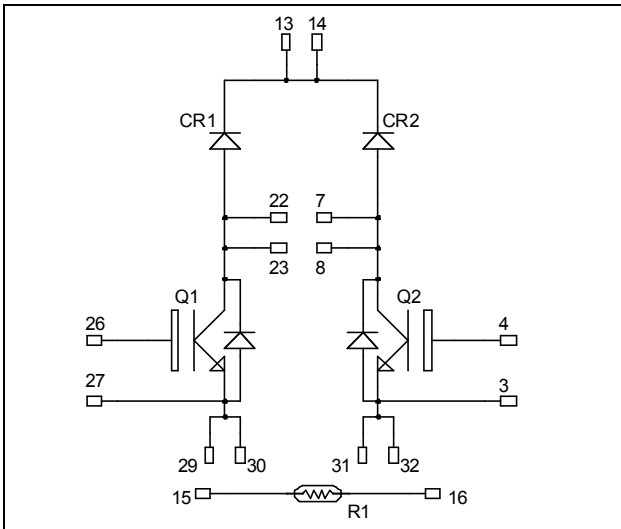


**Dual Boost Chopper
High speed Trench + Field Stop
IGBT4 Power Module**

**$V_{CES} = 650V$
 $I_C = 50A @ T_c = 60^\circ C$**



Application

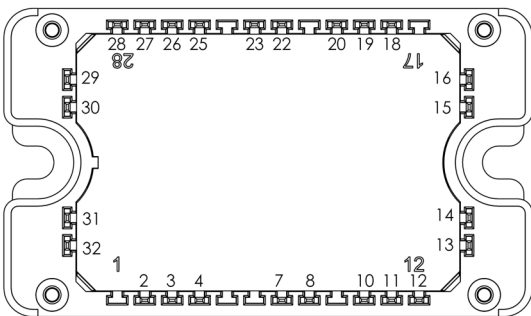
- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction

Features

- **High speed Trench + Field Stop IGBT 4 Technology**
 - Low voltage drop
 - Low leakage current
 - Low switching losses
- Kelvin emitter for easy drive
- Very low stray inductance
- Internal thermistor for temperature monitoring

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
- Easy paralleling due to positive TC of V_{CESat}
- Each leg can be easily paralleled to achieve a single boost of twice the current capability
- RoHS compliant



All multiple inputs and outputs must be shorted together
 Example: 13/14 ; 29/30 ; 22/23 ...

All ratings @ $T_j = 25^\circ C$ unless otherwise specified

Absolute maximum ratings (per IGBT)

Symbol	Parameter	Max ratings	Unit
V_{CES}	Collector - Emitter Voltage	650	V
I_C	Continuous Collector Current	$T_c = 25^\circ C$	70
		$T_c = 60^\circ C$	50
I_{CM}	Pulsed Collector Current	$T_c = 25^\circ C$	140
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Power Dissipation	175	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	$V_{GE} = 0V, V_{CE} = 650V$			50	μA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 50A$	1.4	$T_j = 25^\circ C$ 1.85	2.3	V
		$T_j = 150^\circ C$		2.2		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 0.8 mA$	4.2	5.1	5.6	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			150	nA

Dynamic Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1MHz$		3100		pF
C_{oes}	Output Capacitance			116		
C_{res}	Reverse Transfer Capacitance			90		
Q_G	Gate charge	$V_{GE} = 15V, I_C = 50A$ $V_{CE} = 480V$		315		nC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{Bus} = 400V$ $I_C = 50A$ $R_G = 7\Omega$		19		ns
T_r	Rise Time			33		
$T_{d(off)}$	Turn-off Delay Time			197		
T_f	Fall Time			21		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) $V_{GE} = \pm 15V$ $V_{Bus} = 400V$ $I_C = 50A$ $R_G = 7\Omega$		19		ns
T_r	Rise Time			29		
$T_{d(off)}$	Turn-off Delay Time			227		
T_f	Fall Time			22		
E_{on}	Turn on Energy	$V_{GE} = \pm 15V$ $V_{Bus} = 400V$ $I_C = 50A$		$T_j = 150^\circ C$	1.2	mJ
E_{off}	Turn off Energy	$R_G = 7\Omega$				
I_{sc}	Short Circuit data	$V_{GE} \leq 15V; V_{Bus} = 400V$ $t_p \leq 5\mu s; T_j = 150^\circ C$		350		A
R_{thJC}	Junction to Case Thermal Resistance				0.85	$^\circ C/W$

Chopper Diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{RRM}	Peak Repetitive Reverse Voltage				650	V
I_{RM}	Reverse Leakage Current	$V_R = 650V$			50	μA
I_F	DC Forward Current	$T_c = 25^\circ C$		75		A
V_F	Diode Forward Voltage	$I_F = 75A$ $V_{GE} = 0V$	$T_j = 25^\circ C$	1.6	2	V
			$T_j = 150^\circ C$	1.5		
t_{rr}	Reverse Recovery Time	$I_F = 75A$ $V_R = 300V$ $di/dt = 2000A/\mu s$	$T_j = 25^\circ C$	100		ns
			$T_j = 150^\circ C$	150		
Q_{rr}	Reverse Recovery Charge	$I_F = 75A$ $V_R = 300V$ $di/dt = 2000A/\mu s$	$T_j = 25^\circ C$	3.6		μC
			$T_j = 150^\circ C$	7.6		
E_{rr}	Reverse Recovery Energy	$I_F = 75A$ $V_R = 300V$ $di/dt = 2000A/\mu s$	$T_j = 25^\circ C$	0.85		mJ
			$T_j = 150^\circ C$	1.80		
R_{thJC}	Junction to Case Thermal Resistance				0.98	$^\circ C/W$

IGBT parallel diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V _{RRM}	Peak Repetitive Reverse Voltage					650	V
I _{RM}	Reverse Leakage Current	V _R = 650V				50	μA
I _F	DC Forward Current		T _c = 25°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	I _F = 30A V _R = 300V di/dt = 1800A/μs	T _j = 25°C		1.5		μC
			T _j = 150°C		3.1		
E _{rr}	Reverse Recovery Energy	I _F = 30A V _R = 300V di/dt = 1800A/μs	T _j = 25°C		0.34		mJ
			T _j = 150°C		0.75		
R _{thJC}	Junction to Case Thermal Resistance					2.45	°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
ΔR ₂₅ /R ₂₅			5		%
B _{25/85}	T ₂₅ = 298.15 K		3952		K
ΔB/B			4		%

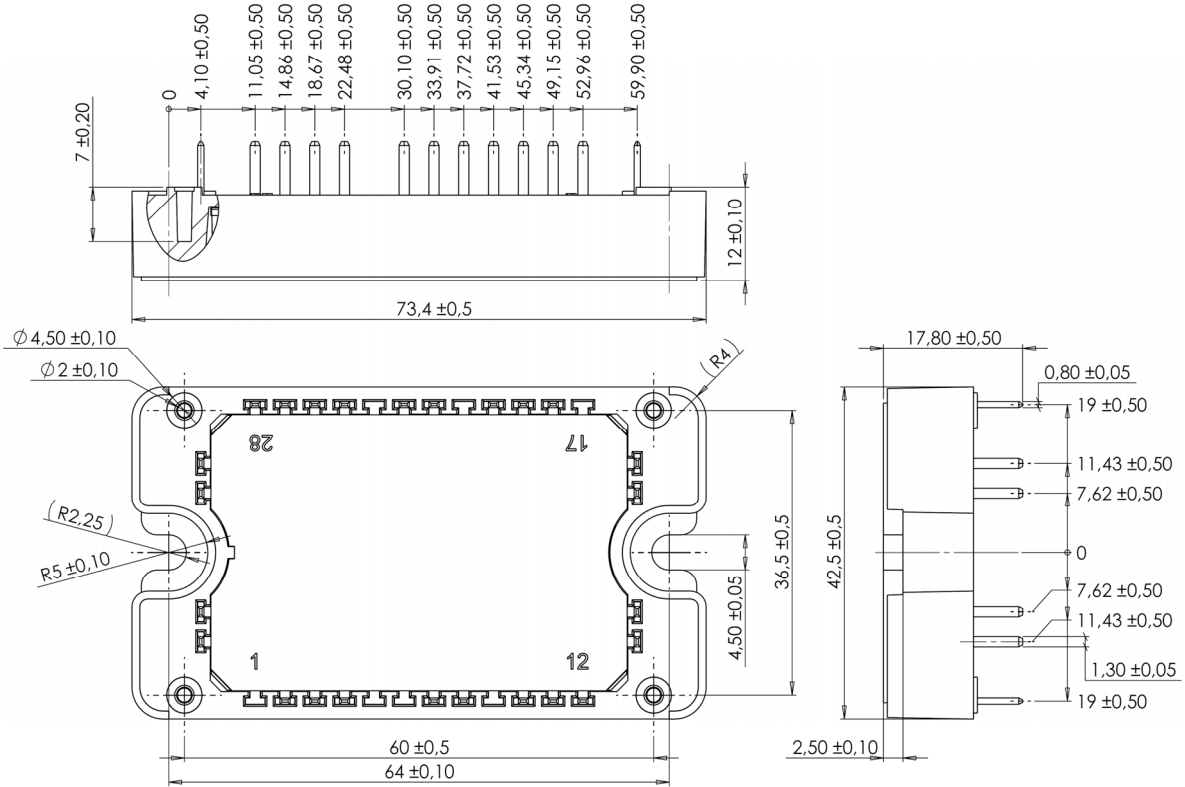
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
 R_T: Thermistor value at T

Thermal and package characteristics

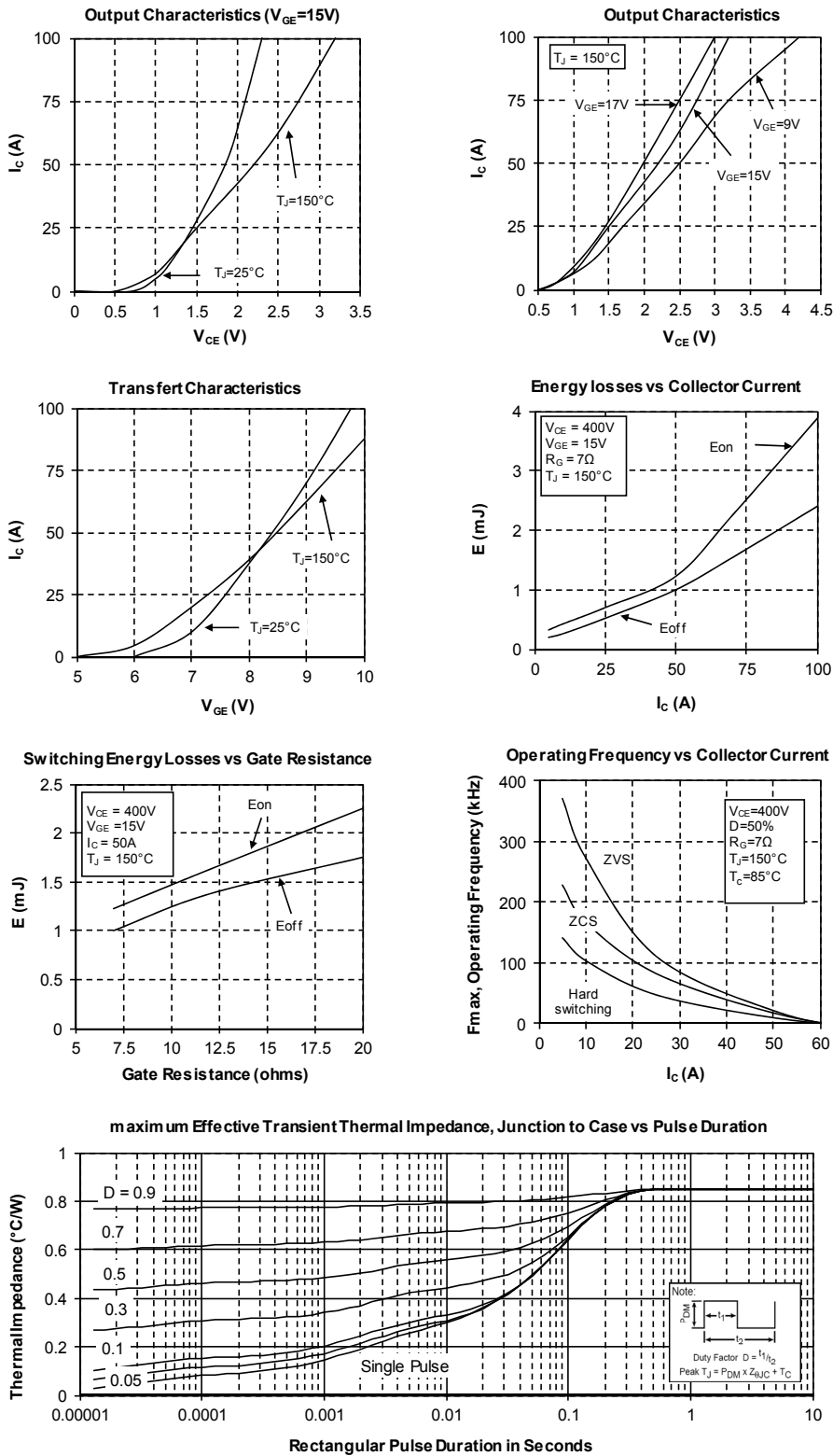
Symbol	Characteristic	Min	Max	Unit		
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000		V		
T _J	Operating junction temperature range	-40	175	°C		
T _{JOP}	Recommended junction temperature under switching conditions	-40	T _{Jmax} -25			
T _{STG}	Storage Temperature Range	-40	125			
T _C	Operating Case Temperature	-40	125			
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

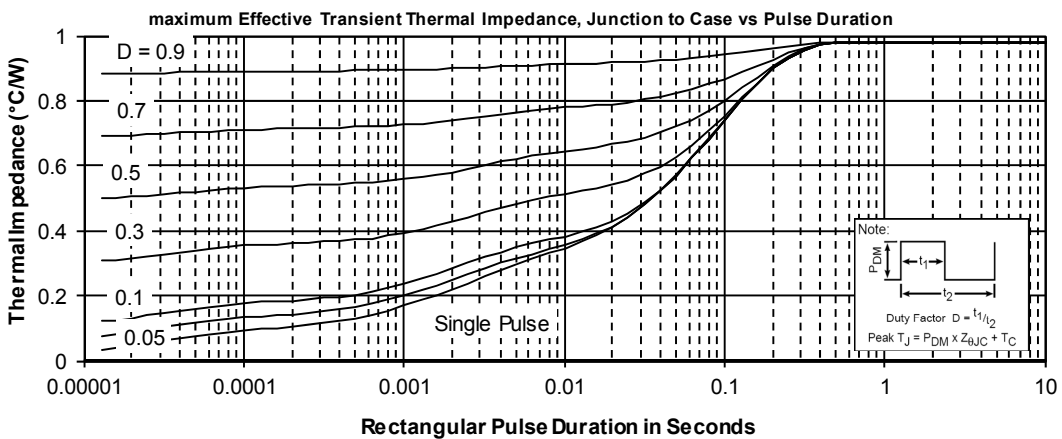
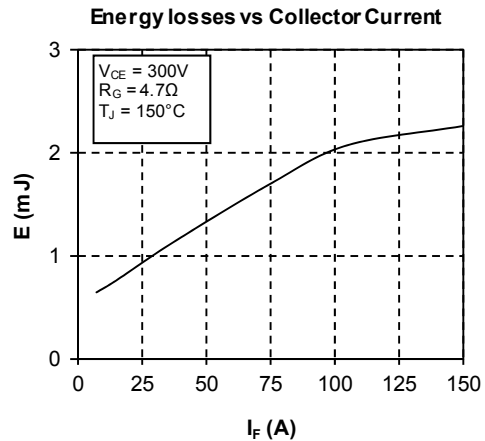
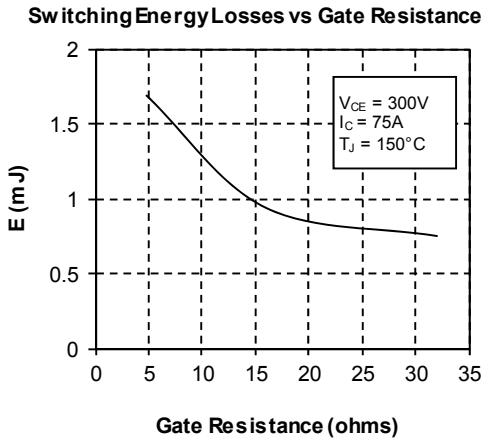
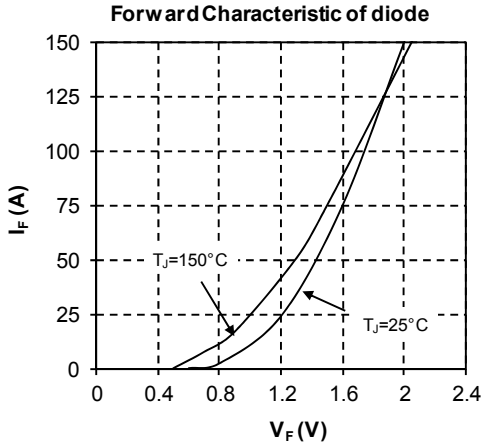
Package outline (dimensions in mm)



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

Typical IGBT Performance Curve



Typical Boost chopper diode Performance Curve


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