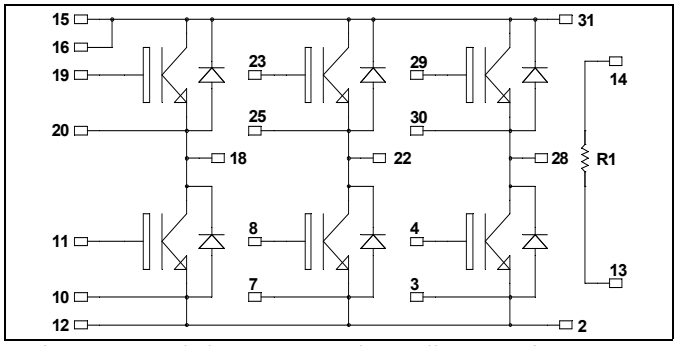
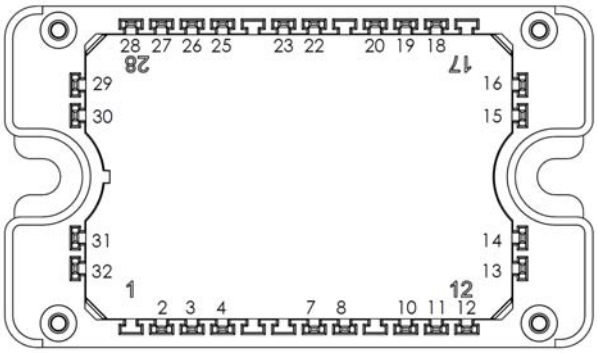
MSCGL40X120T3AG

3 Phase bridge
IGBT4 Power Module

V_{CES} = 1200V
I_C = 40A @ Tc = 100°C



It is recommended to connect a decoupling capacitor between pins 31 & 2 to reduce switching overvoltages, if DC Power is connected between pins 15, 16 & 12.
Pins 15 & 16 must be shorted together.



Application

- Motor control

Features

- **IGBT 4**
  - Low voltage drop
  - Low leakage current
  - Low switching losses
  - Low tail current
- Kelvin emitter for easy drive
- Very low stray inductance
- Internal thermistor for temperature monitoring
- AlN substrate for improved thermal performance

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- RoHS compliant

All ratings @ T_j = 25°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°C	80	A
		T_C = 100°C	40	
I_{CM}	Pulsed Collector Current	T_C = 25°C	90	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Power Dissipation	T_C = 25°C	312	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				250	µA
$V_{CE(sat)}$	Collector Emitter saturation Voltage	V_{GE} = 15V, I_C = 35A	T_j = 25°C		1.85	2.25	V
			T_j = 150°C		2.25		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE}, I_C = 1.2mA		5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				400	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			1950		pF
C_{oes}	Output Capacitance				155		
C_{res}	Reverse Transfer Capacitance				115		
Q_G	Gate charge	V_{GE}= ±15V ; V_{CE}=600V, I_C=35A			0.27		µC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C), V_{GE} = ±15V, V_{CE} = 600V, I_C = 35A, R_G = 12Ω			130		ns
T_r	Rise Time				20		
$T_{d(off)}$	Turn-off Delay Time				300		
T_f	Fall Time				45		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C), V_{GE} = ±15V, V_{CE} = 600V, I_C = 35A, R_G = 12Ω			150		ns
T_r	Rise Time				35		
$T_{d(off)}$	Turn-off Delay Time				350		
T_f	Fall Time				80		
E_{on}	Turn-on Switching Energy	V_{GE} = ±15V, V_{CE} = 600V, I_C = 35A, R_G = 12Ω	T_J = 150°C		4		mJ
E_{off}	Turn-off Switching Energy		T_J = 150°C		3		mJ
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 900V, t_p ≤10µs ; T_j = 150°C			140		A
R_{thJC}	Junction to Case Thermal Resistance					0.48	°C/W

Reverse 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				100	µA
I_F	DC Forward Current		Tc = 100°C		30		A
V_F	Diode Forward Voltage	I_F = 30A			2.6	3.5	V
		I_F = 60A			3.2		
		I_F = 30A	T_j = 125°C		1.8		
t_{rr}	Reverse Recovery Time	I_F = 30A, V_R = 800V, di/dt =200A/µs	T_j = 25°C		300		ns
			T_j = 125°C		380		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		360		nC
			T_j = 125°C		1700		
R_{thJC}	Junction to Case Thermal Resistance					0.84	°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
$\Delta B/B$		T_C=100°C		4		%

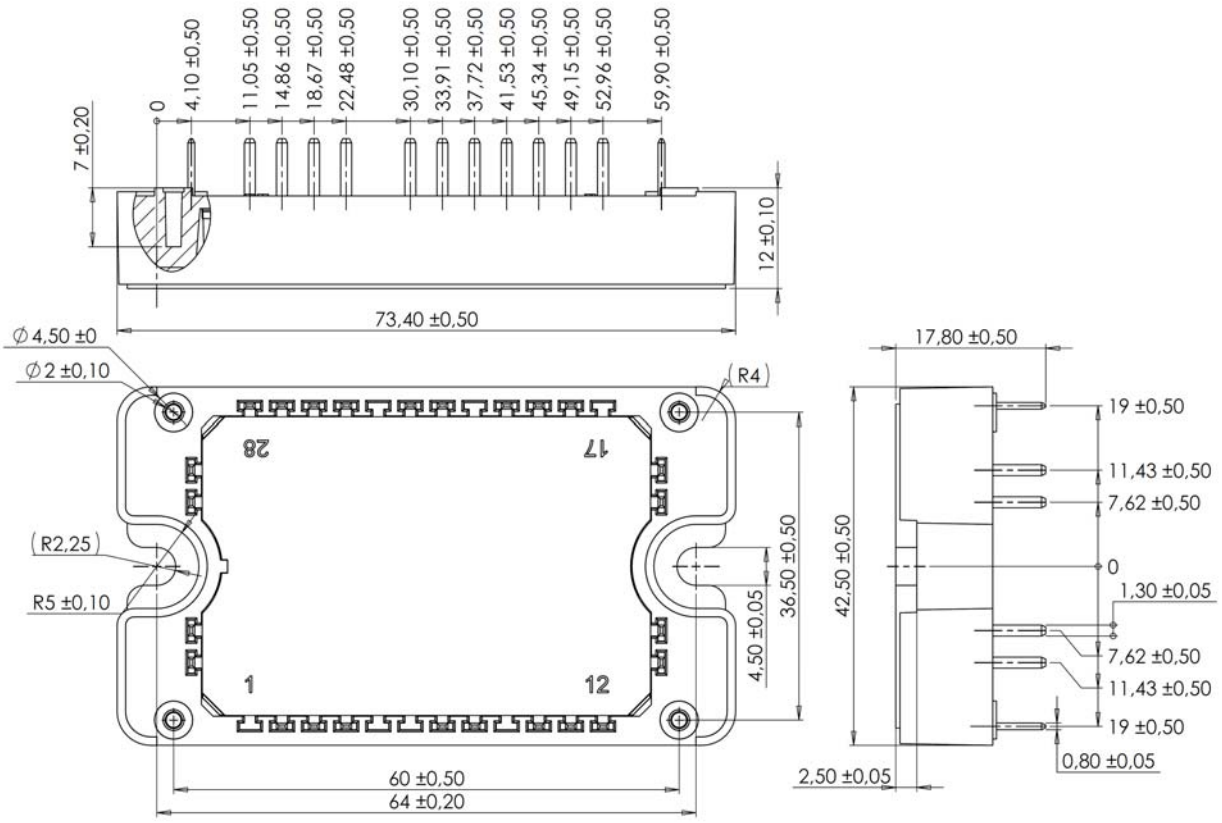
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

Symbol	Characteristic			Min	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_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max -25	
T_{STG}	Storage Temperature Range			-40	125	
T_C	Operating Case Temperature			-40	125	
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

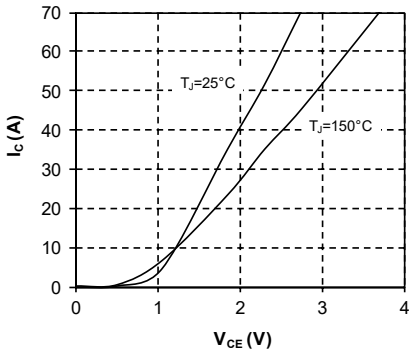
Package outline (dimensions in mm)



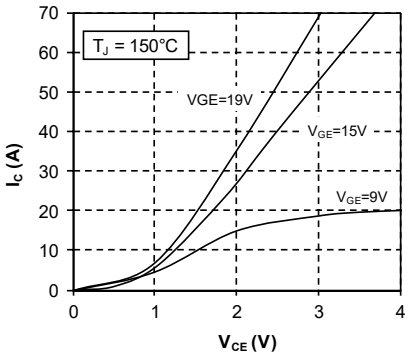
See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

Typical Performance Curve

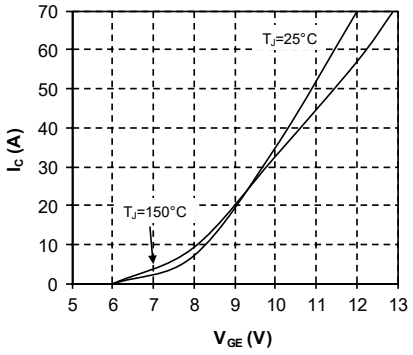
Output Characteristics (V_{GE}=15V)



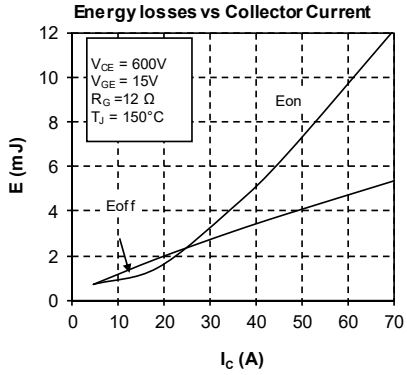
Output Characteristics



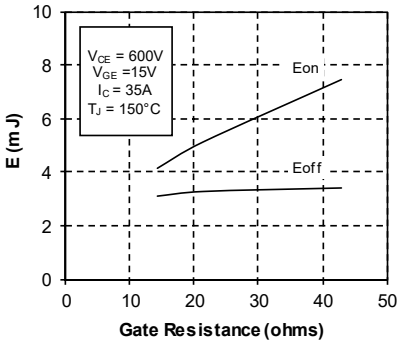
Transfert Characteristics



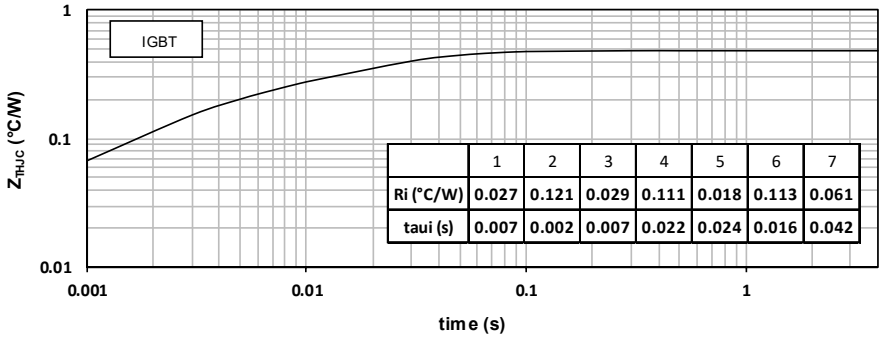
Energy losses vs Collector Current



Switching Energy Losses vs Gate Resistance

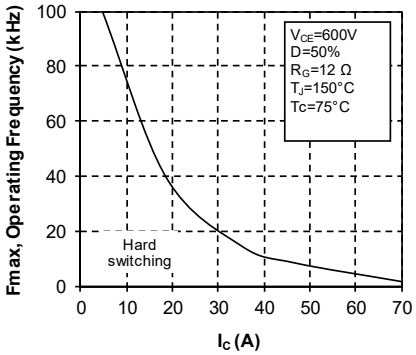


Maximum thermal impedance

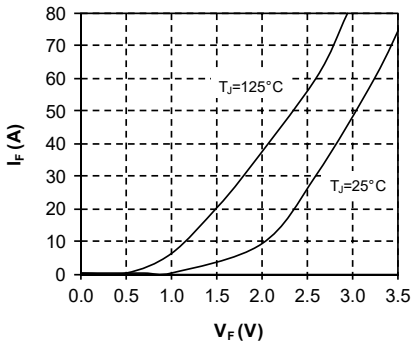


	1	2	3	4	5	6	7
Ri (°C/W)	0.027	0.121	0.029	0.111	0.018	0.113	0.061
taui (s)	0.007	0.002	0.007	0.022	0.024	0.016	0.042

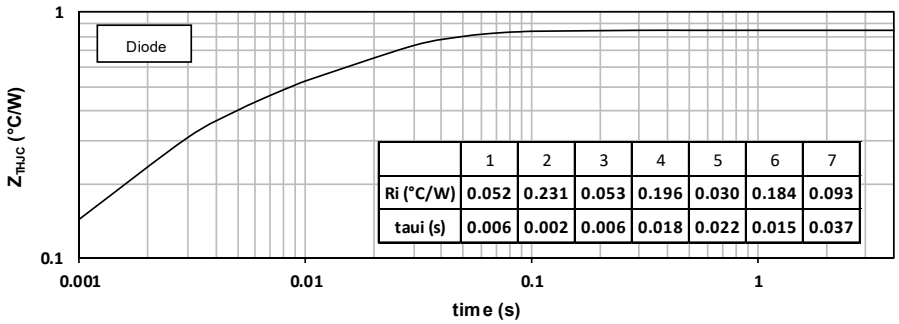
Operating Frequency vs Collector Current



Diode Forward Characteristic



Maximum thermal impedance



	1	2	3	4	5	6	7
Ri (°C/W)	0.052	0.231	0.053	0.196	0.030	0.184	0.093
taui (s)	0.006	0.002	0.006	0.018	0.022	0.015	0.037

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