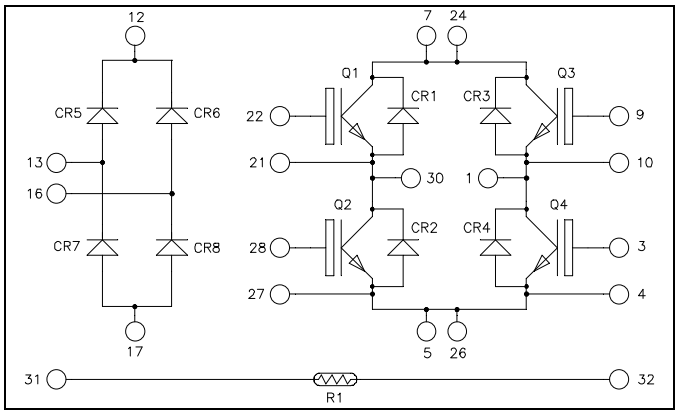
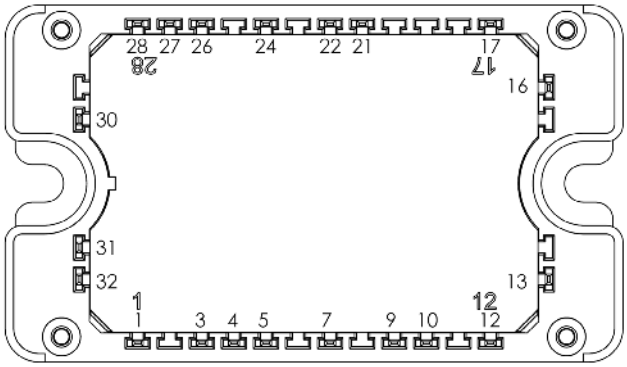
APTGT50H60RT3G

Full bridge + rectifier bridge
Trench + Field Stop IGBT3
Power Module

V_{CES} = 600V
I_C = 50A @ Tc = 80°C





All multiple inputs and outputs must be shorted together
7/24 ; 5/26

Application

- Solar converter

Features

- Trench + Field Stop IGBT3 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
- Solderable terminals both for power and signal for easy PCB mounting
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat
- Low profile
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

1. Full bridge

Absolute maximum ratings (per IGBT)

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	

Electrical Characteristics (per IGBT)

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

Dynamic Characteristics (per IGBT)

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

Reverse diode ratings and characteristics (per diode)

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			250	µA
			T_j = 150°C			500	
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	V
			T_j = 150°C		1.5		
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		0.6		mJ
			T_j = 150°C		1.2		
R_{thJC}	Junction to Case Thermal Resistance					1.42	°C/W

2. Rectifier bridge

Absolute maximum ratings (per diode)

Symbol	*Parameter*			*Max ratings*	*Unit*
V_R	Maximum DC reverse Voltage			600	V
V_{RRM}	Maximum Peak Repetitive Reverse Voltage				
$I_{F(AV)}$	Maximum Average Forward Current	Duty cycle = 50%	T_C = 80°C	40	A
I_{FSM}	Non-Repetitive Forward Surge Current	8.3ms	T_J = 45°C	320	

Electrical Characteristics (per diode)

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_F	Diode Forward Voltage	I_F = 30A			1.8	2.2	V
		I_F = 60A			2.2		
		I_F = 30A	T_j = 125°C		1.5		
I_{RM}	Maximum Reverse Leakage Current	V_R = 600V	T_j = 25°C			250	µA
			T_j = 125°C			500	

Dynamic Characteristics (per diode)

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
t_{rr}	Reverse Recovery Time	I_F=1A,V_R=30V di/dt = 100A/µs	T_j = 25°C		22		ns
t_{rr}	Reverse Recovery Time	I_F = 30A V_R = 400V di/dt = 200A/µs	T_j = 25°C		25		ns
			T_j = 125°C		160		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		35		nC
			T_j = 125°C		480		
I_{RRM}	Reverse Recovery Current		T_j = 25°C		3		A
			T_j = 125°C		6		
t_{rr}	Reverse Recovery Time	I_F = 30A V_R = 400V di/dt = 1000A/µs	T_j = 125°C		85		ns
Q_{rr}	Reverse Recovery Charge				920		µC
I_{RRM}	Reverse Recovery Current				20		A
R_{thJC}	Junction to Case Thermal Resistance					1.2	°C/W

3. Thermal and package characteristics

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		%

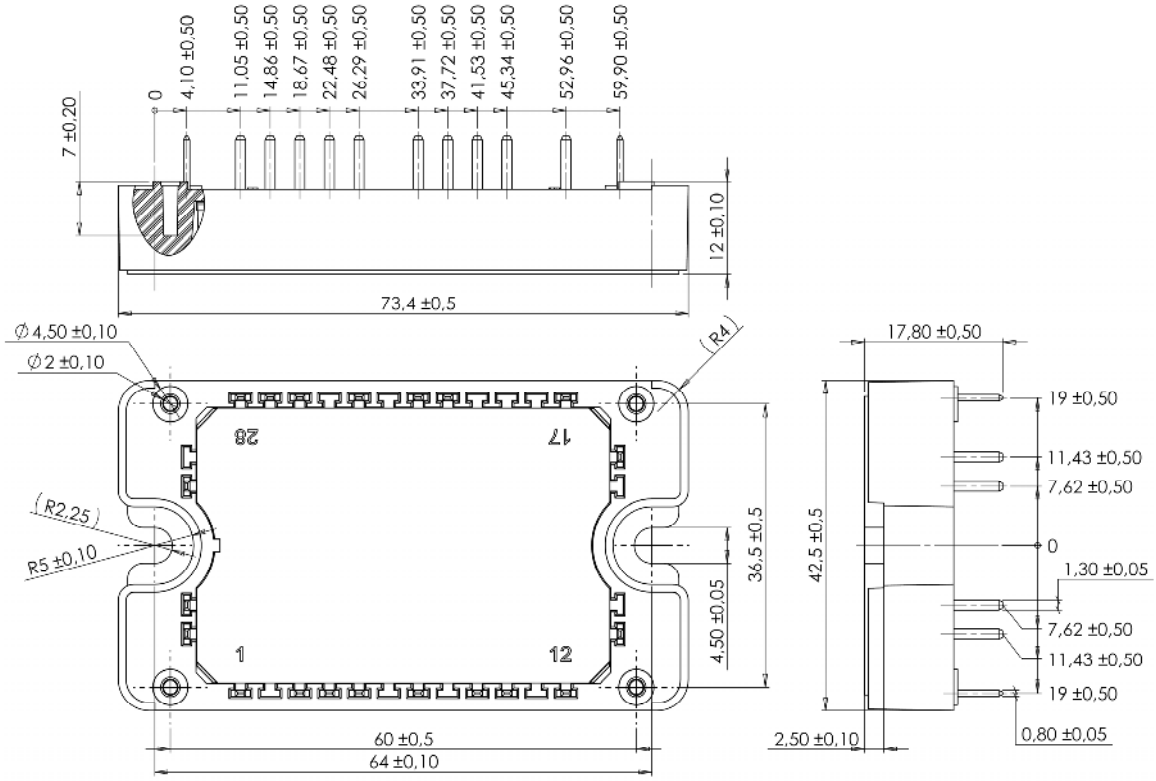
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

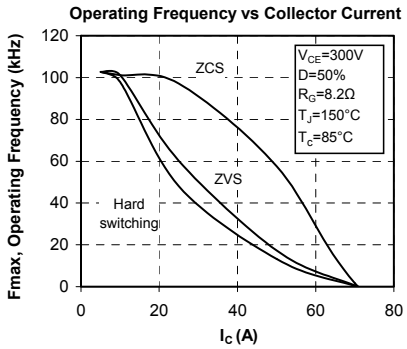
Package characteristics

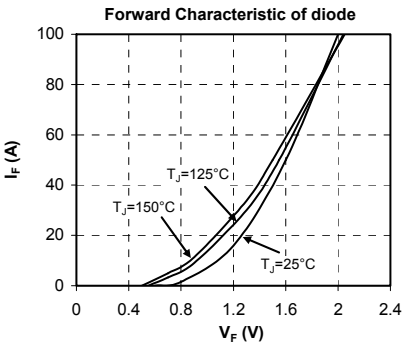
Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		175	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To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

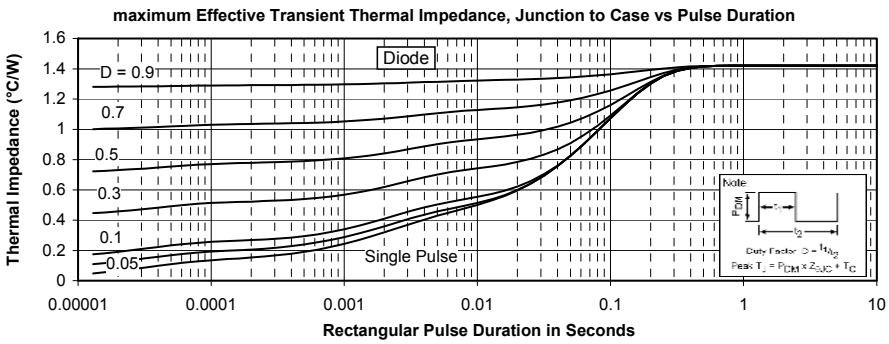
SP3 Package outline (dimensions in mm)



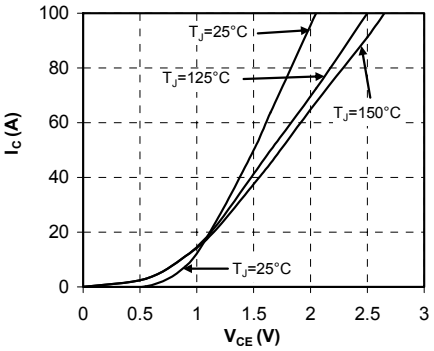
4. Typical full bridge Performance Curve (per IGBT and parallel diode)



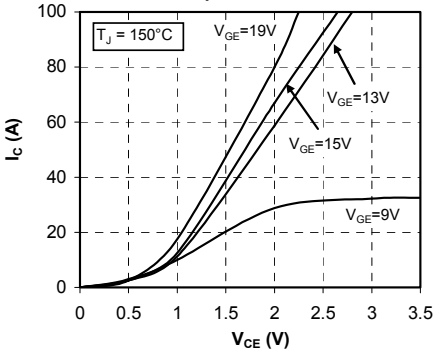




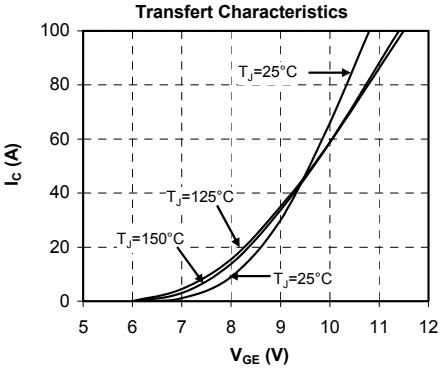
Output Characteristics (V_{GE}=15V)



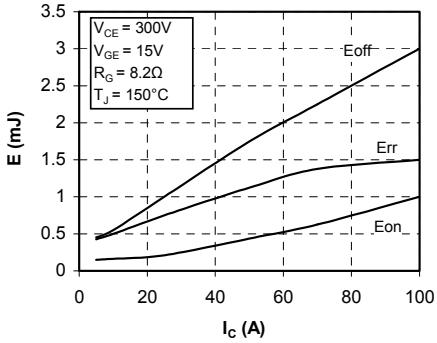
Output Characteristics



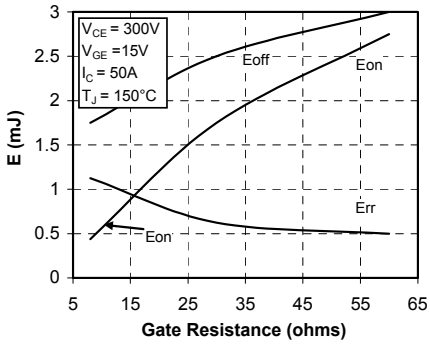
Transfert Characteristics



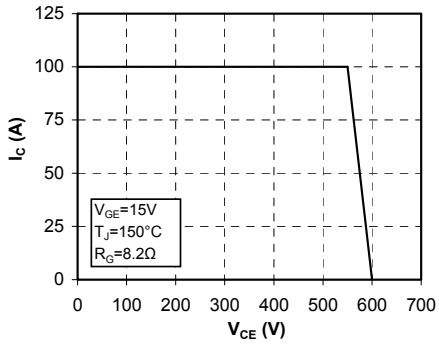
Energy losses vs Collector Current



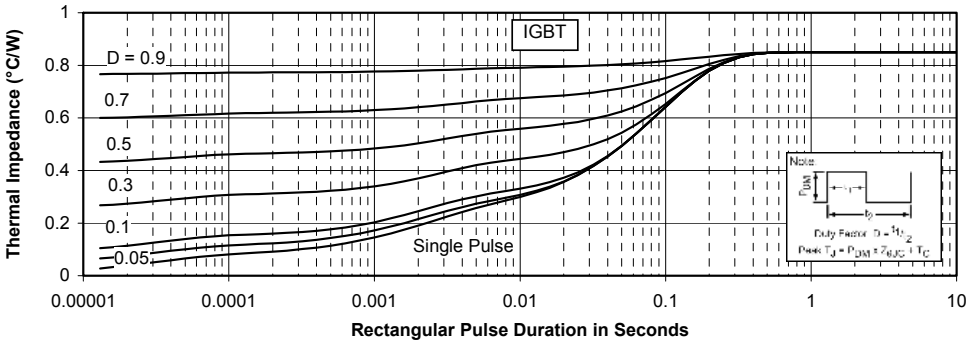
Switching Energy Losses vs Gate Resistance



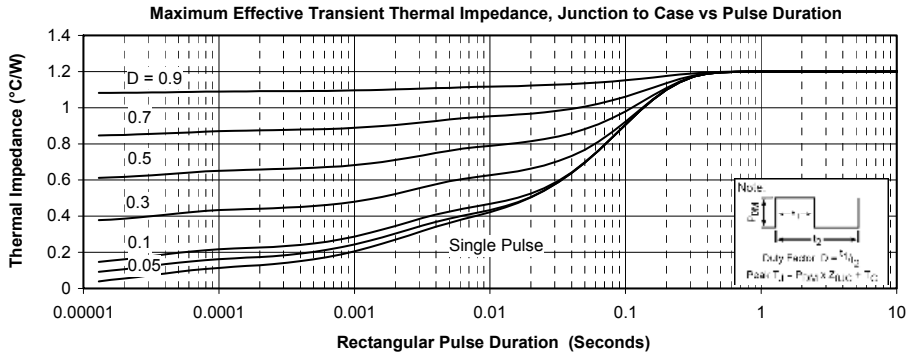
Reverse Bias Safe Operating Area

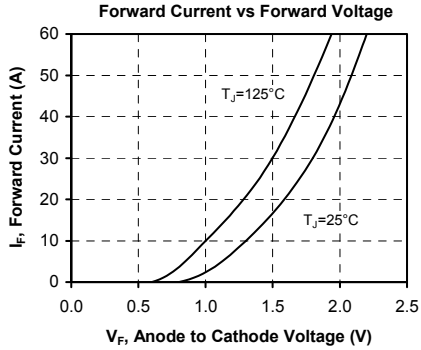


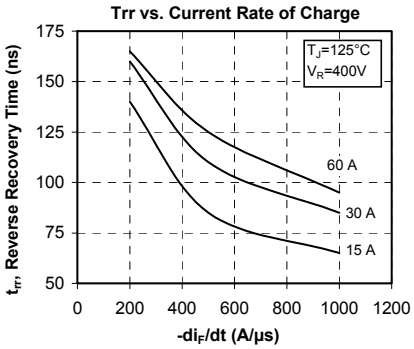
maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration

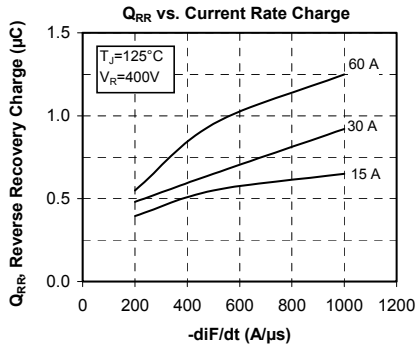


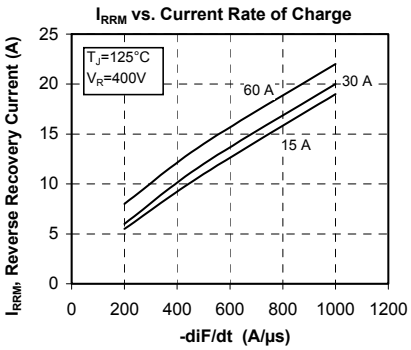
5. Typical rectifier bridge Performance Curve (per diode)

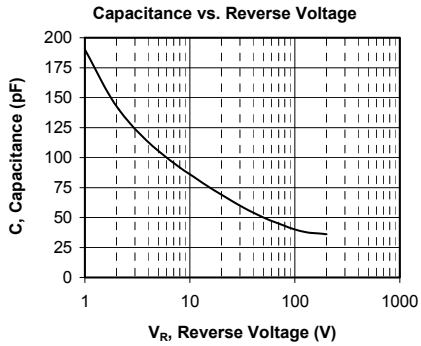












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