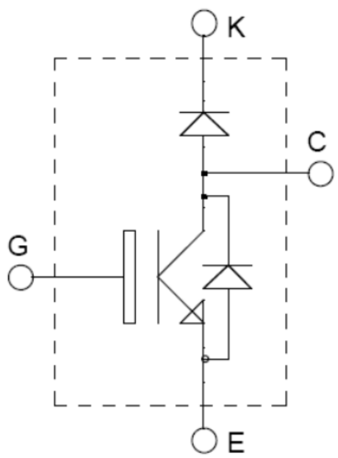
Boost Chopper with Field Stop Trench IGBT + SiC SBD

V_{CES} =1200V
I_C = 30A @T_C= 100^{0}C

Features

- ***Field StopTrench Fast IGBT***
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 50 kHz
  - Low leakage current
- ***Chopper SiC Schottky Diode***
  - Zero reverse recovery current
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF



Applications

- Solar inverters
- AC and DC motor control
- Power Factor Correction
- Aerospace Actuators

RoHS

Benefits

- Outstanding performance at high frequency operation
- Low switching losses
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive Tc of V_{CEsat}
- RoHS Compliant

Absolute Maximum Ratings (T_j=25^{o}C unless otherwise specified)

Parameters	Symbol	Conditions	Specifications	Units
Collector - Emitter Breakdown Voltage	V_{CES}		1200	V
Continuous Collector Current	I_C	T_C = 25 ^{0}C	60	A
		T_C = 100 ^{0}C	30	A
Gate-Emitter Voltage	V_{GES}		±20	V
Pulsed Collector Current	ICM		90	A
Maximum Power Dissipation	P_D	T_C = 25 ^{0}C	TBD	W
		T_C = 100 ^{0}C	TBD	W
Operating Junction Temperature	T_J		-55 ~ 150	^{0}C
Storage Temperature	T_{STG}		-55 ~ 150	^{0}C

Electrical Characteristics (T_j=25°C unless otherwise specified)

Parameters	Symbol	Conditions	Min	Typ	Max	Units
OFF						
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V	--	--	1	mA
Gate-Emitter Leakage Current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	--	--	±250	nA
ON						
Gate-Emitter Threshold Voltage	$V_{GE(TH)}$	V_{GE} = V_{CE}, I_C = 30mA	3.5	5.5	7.5	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	V_{CE} = 15V, I_C = 30A, T_J= 25 °C	--	2.0	2.5	V
		V_{CE} = 15V, I_C = 30A, T_J= 125 °C	--	2.3	--	V
DYNAMIC						
Input Capacitance	C_{IES}	V_{CE} = 30V, V_{GE} = 0V, f = 1 MHz	--	4000	--	pF
Output Capacitance	C_{OES}		--	105	--	pF
Reverse Transfer Capacitance	C_{RES}		--	72	--	pF
SWITCHING						
Turn-On Delay Time	$t_{d(on)}$	V_{CE}= 600V, I_C =30A, R_G= 10Ω, V_{GE}= 15V, Inductive Load, T_J=25 °C	--	40	--	ns
Rise Time	t_r		--	50	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	245	--	ns
Fall Time	t_f		--	70	--	ns
Turn-On Switching Energy Loss	E_{ON}		--	3.5	--	mJ
Turn-Off Switching Energy Loss	E_{OFF}		--	0.85	--	mJ
Turn-On Delay Time	$t_{d(on)}$	V_{CE}= 600V, I_C =30A, R_G= 10Ω, V_{GE}= 15V, Inductive Load, T_J=125 °C	--	34	--	ns
Rise Time	t_r		--	27	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	256	--	ns
Fall Time	t_f		--	142	--	ns
Turn-On Switching Energy Loss	E_{ON}		--	3.87	--	mJ
Turn-Off Switching Energy Loss	E_{OFF}		--	1.8	--	mJ
Total Gate Charge	Q_g	V_{CE}= 600V, I_C =30A, V_{GE}= 15V	--	170	255	nC
Gate-Emitter Charge	Q_{ge}		--	27	41	nC
Gate-Collector Charge	Q_{gc}		--	60	90	nC
Short Circuit Withstanding Time	t_{sc}	V_{CE}= 600V, V_{GE}= 15V, T_J=125 °C	10	--	--	µs

SiC Diode Rating and Characteristics (T_j=25^{0}C unless otherwise specified)

Parameters	Symbol	Conditions	Min	Typ	Max	Units
Maximum peak repetitive reverse voltage	V_{RRM}		1200	--	--	V
Maximum Reverse Leakage Current	I_{RM}	V_R = 1200V, T_j = 25 ^{0}C	--	4.1	100	μA
		V_R = 1200V, T_j = 150 ^{0}C	--	606		μA
Diode Forward Voltage	V_F	I_F = 15A, T_j = 25 ^{0}C	--	1.5	1.7	V
		I_F = 15A, T_j = 150 ^{0}C	--	2.3	--	V
Total Capacitive Charge	Q_C	VR=1200 V, IF<IF,max	--	52	--	nC
Switching Time	t_C	dI_F/dt = 200 A/μs, T_j = 175 ^{0}C	--	--	10	ns
Total Capacitance	C	V_R = 1V, f = 1 MHz	--	895	--	pF
		V_R = 600V, f = 1 MHz	--	52	--	pF
		V_R = 1200V, f = 1 MHz	--	43	--	pF

Thermal and Package Characteristics (T_j=25^{0}C unless otherwise specified)

Parameters	Symbol	Conditions	Min	Typ	Max	Units
Junction to Case Thermal Resistance	R_{THJC}	IGBT chip	--	--	0.35	^{0}C/W
		SiC SBD chip	--	--	0.65	^{0}C/W
Mounting Torque	M_d				1.5	N-m
Terminal Connection Torque	M_{dt}		1.3	--	1.5	N-m
Package Weight	W_t			29		g
Isolation Voltage	V_{ISOL}	I_{ISOL} < 1mA, 50/60 Hz, t=1 min	2500	V		

IGBT Characteristics

Fig. 1 Output characteristics

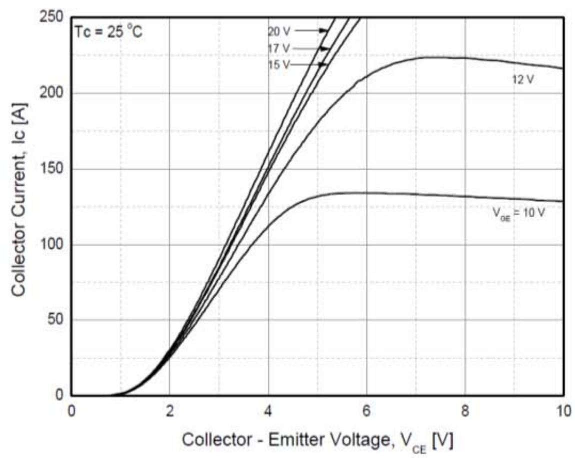


Fig. 2 Saturation voltage characteristics

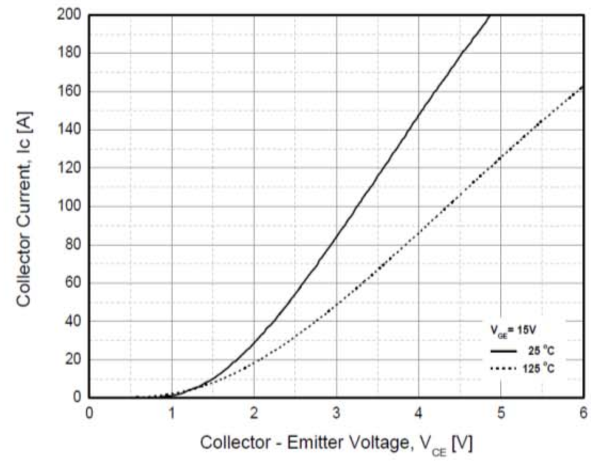


Fig. 3 Saturation voltage vs. collector current

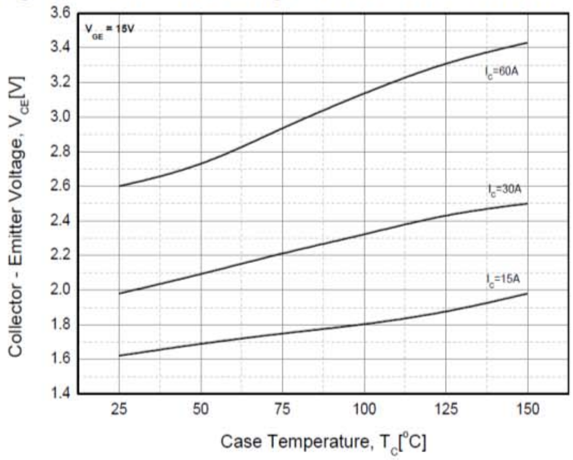


Fig. 4 Saturation voltage vs. gate bias

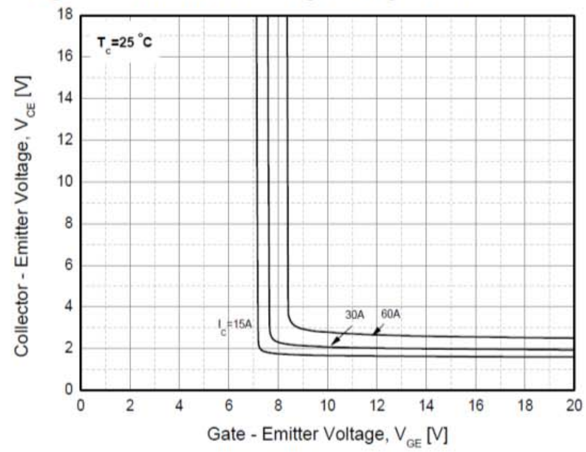


Fig. 5 Saturation voltage vs. gate bias

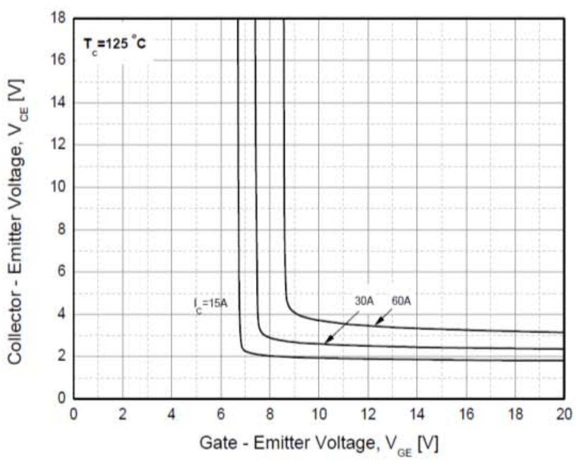


Fig. 6 Capacitance characteristics

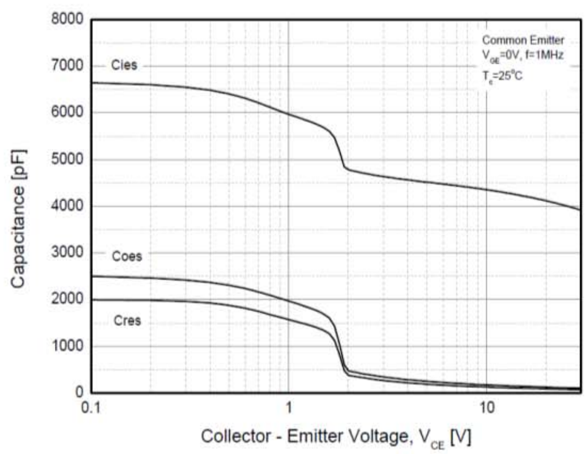


Fig. 7 Turn on time vs. gate resistance

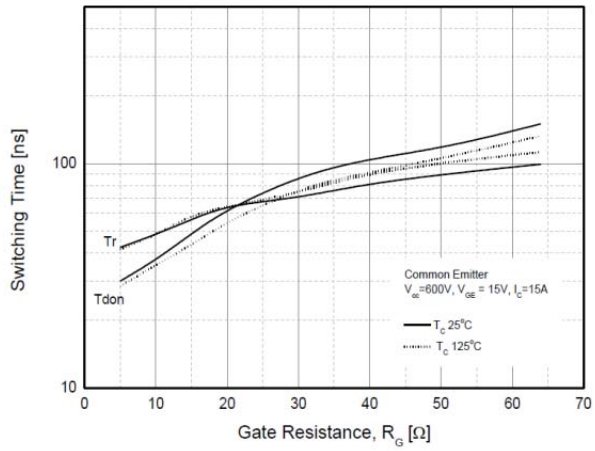


Fig. 8 Turn off time vs. gate resistance

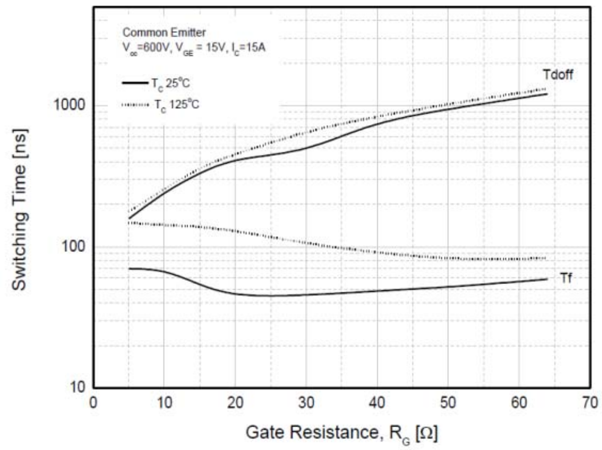


Fig. 9 Switching loss vs. gate resistance

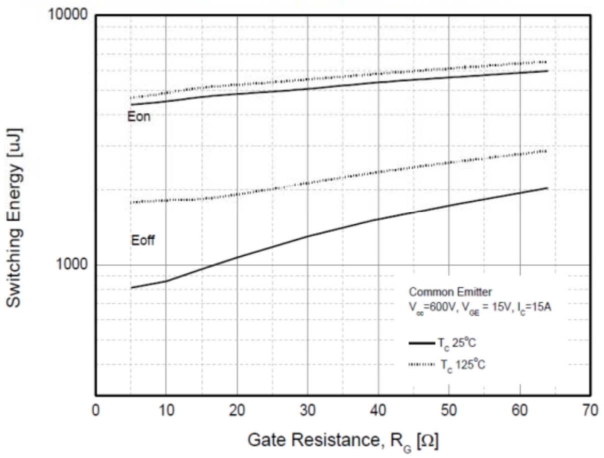


Fig. 10 Turn on time vs. collector current

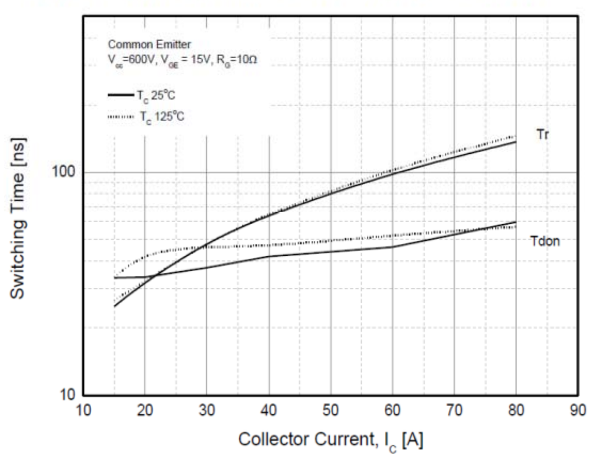


Fig. 11 Turn off time vs. collector current

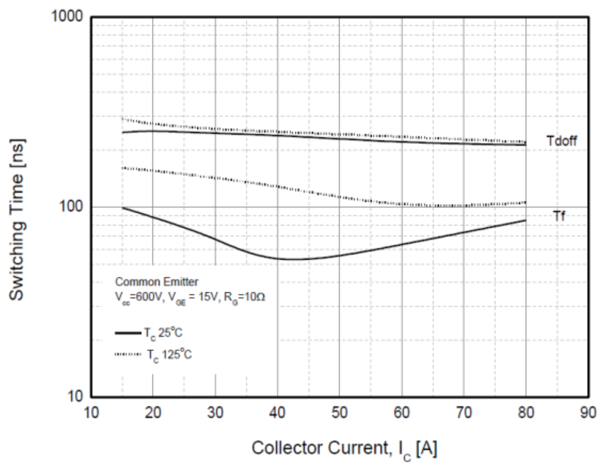


Fig. 12 Switching loss vs. collector current

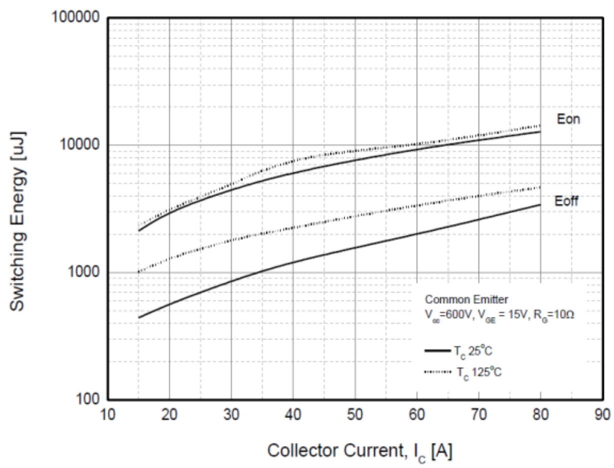


Fig. 13 Gate charge characteristics

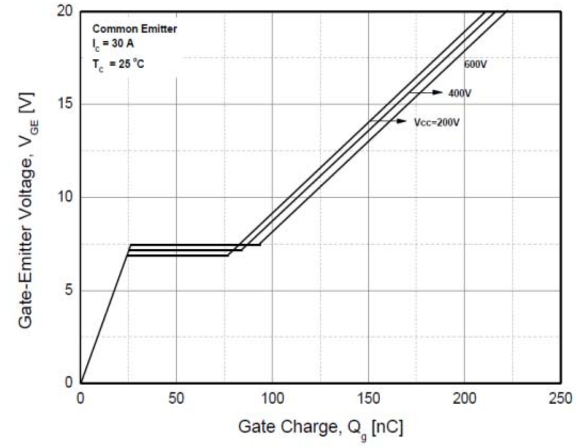


Fig. 14 SOA

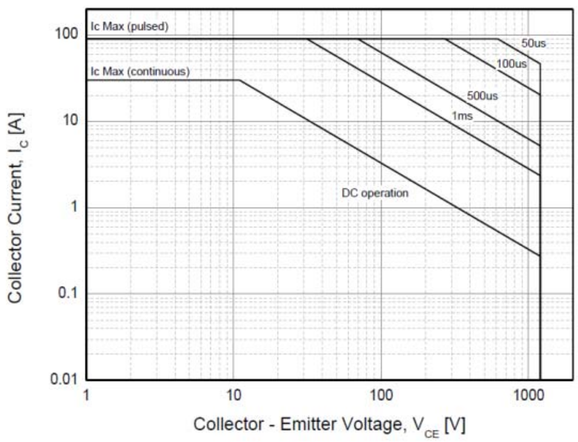


Fig. 15 RBSOA

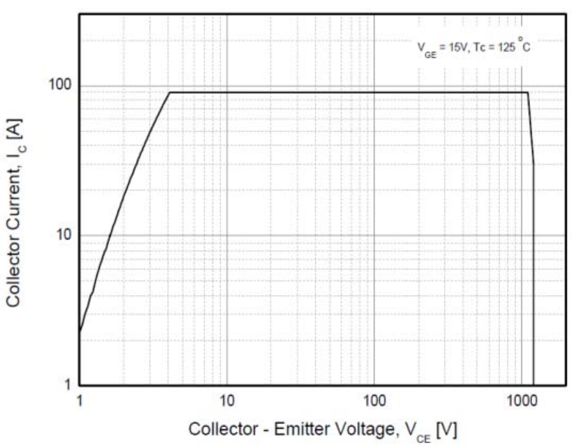
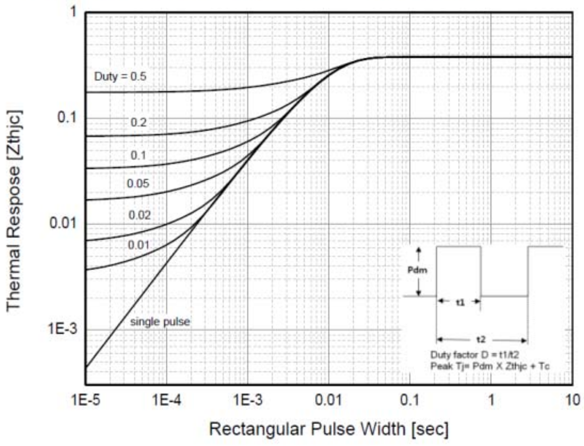


Fig. 16 Transient thermal impedance



Boost SiC Diode Characteristics

Fig. 17 Forward Characteristics

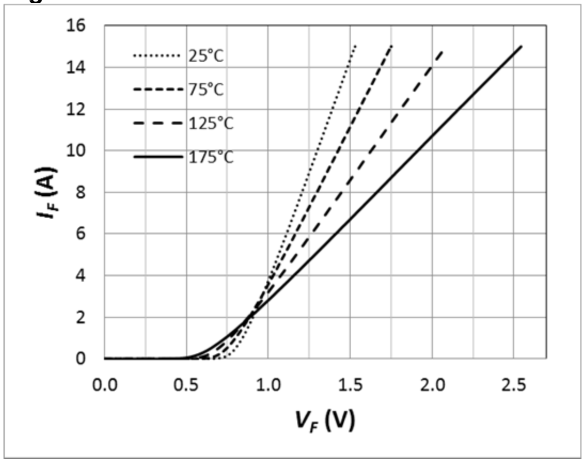


Fig. 18 Reverse Characteristics

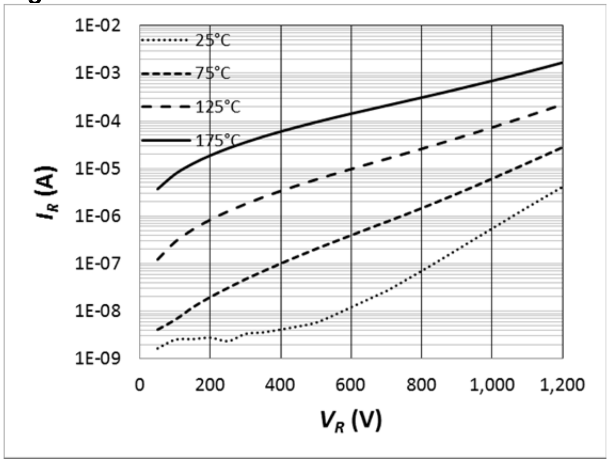


Fig. 19 Power Derating

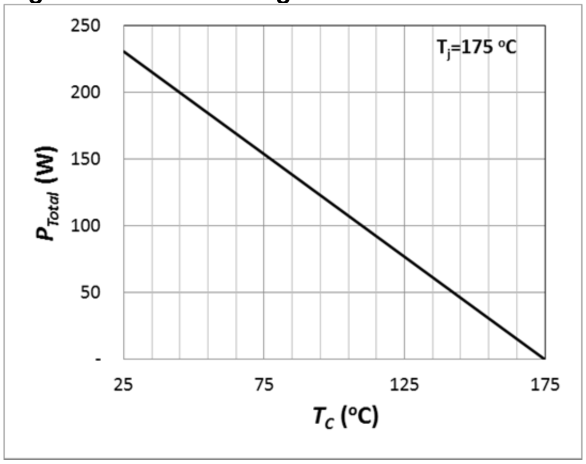


Fig. 20 Current Derating

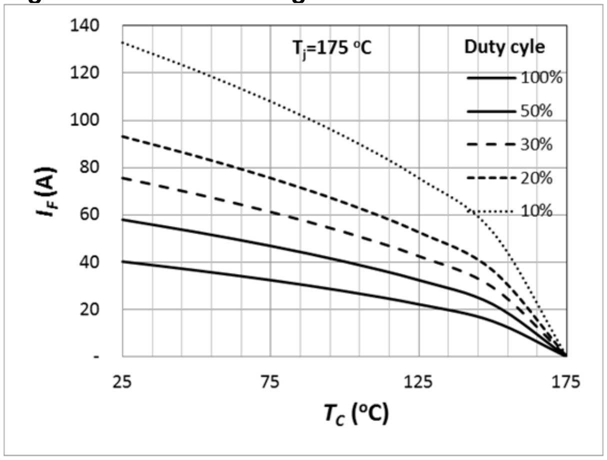


Fig. 21 Capacitance Curve

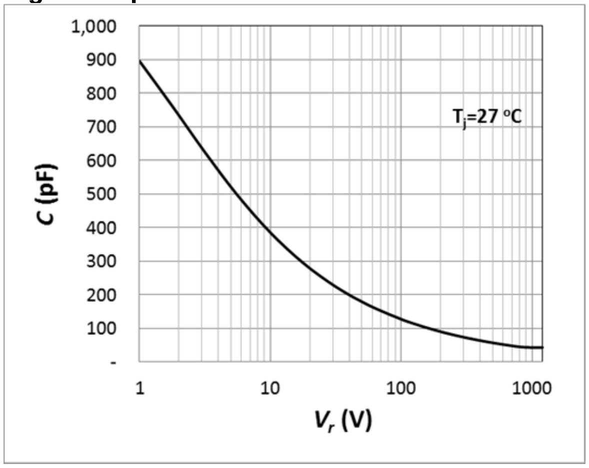
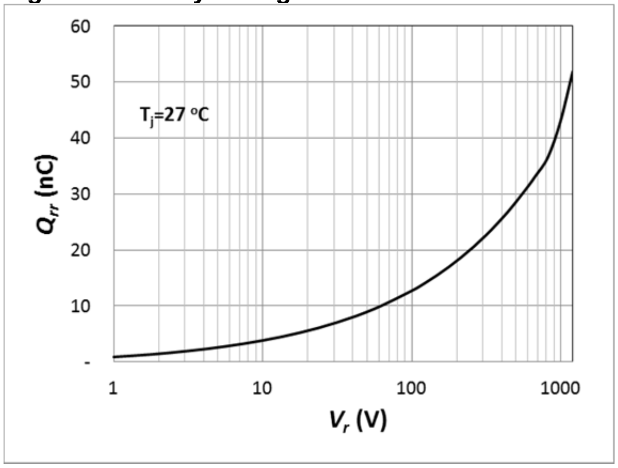
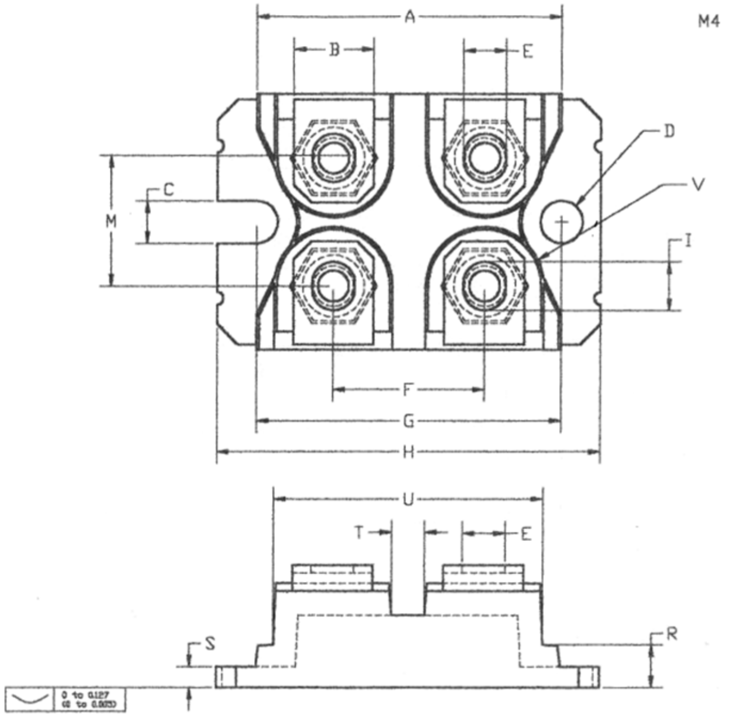
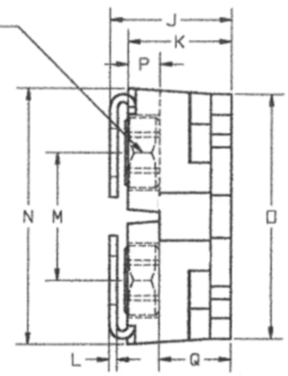


Fig 22 Recovery Charge



SOT-227 Package Outline





DIM.	MILLIMETER Min.	MILLIMETER Max.	INCHES Min.	INCHES Max.
A	31.67	31.90	1.247	1.256
B	7.95	8.18	0.313	0.322
C	4.14	4.24	0.163	0.167
D	4.14	4.24	0.163	0.167
E	4.14	4.24	0.163	0.167
F	14.94	15.09	0.588	0.594
G	30.15	30.25	1.187	1.191
H	38.00	38.10	1.496	1.500
I	4.75	4.83	0.187	0.190
J	11.76	12.19	0.463	0.480
K	9.45	9.60	0.372	0.378
L	0.76	0.84	0.030	0.033
M	12.62	12.88	0.497	0.507
N	25.15	25.30	0990	0.996
O	24.79	25.04	0.976	0.986
P	2.74	3.15	0.108	0.124
Q	6.91	6.99	0.272	0.275
R	4.17	4.42	0.164	0.174
S	2.08	2.13	0.082	0.084
T	3.28	3.63	0.129	0.143
U	26.75	26.90	1.053	1.059
V	3.94	4.04	0.155	0.159

Revision History

Date	Revision	Notes
6/3/2014	1.0	Initial release

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Notes

- **RoHS Compliance**
  The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented March, 2013. RoHS Declarations for this product can be obtained from the Product Documentation sections of www.gptechgroup.com.

- **REACh Compliance**
  REACh substances of high concern (SVHCs) information is available for this product. Since the European Chemi- cal Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future,please contact our office at GPTG Headquarters in Lake Forest, California to insure you get the most up-to-date REACh SVHC Declaration.
  REACh banned substance information (REACh Article 67) is also available upon request.

- This product has not been designed or tested for use in, and is not intended for use in, applications implanted into the human body nor in applications in which failure of the product could lead to death, personal injury or property damage, including but not limited to equipment used in the operation of nuclear facilities, life-support machines, cardiac defibrillators or similar emergency medical equipment, aircraft navigation or communication or control systems, or air traffic control.

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