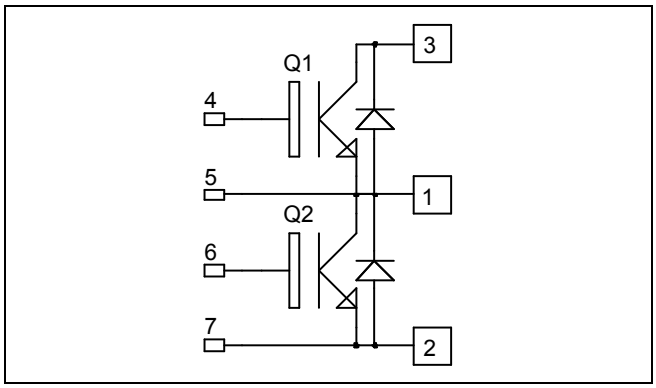
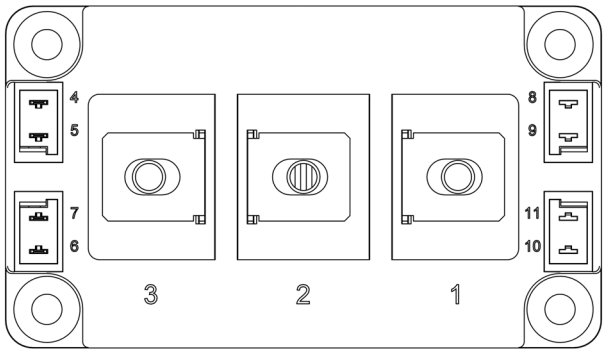
APTGT400A120D3G

Phase leg
Trench + Field Stop IGBT3
Power Module

V_{CES} = 1200V
I_C = 400A @ Tc = 80°C





Application

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

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
- High level of integration
- M6 power connectors

Benefits

- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive T_C of V_{CEsat}
- 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°C	580	A
		T_C = 80°C	400	
I_{CM}	Pulsed Collector Current	T_C = 25°C	800	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_C = 25°C	2100	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 125°C	800A @ 1100V	

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

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V, V_{CE} = 1200V				750	µA
$V_{CE(sat)}$	Collector Emitter saturation Voltage	V_{GE} = 15V, I_C = 400A	T_j = 25°C		1.7	2.1	V
			T_j = 125°C		2.0		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE}, I_C = 12mA		5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				400	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
C_{ies}	Input Capacitance	V_{GE} = 0V ; V_{CE} = 25V, f = 1MHz			29		nF
C_{res}	Reverse Transfer Capacitance				1.3		
Q_G	Gate charge	V_{GE}=±15V, I_C=400A, V_{CE}=600V			3.7		µC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C), V_{GE} = ±15V, V_{Bus} = 600V, I_C = 400A, R_G = 1.8Ω			250		ns
T_r	Rise Time				90		
$T_{d(off)}$	Turn-off Delay Time				550		
T_f	Fall Time				130		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C), V_{GE} = ±15V, V_{Bus} = 600V, I_C = 400A, R_G = 1.8Ω			300		ns
T_r	Rise Time				100		
$T_{d(off)}$	Turn-off Delay Time				650		
T_f	Fall Time				180		
E_{on}	Turn on Energy	V_{GE} = ±15V, V_{Bus} = 600V, I_C = 400A, R_G = 1.8Ω	T_j = 125°C		36		mJ
E_{off}	Turn off Energy		T_j = 125°C		62		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 900V, t_p ≤ 10µs ; T_j = 125°C			1600		A

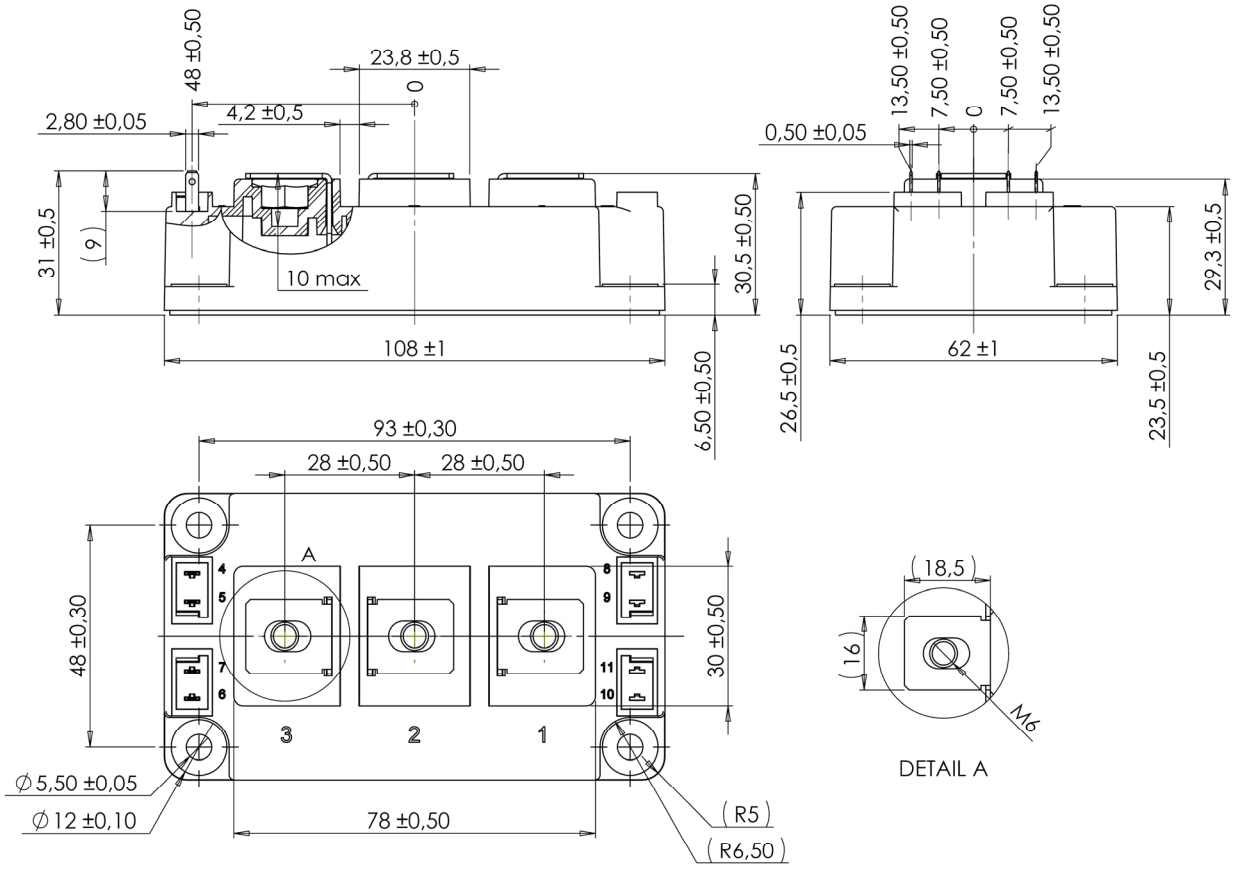
Reverse diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I_{RRM}	Maximum Reverse Leakage Current	V_R=1200V	T_j = 25°C			750	µA
			T_j = 125°C			1000	
I_F	DC Forward Current		Tc = 80°C		400		A
V_F	Diode Forward Voltage	I_F = 400A, V_{GE} = 0V	T_j = 25°C		1.6	2.1	V
			T_j = 125°C		1.6		
t_{rr}	Reverse Recovery Time	I_F = 400A, V_R = 600V, di/dt =4000A/µs	T_j = 25°C		170		ns
			T_j = 125°C		280		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		36		µC
			T_j = 125°C		72		
E_{rr}	Reverse Recovery Energy		T_j = 25°C		20		mJ
			T_j = 125°C		36		

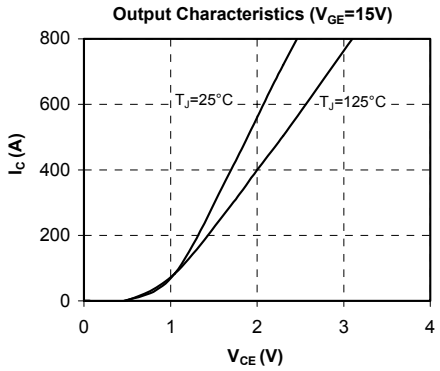
Thermal and package characteristics

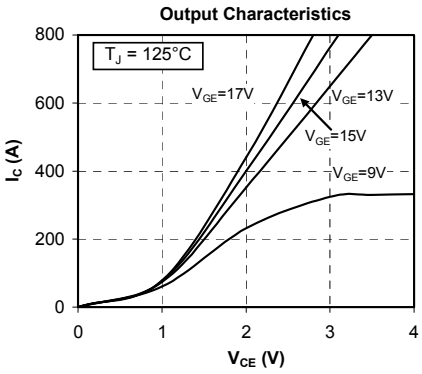
Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance		IGBT			0.06	°C/W
			Diode			0.13	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		125	
Torque	Mounting torque	For terminals	M6	3		5	N.m
		To Heatsink	M6	3		5	
Wt	Package Weight					350	g

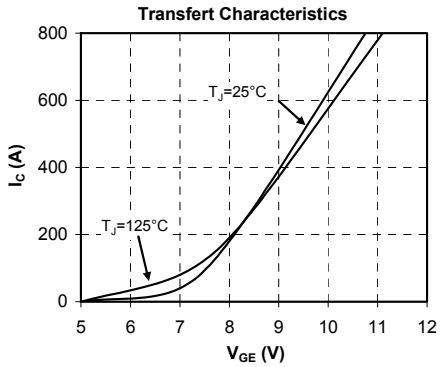
D3 Package outline (dimensions in mm)

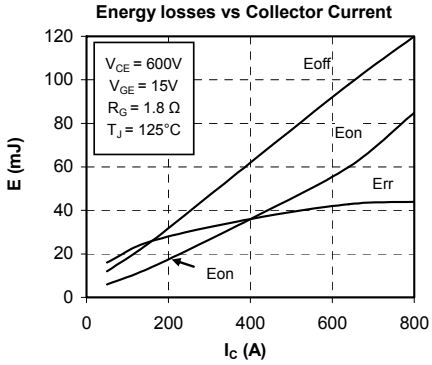


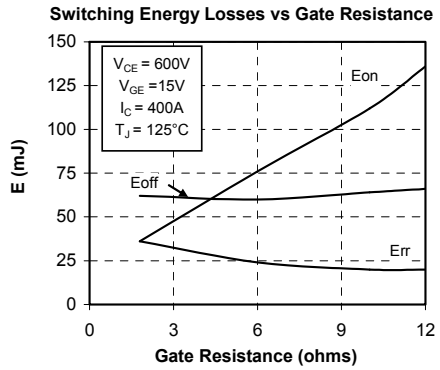
Typical Performance Curve

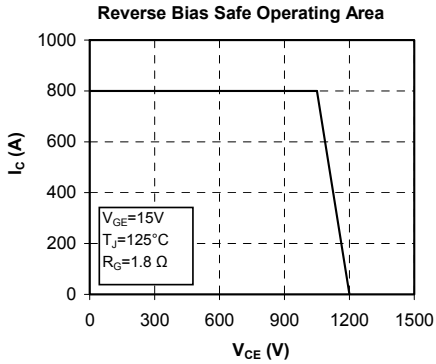


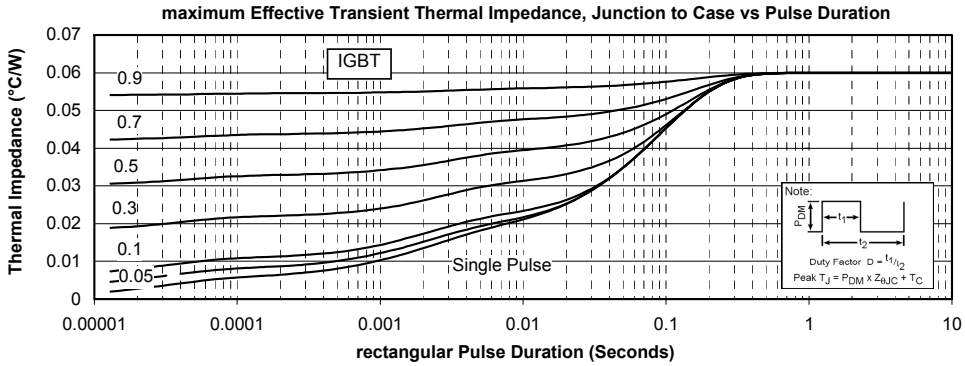




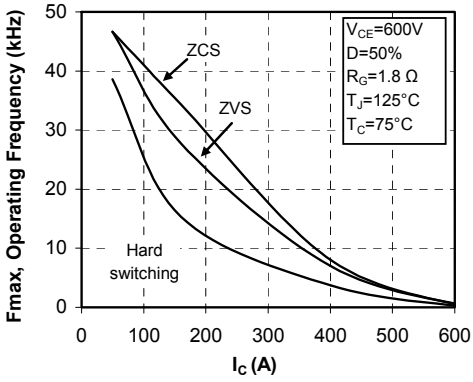




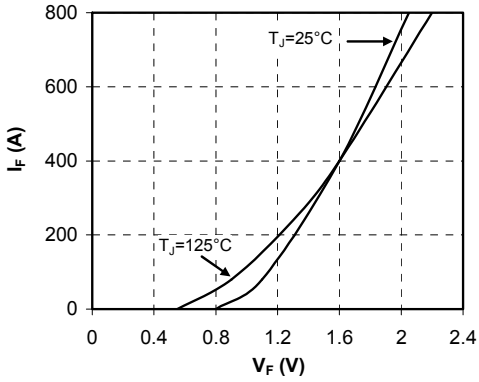




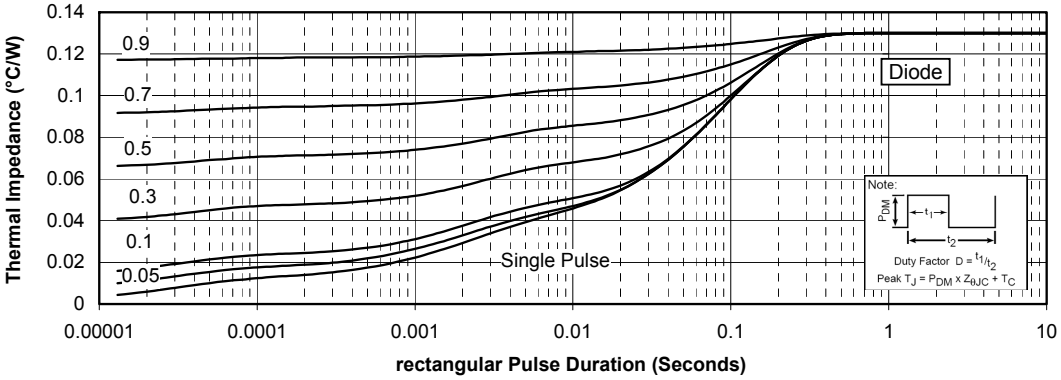
Operating Frequency vs Collector Current



Forward Characteristic of diode



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



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