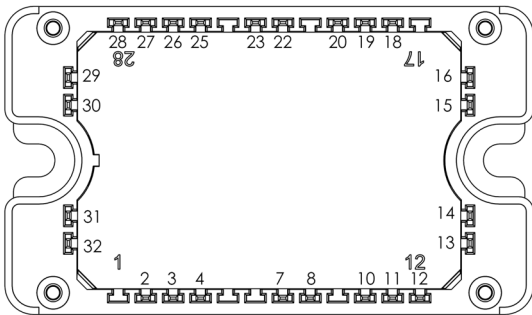
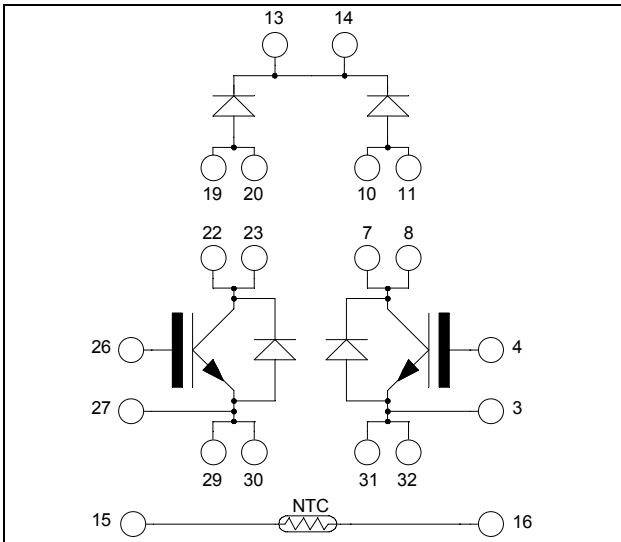


**Dual Boost Chopper  
High speed Trench + Field Stop  
IGBT4 Power Module**

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



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	$\pm 20$	V
$P_D$	Power Dissipation	175	W

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

**Application**

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction (PFC)
- Interleaved PFC

**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

**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	$\mu A$
$V_{CE(sat)}$	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	$V_{GE} = \pm 15V$ $V_{Bus} = 400V$ $I_C = 50A$ $R_G = 7\Omega$		$T_j = 150^\circ C$	1.2	mJ
$E_{off}$	Turn off Energy					
$I_{sc}$	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	$\mu A$
$I_F$	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		$\mu C$
			$T_j = 150^\circ C$	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 <sub>RRM</sub>	Peak Repetitive Reverse Voltage					650	V
I <sub>RM</sub>	Reverse Leakage Current	V <sub>R</sub> = 650V				50	μA
I <sub>F</sub>	DC Forward Current		T <sub>c</sub> = 25°C		30		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 30A V <sub>GE</sub> = 0V	T <sub>j</sub> = 25°C		1.6	2	V
			T <sub>j</sub> = 150°C		1.5		
t <sub>rr</sub>	Reverse Recovery Time		T <sub>j</sub> = 25°C		100		ns
			T <sub>j</sub> = 150°C		150		
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 30A V <sub>R</sub> = 300V di/dt = 1800A/μs	T <sub>j</sub> = 25°C		1.5		μC
			T <sub>j</sub> = 150°C		3.1		
E <sub>rr</sub>	Reverse Recovery Energy		T <sub>j</sub> = 25°C		0.34		mJ
			T <sub>j</sub> = 150°C		0.75		
R <sub>thJC</sub>	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 <sub>25</sub>	Resistance @ 25°C		50		kΩ
ΔR <sub>25</sub> /R <sub>25</sub>			5		%
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K
ΔB/B			4		%

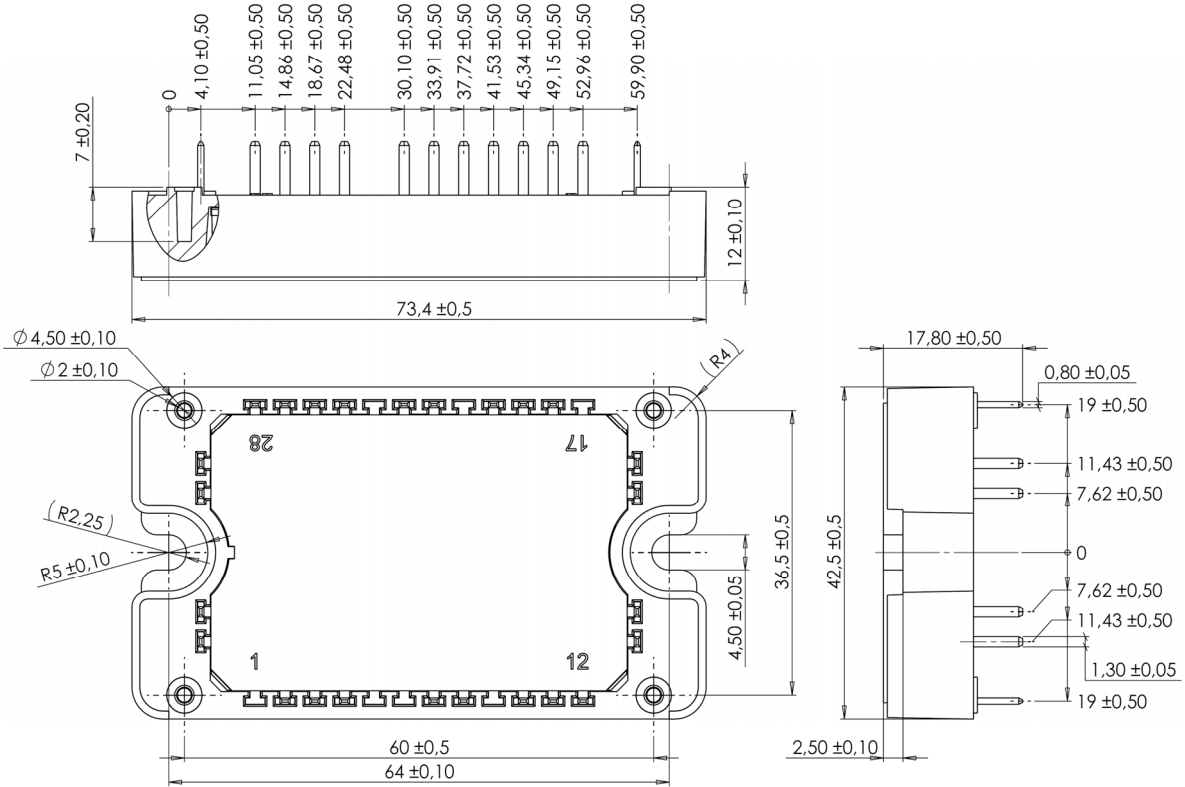
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

**Thermal and package characteristics**

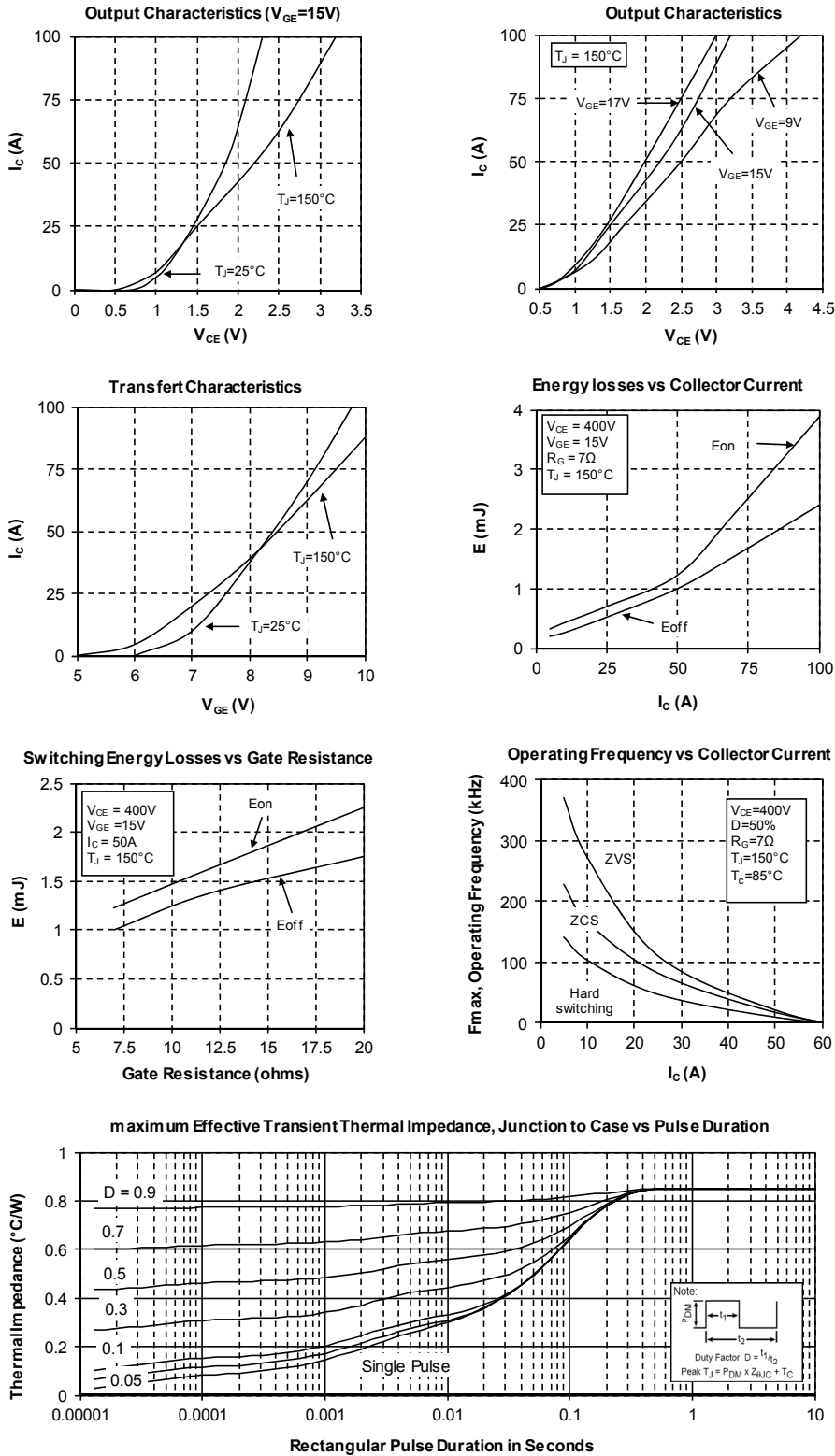
Symbol	Characteristic	Min	Max	Unit		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000		V		
T <sub>J</sub>	Operating junction temperature range	-40	175	°C		
T <sub>JOP</sub>	Recommended junction temperature under switching conditions	-40	T <sub>Jmax</sub> -25			
T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

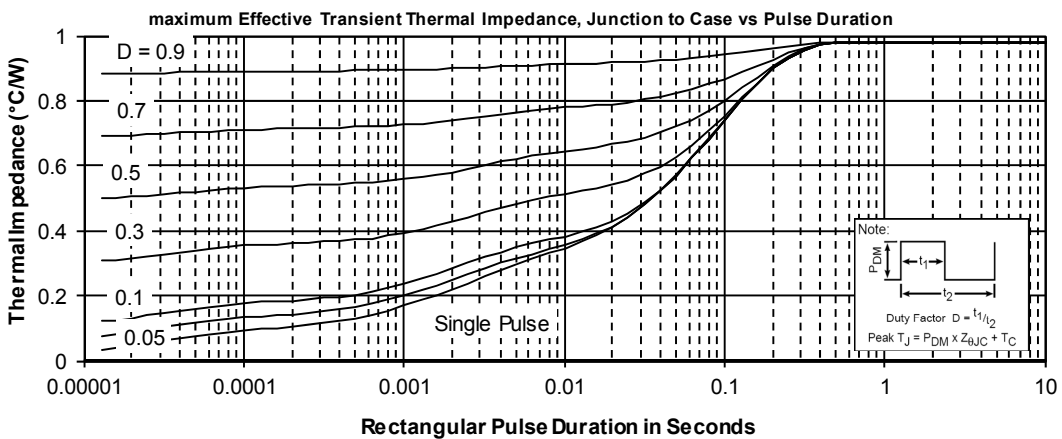
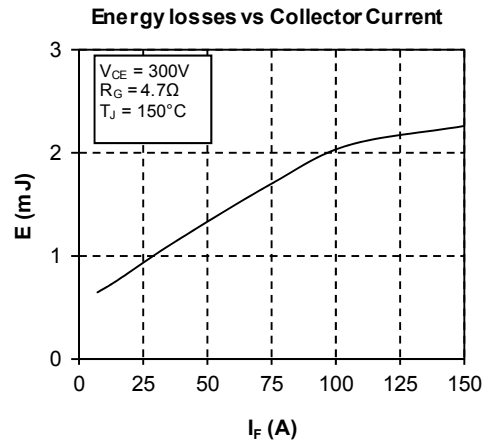
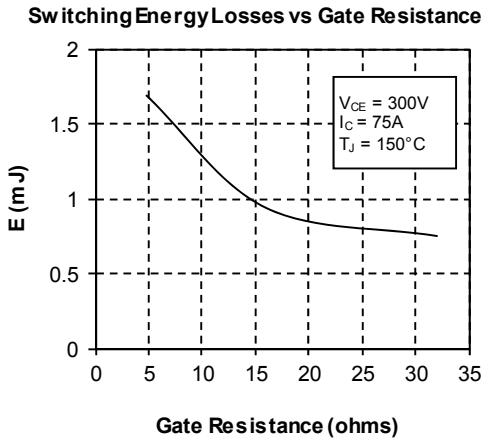
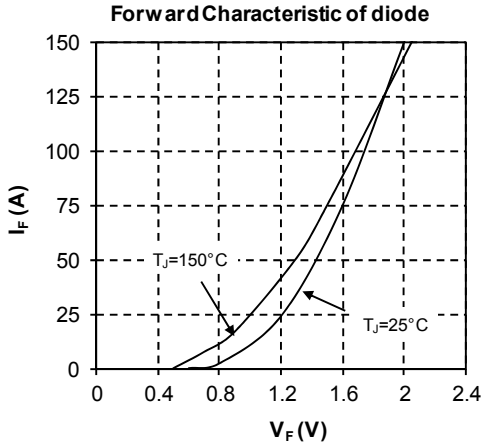
**Package outline** (dimensions in mm)



See application note 1906 - Mounting Instructions for SP3F Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical IGBT Performance Curve



**Typical Boost chopper diode Performance Curve**


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