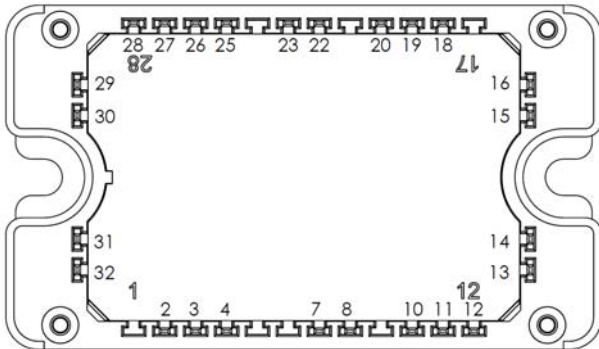
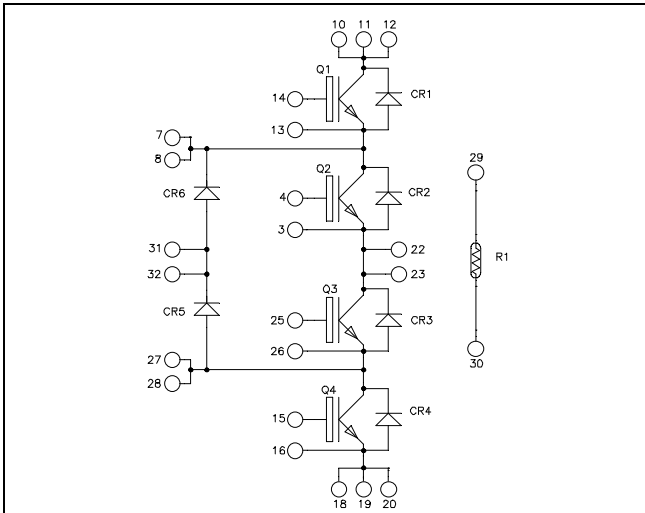


**Three level inverter  
Trench + Field Stop IGBT3  
Power Module**

**$V_{CES} = 600V$   
 $I_C = 50A @ T_c = 80^\circ C$**



All multiple inputs and outputs must be shorted together  
 Example: 10/11/12 ; 7/8 ...

### Application

- Solar converter
- Uninterruptible Power Supplies

### Features

- Trench + Field Stop IGBT3
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 20 kHz
  - 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
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Low profile
- RoHS Compliant

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

### Q1 to Q4 Absolute maximum ratings (per IGBT)

Symbol	Parameter	Max ratings	Unit
$V_{CES}$	Collector - Emitter Voltage	600	V
$I_C$	Continuous Collector Current	$T_C = 25^\circ C$	80
		$T_C = 80^\circ C$	50
$I_{CM}$	Pulsed Collector Current	$T_C = 25^\circ C$	100
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Power Dissipation	$T_C = 25^\circ C$	176
RBSOA	Reverse Bias Safe Operating Area	$T_J = 150^\circ C$	100A @ 550V

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

**Q1 to Q4 Electrical Characteristics (per IGBT)**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I <sub>CEs</sub>	Zero Gate Voltage Collector Current	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 600V			250	μA
V <sub>CE(sat)</sub>	Collector Emitter Saturation Voltage	V <sub>GE</sub> = 15V		1.5	1.9	V
		I <sub>C</sub> = 50A	T <sub>j</sub> = 25°C			
V <sub>GE(th)</sub>	Gate Threshold Voltage	V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 600μA	5.0	5.8	6.5	V
I <sub>GES</sub>	Gate – Emitter Leakage Current	V <sub>GE</sub> = 20V, V <sub>CE</sub> = 0V			600	nA

**Q1 to Q4 Dynamic Characteristics (per IGBT)**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C <sub>ies</sub>	Input Capacitance	V <sub>GE</sub> = 0V V <sub>CE</sub> = 25V f = 1MHz		3150		pF
C <sub>oes</sub>	Output Capacitance			200		
C <sub>res</sub>	Reverse Transfer Capacitance			95		
Q <sub>G</sub>	Gate charge	V <sub>GE</sub> = ±15V, I <sub>C</sub> = 50A V <sub>CE</sub> = 300V		0.5		μC
T <sub>d(on)</sub>	Turn-on Delay Time	Inductive Switching (25°C) V <sub>GE</sub> = ±15V V <sub>Bus</sub> = 300V I <sub>C</sub> = 50A R <sub>G</sub> = 8.2Ω		110		ns
T <sub>r</sub>	Rise Time			45		
T <sub>d(off)</sub>	Turn-off Delay Time			200		
T <sub>f</sub>	Fall Time			40		
T <sub>d(on)</sub>	Turn-on Delay Time	Inductive Switching (150°C) V <sub>GE</sub> = ±15V V <sub>Bus</sub> = 300V I <sub>C</sub> = 50A R <sub>G</sub> = 8.2Ω		120		ns
T <sub>r</sub>	Rise Time			50		
T <sub>d(off)</sub>	Turn-off Delay Time			250		
T <sub>f</sub>	Fall Time			60		
E <sub>on</sub>	Turn-on Switching Energy	V <sub>GE</sub> = ±15V V <sub>Bus</sub> = 300V	T <sub>j</sub> = 150°C	0.43		mJ
E <sub>off</sub>	Turn-off Switching Energy	I <sub>C</sub> = 50A R <sub>G</sub> = 8.2Ω		T <sub>j</sub> = 150°C	1.75	
I <sub>sc</sub>	Short Circuit data	V <sub>GE</sub> ≤ 15V ; V <sub>Bus</sub> = 360V t <sub>p</sub> ≤ 6μs ; T <sub>j</sub> = 150°C		250		A
R <sub>thJC</sub>	Junction to Case Thermal Resistance				0.85	°C/W

**CR1 to CR4 diode ratings and characteristics (per diode)**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V <sub>RRM</sub>	Peak Repetitive Reverse Voltage				600	V
I <sub>RM</sub>	Reverse Leakage Current	V <sub>R</sub> = 600V			150	μA
I <sub>F</sub>	DC Forward Current			30		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 30A V <sub>GE</sub> = 0V	T <sub>c</sub> = 80°C			
			T <sub>j</sub> = 25°C		1.6	2
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 30A V <sub>R</sub> = 300V di/dt = 1800A/μs	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	I <sub>F</sub> = 30A V <sub>R</sub> = 300V di/dt = 1800A/μs	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

**CR5 & CR6 diode ratings and characteristics (per diode)**

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V <sub>RRM</sub>	Peak Repetitive Reverse Voltage					600	V
I <sub>RM</sub>	Reverse Leakage Current	V <sub>R</sub> =600V				150	μA
I <sub>F</sub>	DC Forward current	T <sub>c</sub> = 80°C			50		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 50A 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	I <sub>F</sub> = 50A V <sub>R</sub> = 300V di/dt = 1800A/μs	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> = 50A V <sub>R</sub> = 300V di/dt = 1800A/μs	T <sub>j</sub> = 25°C		2.6		μC
			T <sub>j</sub> = 150°C		5.4		
E <sub>rr</sub>	Reverse Recovery Energy	I <sub>F</sub> = 50A V <sub>R</sub> = 300V di/dt = 1800A/μs	T <sub>j</sub> = 25°C		0.60		mJ
			T <sub>j</sub> = 150°C		1.20		
R <sub>thJC</sub>	Junction to Case Thermal Resistance					1.42	°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	T <sub>C</sub> = 100°C		4		%

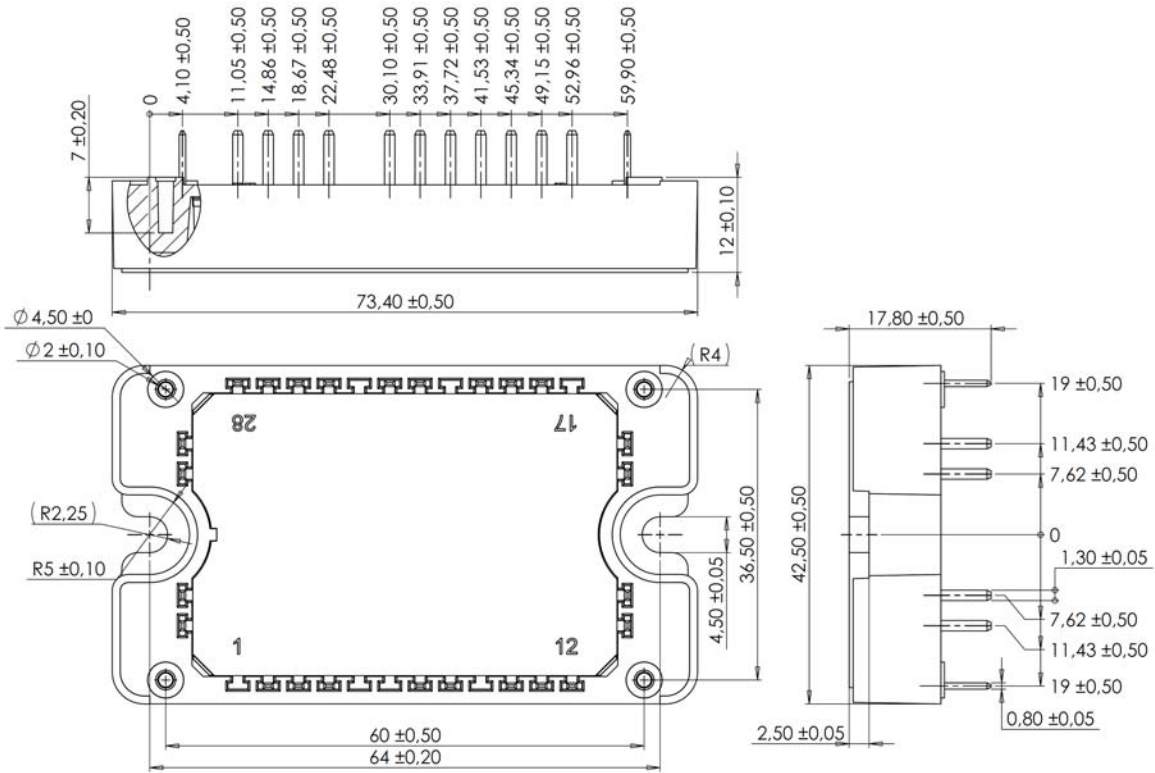
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature  
 R<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

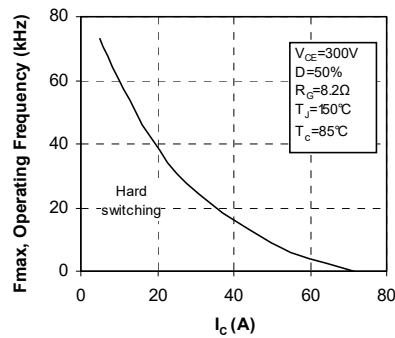
**Package outline (dimensions in mm)**

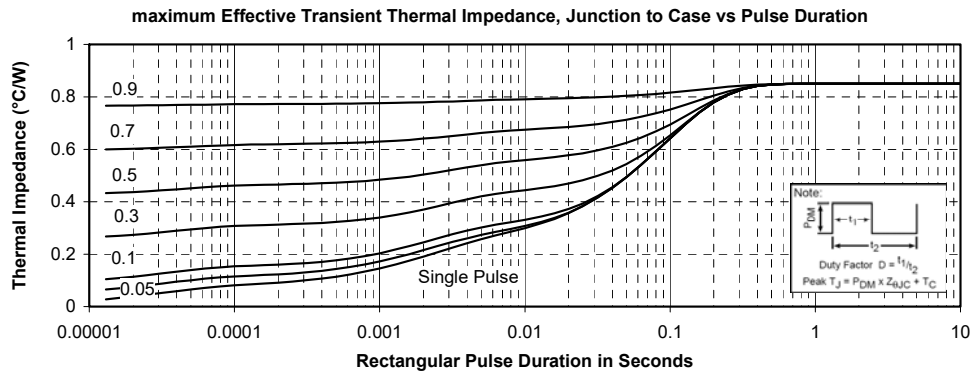
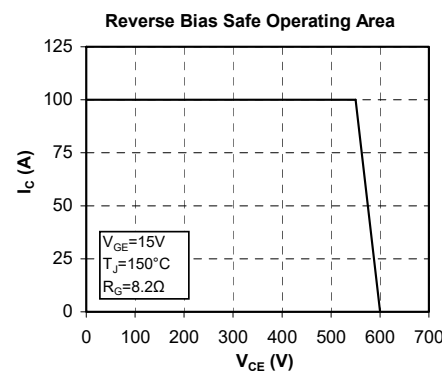
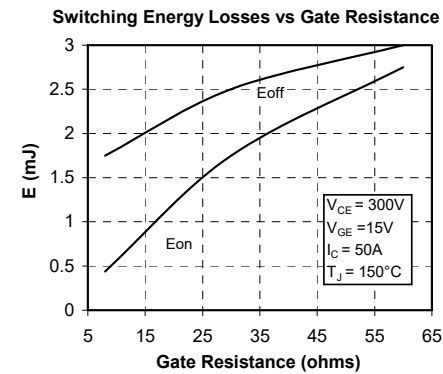
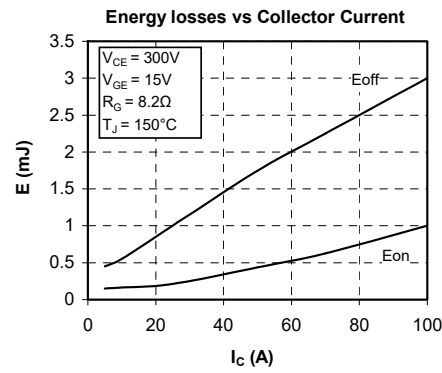
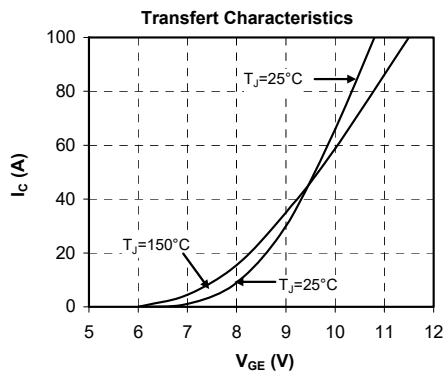
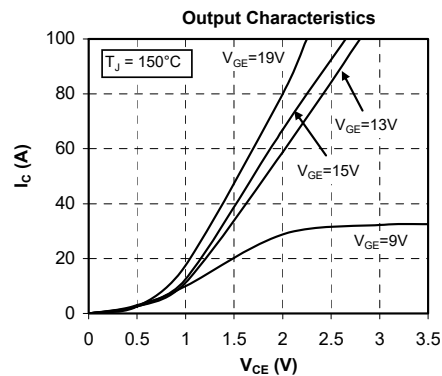
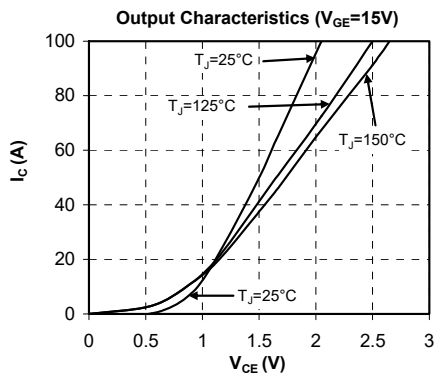


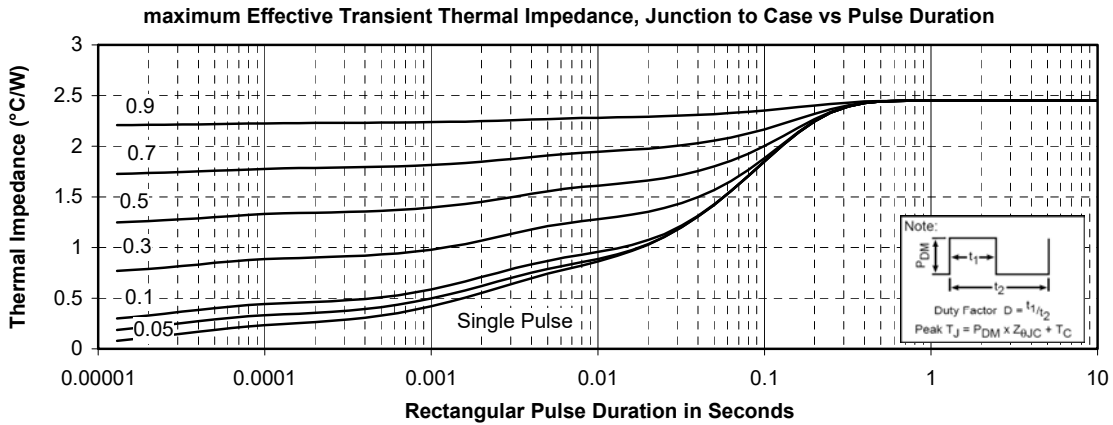
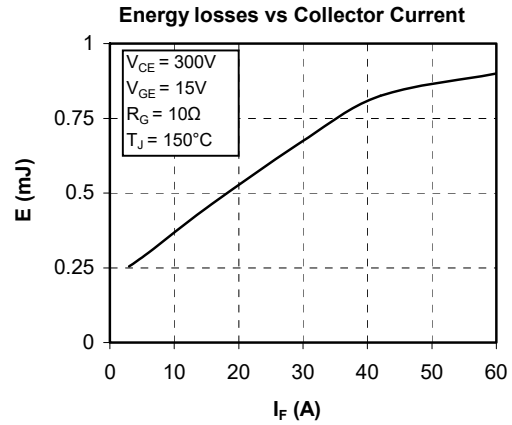
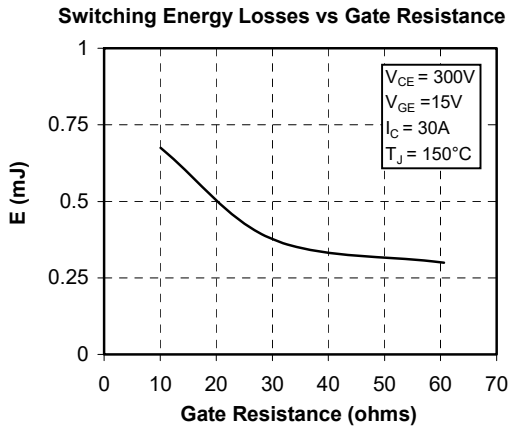
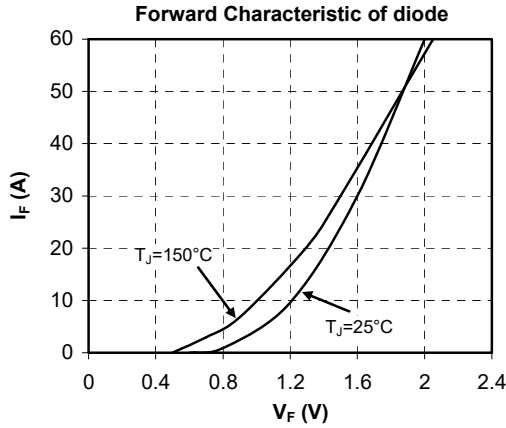
See application note 1906 - Mounting Instructions for SP3F Power Modules on [www.microsemi.com](http://www.microsemi.com)

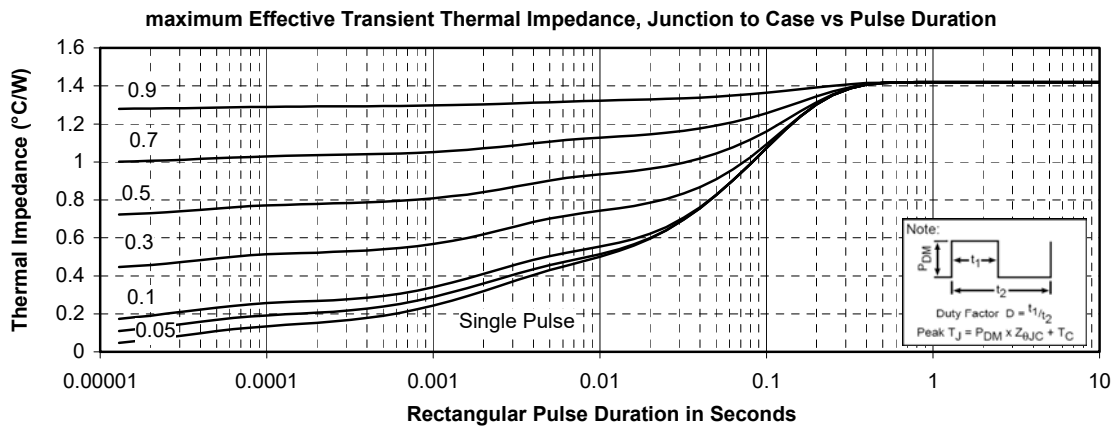
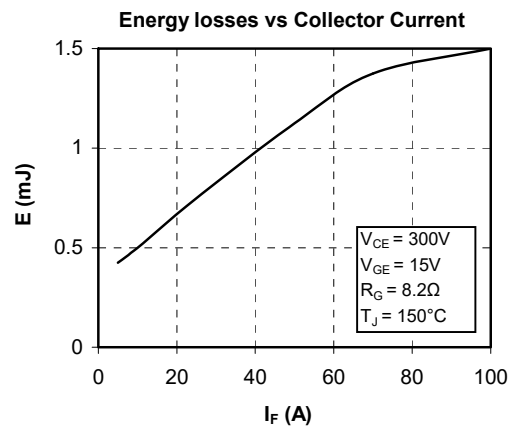
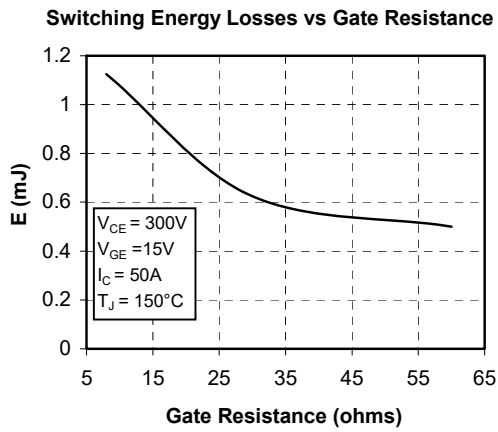
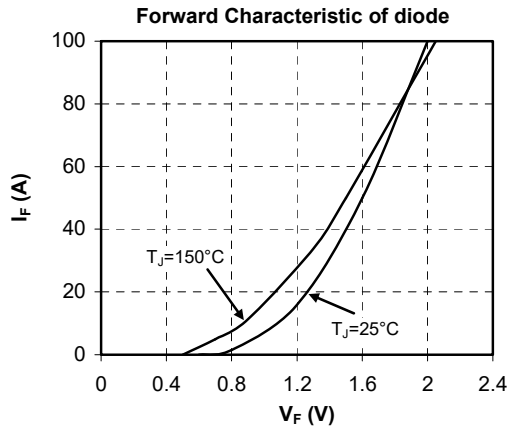
**Q1 to Q4 Typical performance curve**

**Operating Frequency vs Collector Current**





**CR1 to CR4 Typical performance curve**


**CR5 & CR6 Typical performance curve**


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