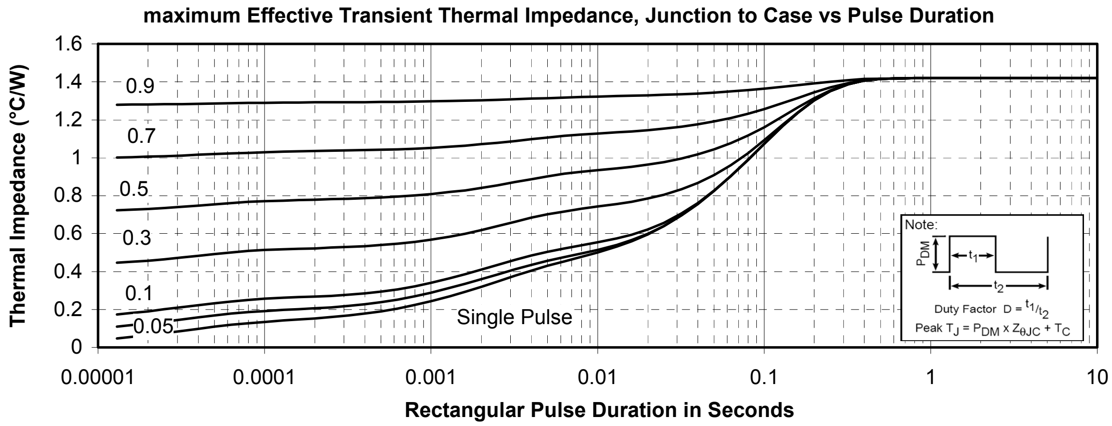


CR5 & CR6 Typical performance curve









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