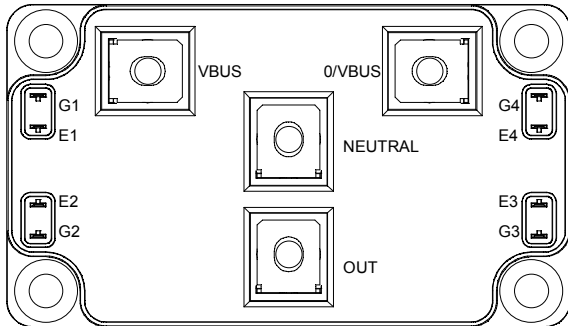
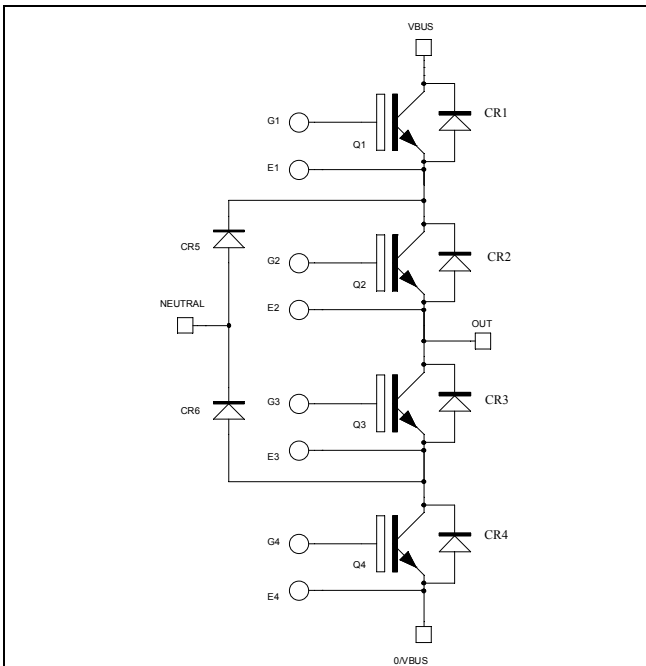


**Three level inverter  
Trench + Field Stop IGBT  
Power Module**

**$V_{CES} = 1700V$   
 $I_C = 100A @ T_c = 80^\circ C$**



### Application

- Solar converter
- Uninterruptible Power Supplies

### Features

- Trench + Field Stop IGBT 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
- Very low stray inductance
  - Symmetrical design
  - M5 power connectors
- High level of integration

### Benefits

- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat
- Low profile
- RoHS Compliant

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

Symbol	Parameter		Max ratings	Unit
$V_{CES}$	Collector - Emitter Breakdown Voltage		1700	V
$I_C$	Continuous Collector Current	$T_c = 25^\circ C$	150	A
		$T_c = 80^\circ C$	100	
$I_{CM}$	Pulsed Collector Current	$T_c = 25^\circ C$	200	
$V_{GE}$	Gate - Emitter Voltage		$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	560	W
RBSOA	Reverse Bias Safe Operating Area	$T_j = 125^\circ C$	200A @ 1600V	

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://www.microsemi.com)

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

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

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{GE} = 0V, V_{CE} = 1700V$			350	$\mu\text{A}$
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 100A$	$T_j = 25^\circ\text{C}$	2.0	2.4	V
			$T_j = 125^\circ\text{C}$	2.4		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 2mA$	5.0	5.8	6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			500	nA

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

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0V$		9		nF
$C_{oes}$	Output Capacitance	$V_{CE} = 25V$		0.36		
$C_{res}$	Reverse Transfer Capacitance	$f = 1MHz$		0.3		
$Q_G$	Gate charge	$V_{GE} = \pm 15V, I_C = 100A$ $V_{CE} = 900V$		1.2		$\mu\text{C}$
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ )		370		ns
$T_r$	Rise Time	$V_{GE} = 15V$		40		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 900V$		650		
$T_f$	Fall Time	$I_C = 100A$ $R_G = 4.7 \Omega$		180		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $125^\circ\text{C}$ )		400		ns
$T_r$	Rise Time	$V_{GE} = 15V$		50		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 900V$		800		
$T_f$	Fall Time	$I_C = 100A$ $R_G = 4.7 \Omega$		300		
$E_{on}$	Turn-on Switching Energy	$V_{GE} = 15V$ $V_{Bus} = 900V$	$T_j = 125^\circ\text{C}$	32		mJ
$E_{off}$	Turn-off Switching Energy	$I_C = 100A$ $R_G = 4.7 \Omega$	$T_j = 125^\circ\text{C}$	31		
$I_{sc}$	Short Circuit data	$V_{GE} \leq 15V ; V_{Bus} = 1000V$ $t_p \leq 10\mu\text{s} ; T_j = 125^\circ\text{C}$		400		A
$R_{thJC}$	Junction to Case Thermal Resistance				0.22	$^\circ\text{C}/\text{W}$

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

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V <sub>RRM</sub>	Maximum Peak Repetitive Reverse Voltage			1700			V
I <sub>RM</sub>	Maximum Reverse Leakage Current	V <sub>R</sub> =1700V	T <sub>j</sub> = 25°C			350	μA
			T <sub>j</sub> = 125°C			600	
I <sub>F</sub>	DC Forward Current				100		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 100A	T <sub>j</sub> = 25°C		1.8	2.2	V
			T <sub>j</sub> = 125°C		1.9		
t <sub>rr</sub>	Reverse Recovery Time		T <sub>j</sub> = 25°C		385		ns
			T <sub>j</sub> = 125°C		490		
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 100A V <sub>R</sub> = 900V di/dt = 1600A/μs	T <sub>j</sub> = 25°C		28		μC
			T <sub>j</sub> = 125°C		46		
E <sub>rr</sub>	Reverse Recovery Energy		T <sub>j</sub> = 25°C		12		mJ
			T <sub>j</sub> = 125°C		24		
R <sub>thJC</sub>	Junction to Case Thermal Resistance					0.39	°C/W

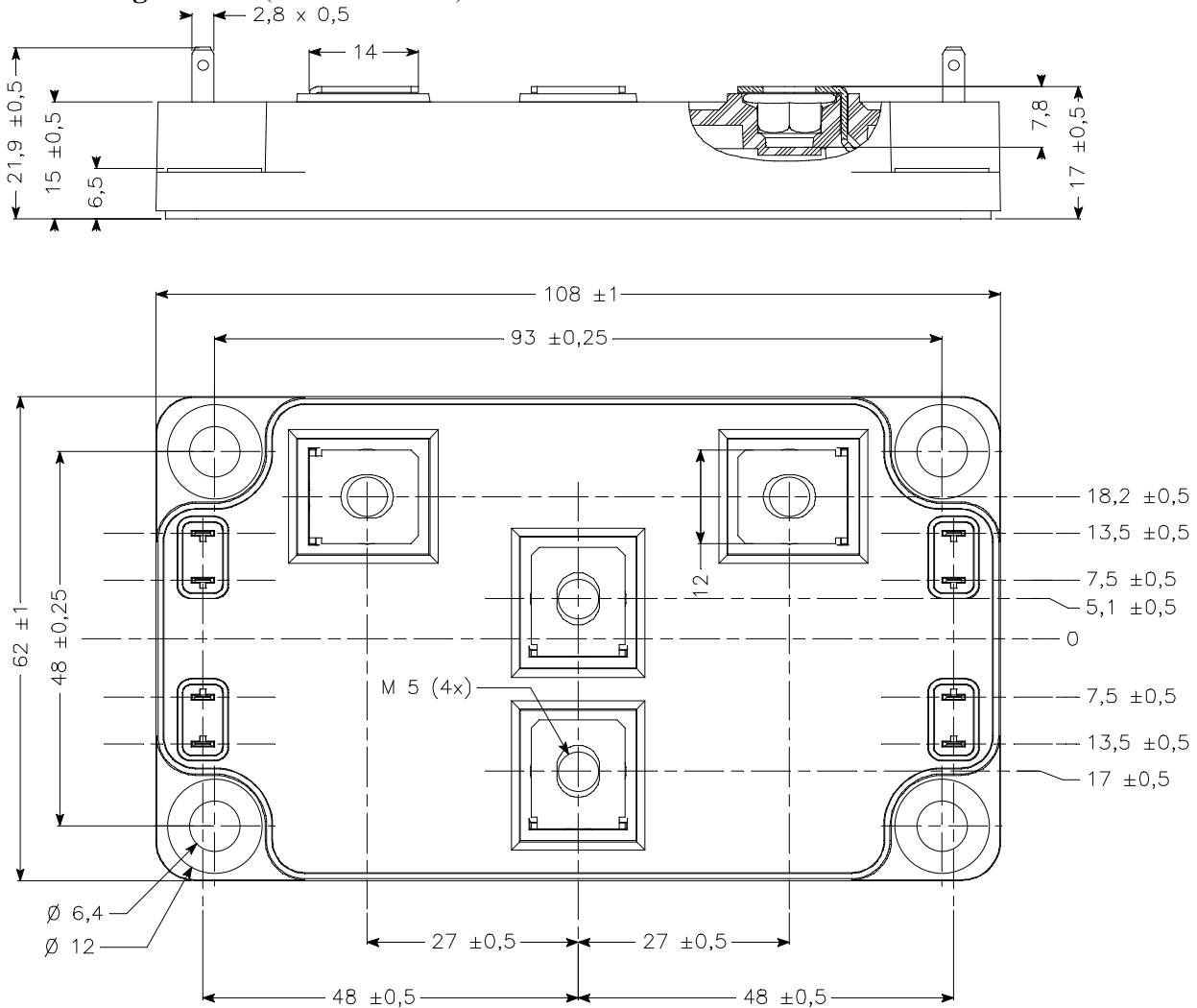
**CR5 & CR6 diode ratings and characteristics (per diode)**

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V <sub>RRM</sub>	Maximum Peak Repetitive Reverse Voltage			1700			V
I <sub>RM</sub>	Maximum Reverse Leakage Current	V <sub>R</sub> =1700V	T <sub>j</sub> = 25°C			350	μA
			T <sub>j</sub> = 125°C			600	
I <sub>F</sub>	DC Forward Current				150		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 150A	T <sub>j</sub> = 25°C		1.8	2.2	V
			T <sub>j</sub> = 125°C		1.9		
t <sub>rr</sub>	Reverse Recovery Time		T <sub>j</sub> = 25°C		385		ns
			T <sub>j</sub> = 125°C		490		
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 150A V <sub>R</sub> = 900V di/dt = 1600A/μs	T <sub>j</sub> = 25°C		38		μC
			T <sub>j</sub> = 125°C		62		
E <sub>rr</sub>	Reverse Recovery Energy		T <sub>j</sub> = 25°C		17.5		mJ
			T <sub>j</sub> = 125°C		35		
R <sub>thJC</sub>	Junction to Case Thermal Resistance					0.26	°C/W

**Thermal and package characteristics**

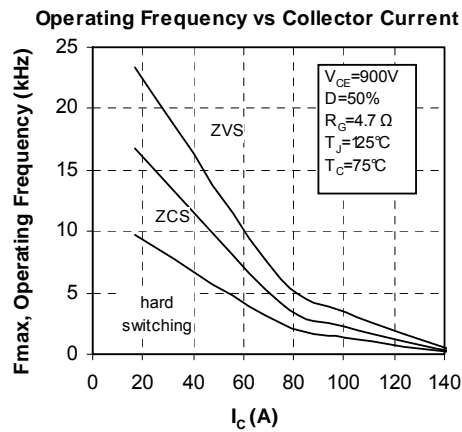
Symbol	Characteristic	Min	Typ	Max	Unit	
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t = 1 min, I <sub>isol</sub> < 1mA, 50/60Hz	4000			V	
T <sub>J</sub>	Operating junction temperature range	-40		150	°C	
T <sub>STG</sub>	Storage Temperature Range	-40		125		
T <sub>C</sub>	Operating Case Temperature	-40		100		
Torque	Mounting torque	To heatsink	M6	3	5	N.m
		For terminals	M5	2	3.5	
Wt	Package Weight		300		g	

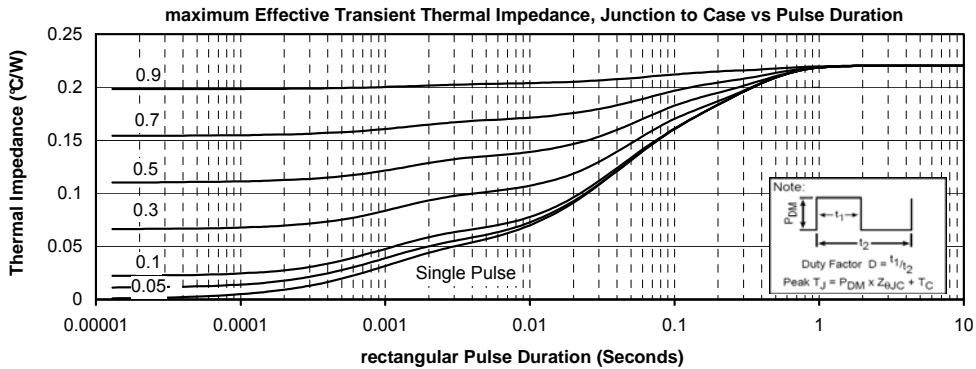
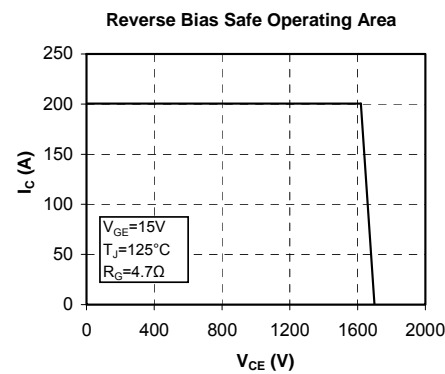
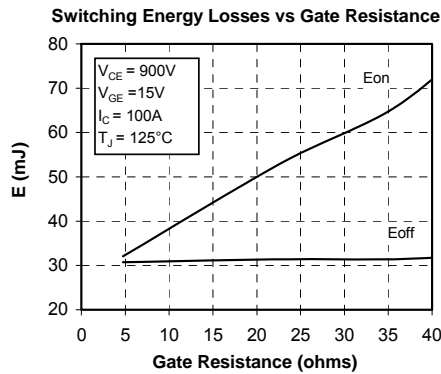
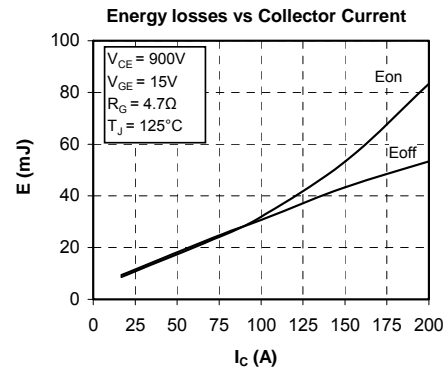
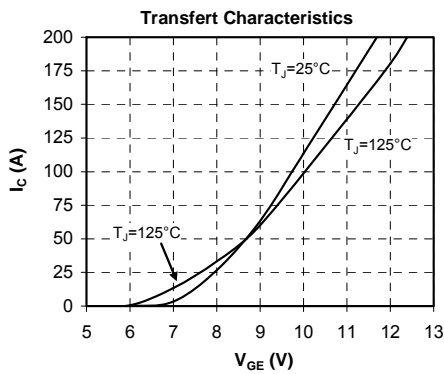
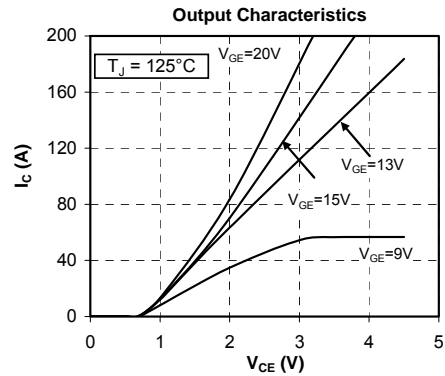
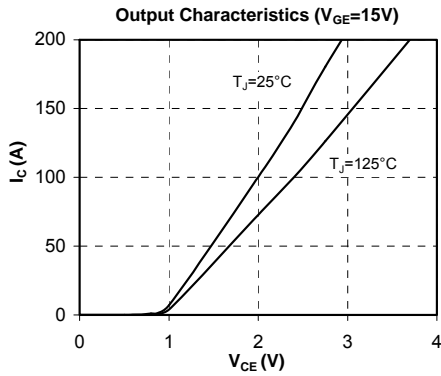
**SP6 Package outline** (dimensions in mm)



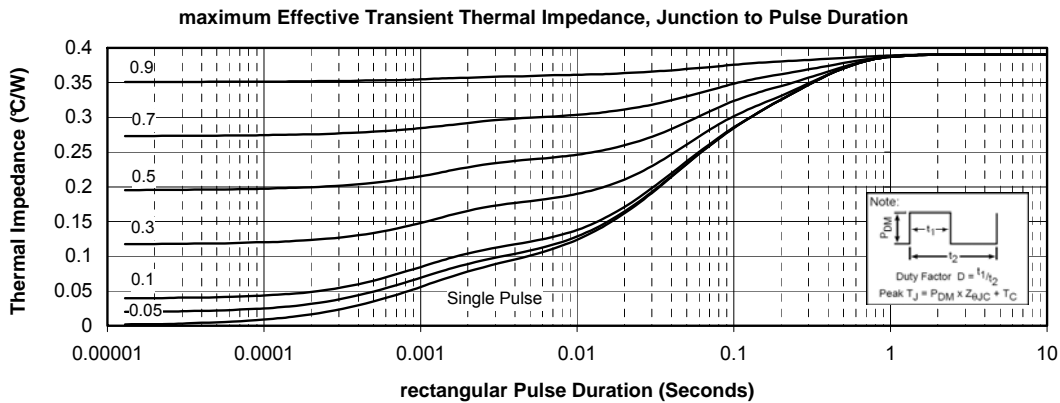
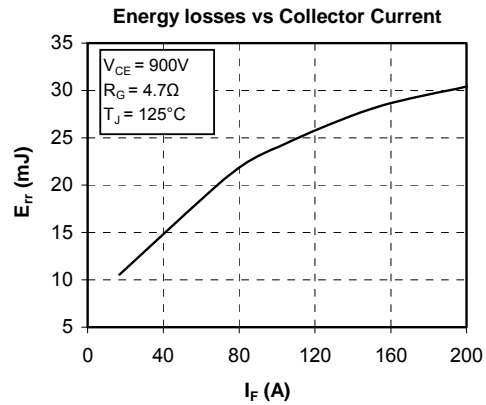
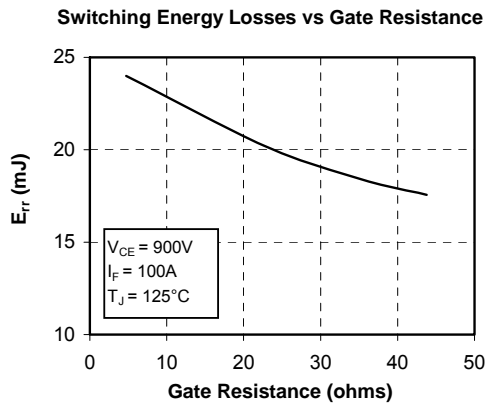
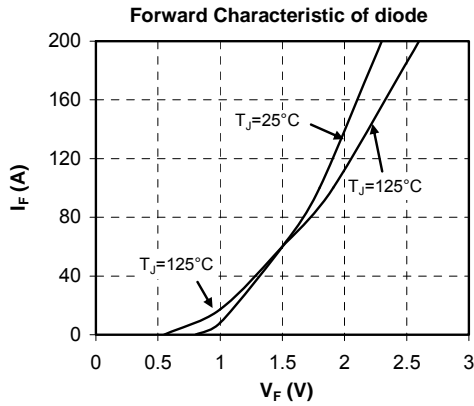
See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

**Q1 to Q4 Typical performance curve** (per IGBT)

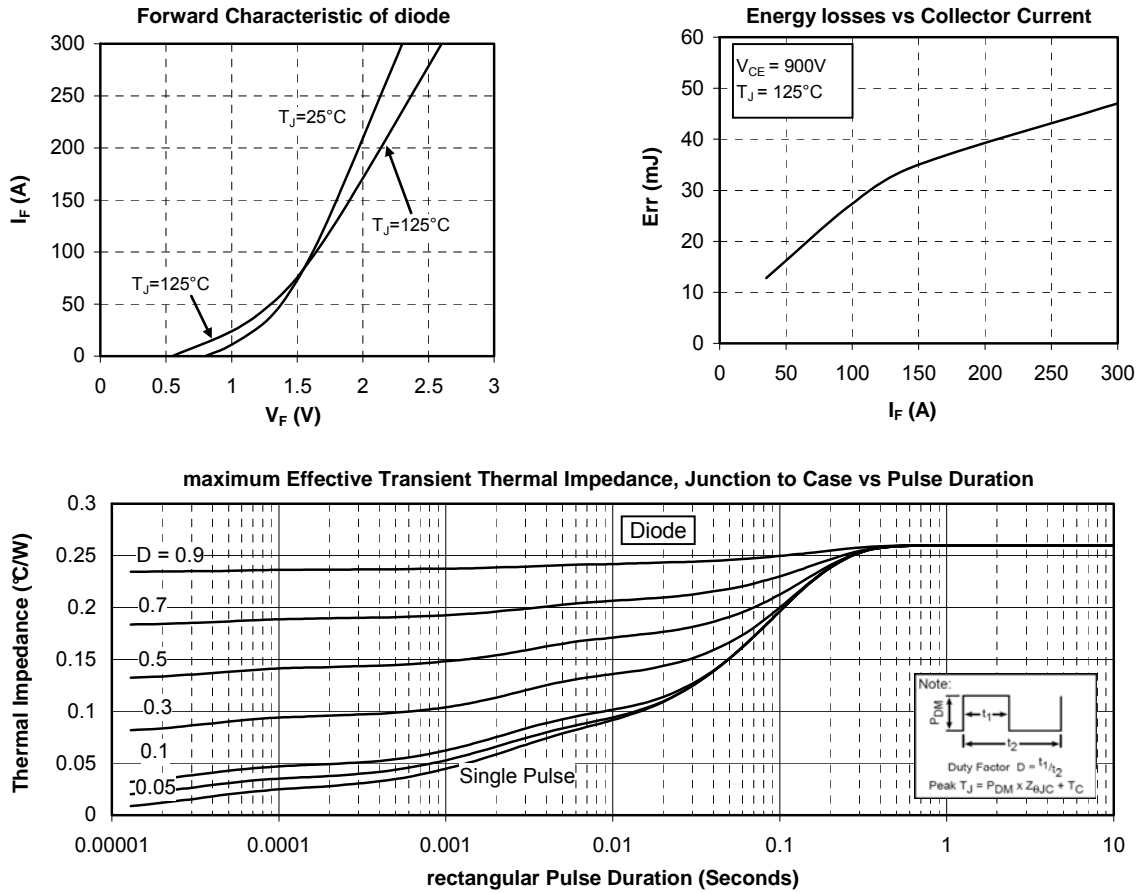




## CR1 to CR4 Typical performance curve (per diode)



## CR5 & CR6 Typical performance curve (per diode)



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