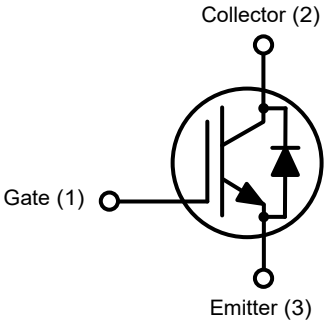
BGH75N120HF1

Hybrid SiC Discrete Devices

Product Summary

V_{CE}	1200 V
I_C	75A @T_C=100°C
$V_{CE(sat).Typ}$	2.2V @I_C=75A

Package: TO-247-3



Trench Field Stop IGBT Co-packed with SiC Schottky Barrier Diode

Features

- Low $V_{CE(sat)}$
- Trench FS Technology
- High Speed Switching
- Hybrid SiC Discrete Devices
- Halogen Free, RoHS Complian

Applications

- UPS
- PV Inverter
- Welding Machine
- DC/DC Converters with high Switching frequency

Package Pin Definitions

- Pin1 - Gate
- Pin2 - Collector & Backside
- Pin3 - Emitter

Package Parameters

Part Number	Marking	Package
BGH75N120HF1	BGH75N120HF1	TO-247-3

Maximum Ratings(T_C=25°C Unless Otherwise Noted)

Symbol	Parameter		Value	Unit
V_{CE}	Collector-Emitter Breakdown Voltage		1200	V
V_{GE}	Continuous Gate-Emitter Voltage		±20	
	Transient Gate-Emitter Voltage		±30	
I_C	DC Collector Current, limited by T_{jmax}	T_C=25°C	150	A
		T_C=100°C	75	
I_F	Diode Forward Current, limited by T_{jmax}	T_C=25°C	76	A
		T_C=100°C	45	
$I_{C,pulse}$	Pulse Collector Current	V_{GE}=15V, limited by T_{jmax}	200	A
P_{tot}	Power Dissipation	T_C=25°C	568	W
T_j	Operating Junction Temperature		-40~150	°C
T_{stg}	Storage Temperature		-55~150	°C
M_d	TO-247 mounting torque	M3 Screw	0.7	Nm

Thermal Resistance

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	IGBT Thermal Resistance-Junction to Case		0.22		°C/W
$R_{th(j-c)}$	Diode Thermal Resistance-Junction to Case		0.41		°C/W
$R_{th(j-a)}$	Thermal Resistance-Junction to Ambient		31		°C/W

Electrical Characteristics (Defined at T_j=25°C Unless Otherwise Specified)
IGBT Static Characteristics

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE}=15V, I_C=75A	T_j=25°C		2.2	2.65	V
			T_j=100°C		2.6		
			T_j=150°C		3		
I_{CES}	Zero Gate Voltage Drain Current	V_{CE}=1200V, V_{GE}=0V	T_j=25°C		4	400	μA
			T_j=150°C		85	4000	
		V_{CE}=960V, V_{GE}=0V	T_j=25°C		0.3	90	
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=±20V, V_{CE}=0V	T_j=25°C		6	100	nA
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE}=V_{CE}, I_C=2.6mA	T_j=25°C	5	5.7	6.2	V

g_{fs}	Transconductance	V_{CE}=20V, I_C=75A		97		S

Dynamic Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{ies}	Input Capacitance	V_{GE}=0V, V_{CE}=25V f=250kHz		8260		pF
C_{oes}	Output Capacitance			575		pF
C_{res}	Reverse Transfer Capacitance			134		pF
Q_G	Total Gate Charge	V_{CC}=960V, V_{GE}=15V, I_C=75A		398		nC

Switching Characteristics, Inductive Load

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	T_j=25°C V_{DC}=600V, I_C=37.5A V_{GE}=0/15V, $R_{G(ext)}$=10Ω L_σ=60nH		45		ns
t_r	Rise Time			51		
$t_{d(off)}$	Turn-Off Delay Time			355		
t_f	Fall Time			59		
E_{on}	Turn-On Energy			1.57		mJ
E_{off}	Turn-Off Energy			1.11		
E_{total}	Total Switiching Energy			2.68		
$t_{d(on)}$	Turn-On Delay Time	T_j=125°C V_{DC}=600V, I_C=37.5A V_{GE}=0/15V, $R_{G(ext)}$=10Ω L_σ=60nH		39		ns
t_r	Rise Time			47		
$t_{d(off)}$	Turn-Off Delay Time			403		
t_f	Fall Time			93		
E_{on}	Turn-On Energy			1.59		mJ
E_{off}	Turn-Off Energy			1.44		
E_{total}	Total Switiching Energy			3.03		

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	T_j=25°C V_{DC}=600V, I_C=75A V_{GE}=0/15V, $R_{G(ext)}$=10Ω L_σ=60nH		52		ns
t_r	Rise Time			101		
$t_{d(off)}$	Turn-Off Delay Time			338		
t_f	Fall Time			54		
E_{on}	Turn-On Energy			4.49		mJ
E_{off}	Turn-Off Energy			2.58		
E_{total}	Total Switiching Energy			7.07		
$t_{d(on)}$	Turn-On Delay Time	T_j=125°C V_{DC}=600V, I_C=75A V_{GE}=0/15V, $R_{G(ext)}$=10Ω L_σ=60nH		47		ns
t_r	Rise Time			93		
$t_{d(off)}$	Turn-Off Delay Time			378		
t_f	Fall Time			65		
E_{on}	Turn-On Energy			4.52		mJ
E_{off}	Turn-Off Energy			3.09		
E_{total}	Total Switiching Energy			7.61		

SiC Schottky Barrier Diode Static Characteristics

Symbol	Parameter	Test conditions		Value			Unit
				Min.	Typ.	Max.	
V_F	Diode Forward Voltage	I_F=20A, V_{GE}=0V	T_j=25°C		1.3	1.6	V
			T_j=100°C		1.47		
			T_j=150°C		1.65		
Q_C	Diode Capacitive Charge	V_R=800V, T_j=25°C			120		nC
C	Diode Capacitance	V_R=1V, f=1MHz			1342		pF
		V_R=400V, f=1MHz			112		
		V_R=800V, f=1MHz			85		

Typical Performance

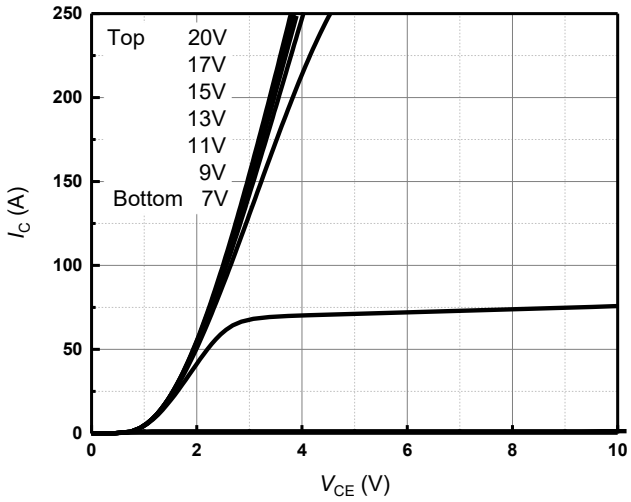


Figure 1 Output Characteristics (T_j=25°C)

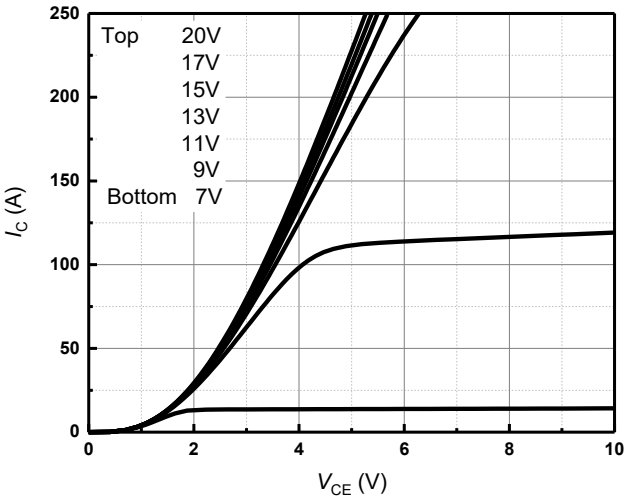


Figure 2 Output Characteristics (T_j=150°C)

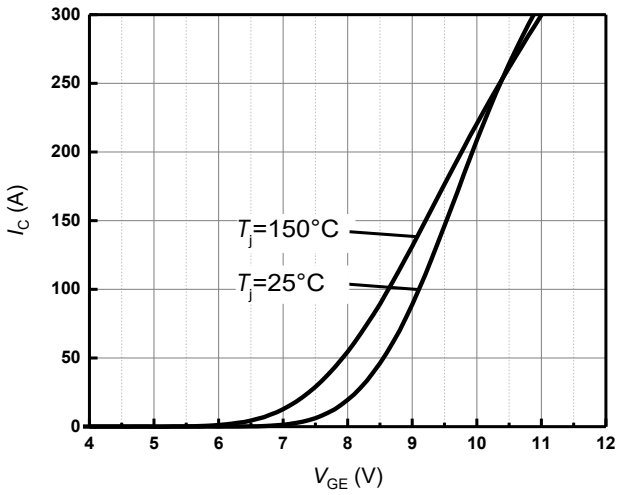


Figure 3 Transfer Characteristics for Various Temperature (V_{CE}=20V)

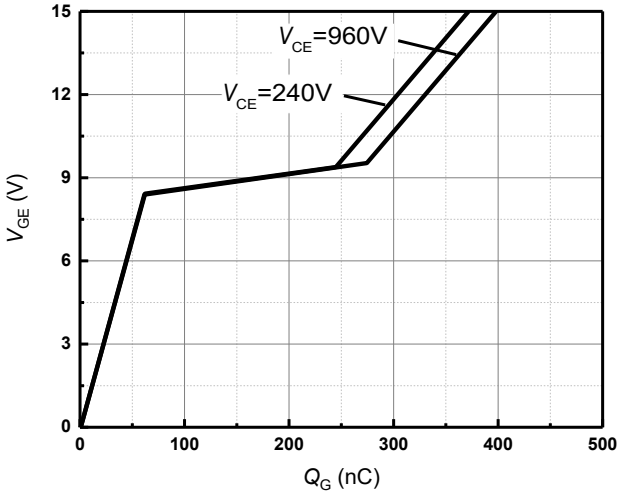


Figure 4 Gate Charge Characteristics (I_C=75A)

Typical Performance

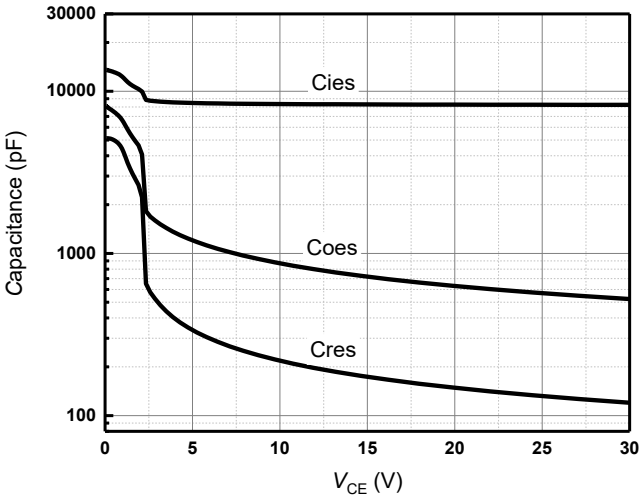


Figure 5 Capacitance Characteristics (V_{GE}=0V , f=250kHZ)

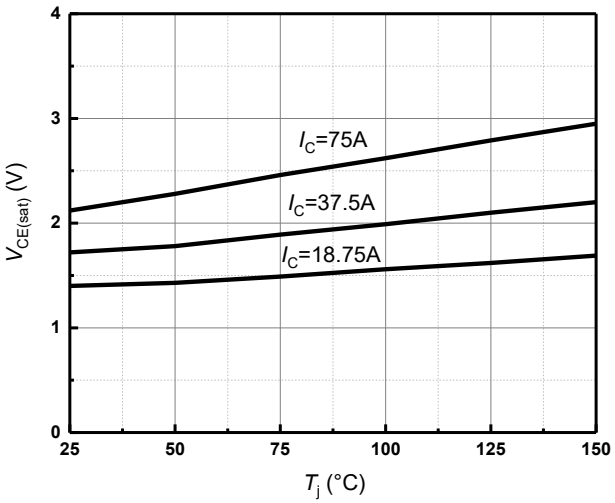


Figure 6 Collector-Emitter Saturation Voltage vs. Junction Temperature for Various Collector Current (V_{GE}=15V)

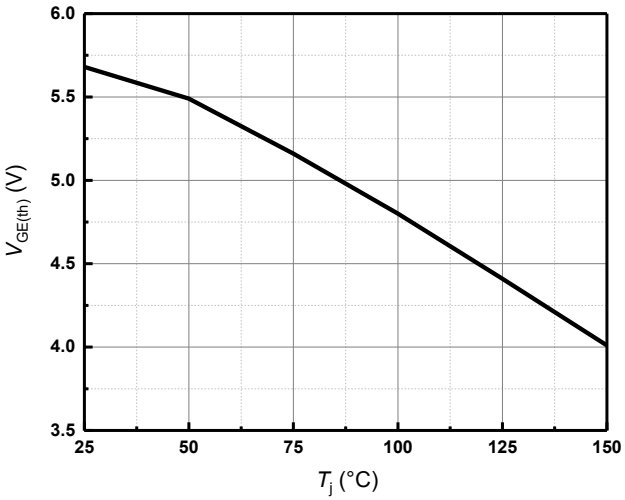


Figure 7 Gate-Emitter threshold Voltage vs. Junction Temperature (I_C=2.6mA)

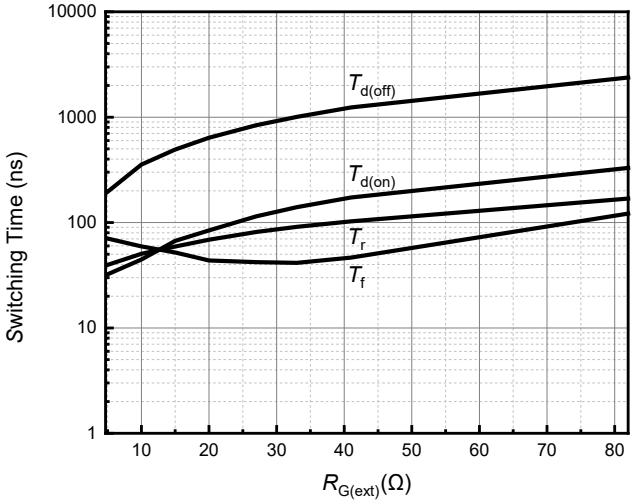


Figure 8 Switching Times vs. Gate Resistor (V_{CC}=600V , V_{GE}=15V , I_C=75A , T_j=25°C)

Typical Performance

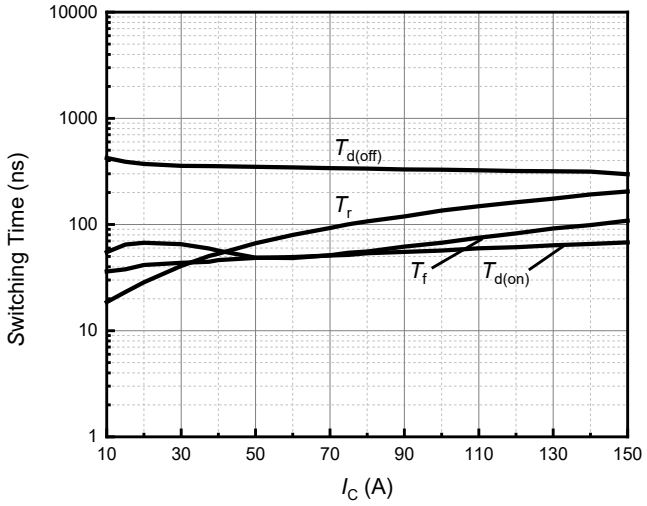


Figure 9 Switching Times vs. Collector Current (V_{CC}=600V , V_{GE}=15V , $R_{G(ext)}$=10Ω , T_j=25°C)

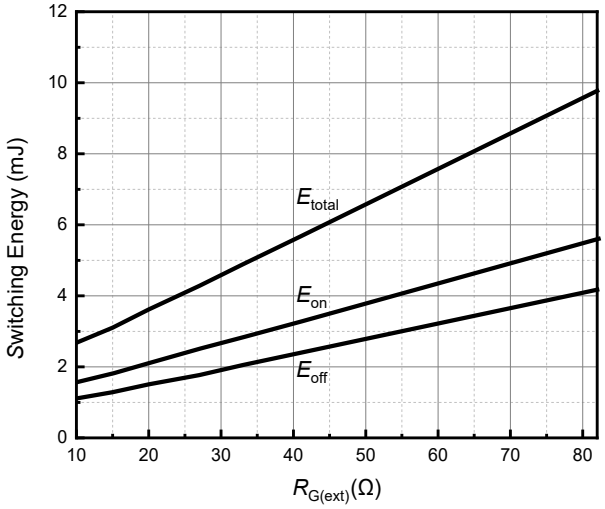


Figure 10 Switching Loss vs. Gate Resistor (V_{CC}=600V , V_{GE}=15V , I_C=75A , T_j=25°C)

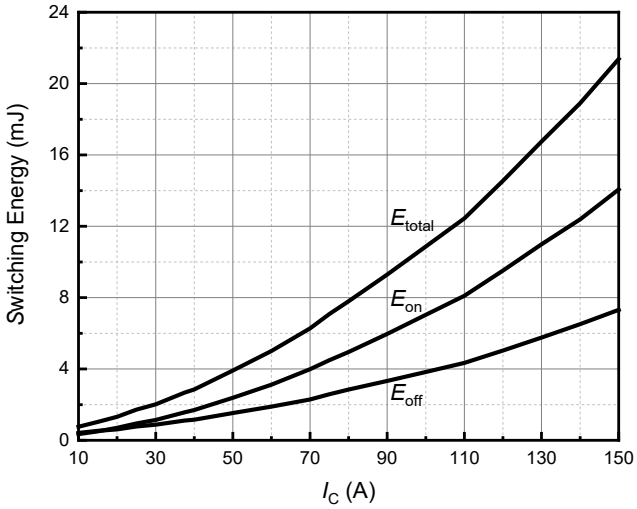


Figure 11 Switching Loss vs. Collector Current (V_{CC}=600V , V_{GE}=15V , $R_{G(ext)}$=10Ω , T_j=25°C)

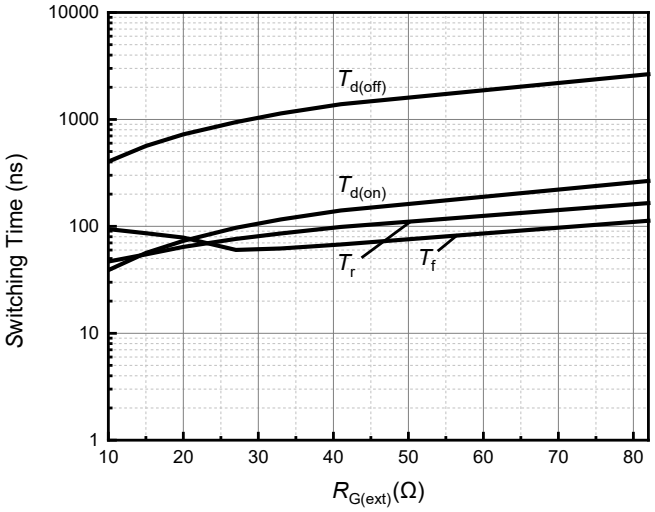


Figure 12 Switching Times vs. Gate Resistor (V_{CC}=600V , V_{GE}=15V , I_C=75A , T_j=125°C)

Typical Performance

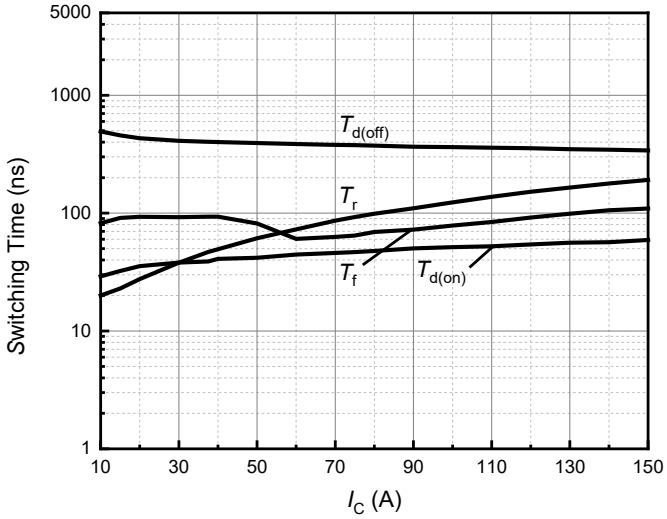


Figure 13 Switching Times vs. Collector Current (V_{CC}=600V , V_{GE}=15V , $R_{G(ext)}$=10Ω , T_j=125°C)

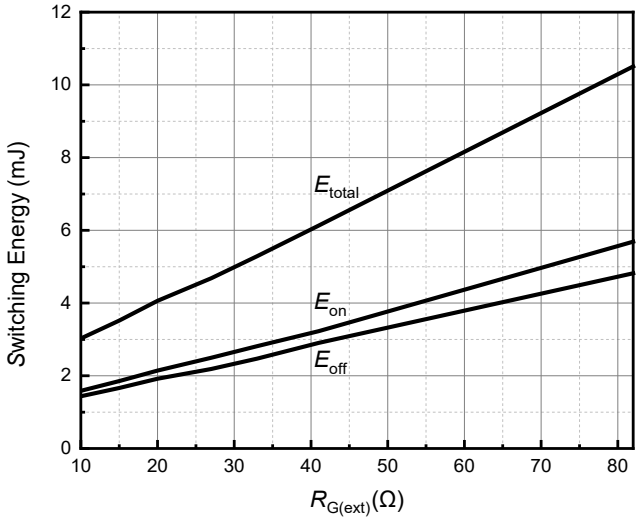


Figure 14 Switching Loss vs. Gate Resistor (V_{CC}=600V , V_{GE}=15V , I_C=75A , T_j=125°C)

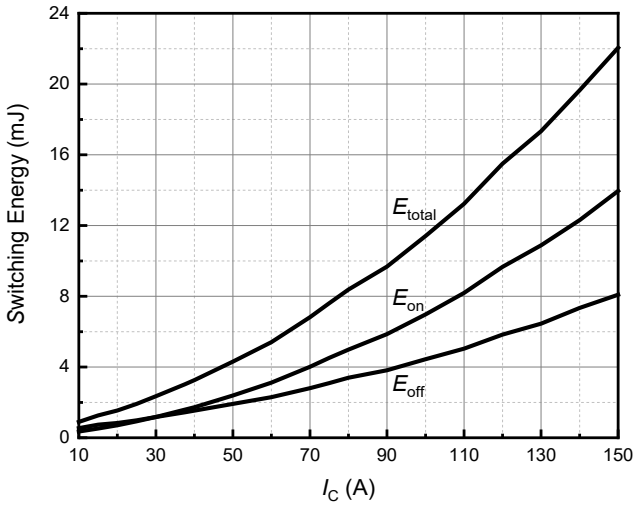


Figure 15 Switching Loss vs. Collector Current (V_{CC}=600V , V_{GE}=15V , $R_{G(ext)}$=10Ω , T_j=125°C)

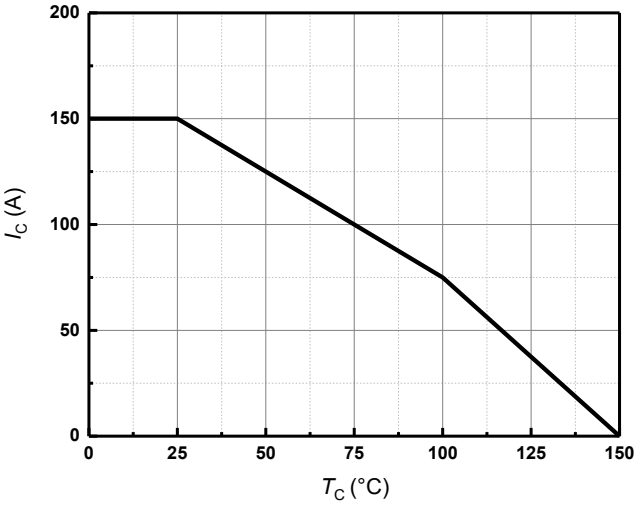


Figure 16 Maximum Collector current vs. Case Temperature

Typical Performance

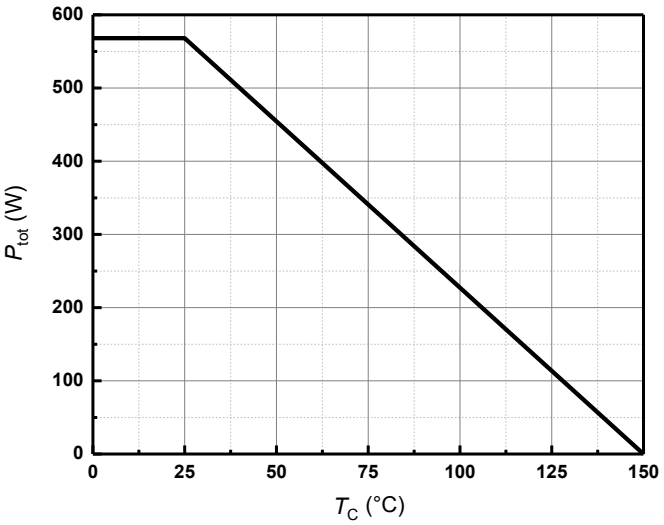


Figure 17 Power Dissipation as a Funcation of T_c

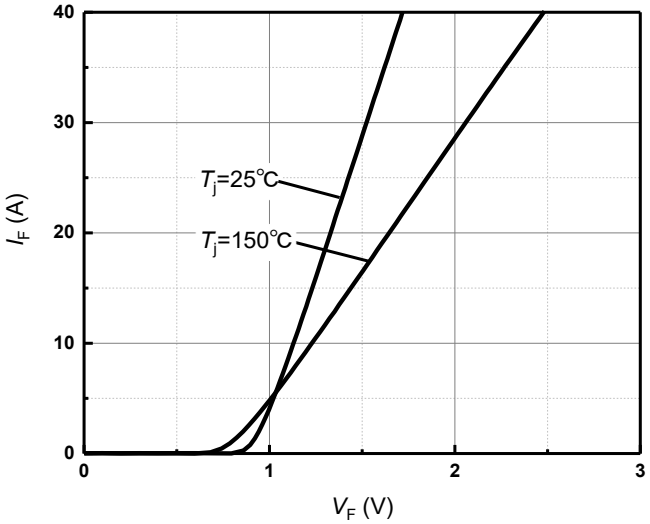


Figure 18 Forward characteristic of Diode

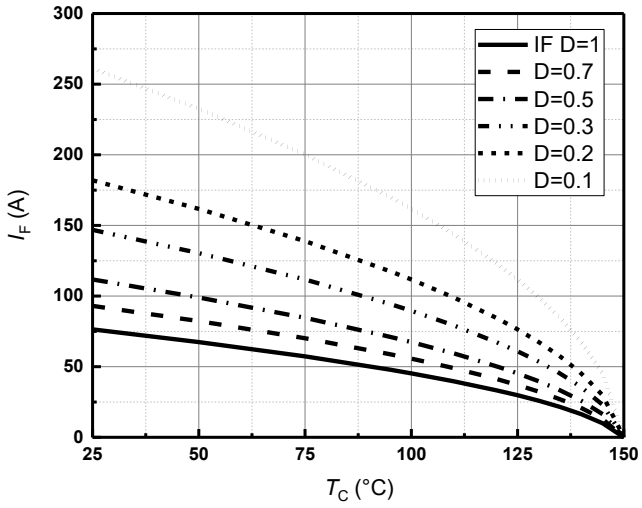


Figure 19 Diode forward current as function of temperature, D=duty cycle

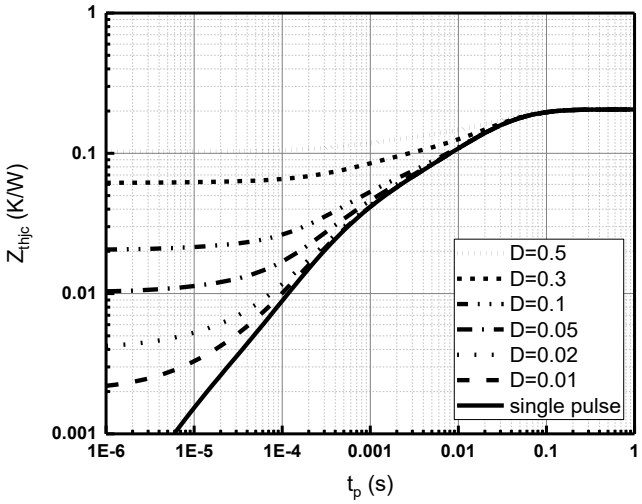


Figure 20 IGBT Transient Thermal Response Curve

Typical Performance

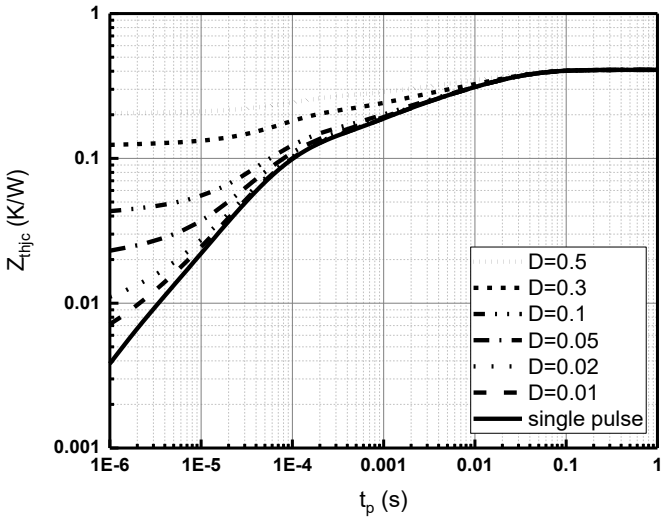
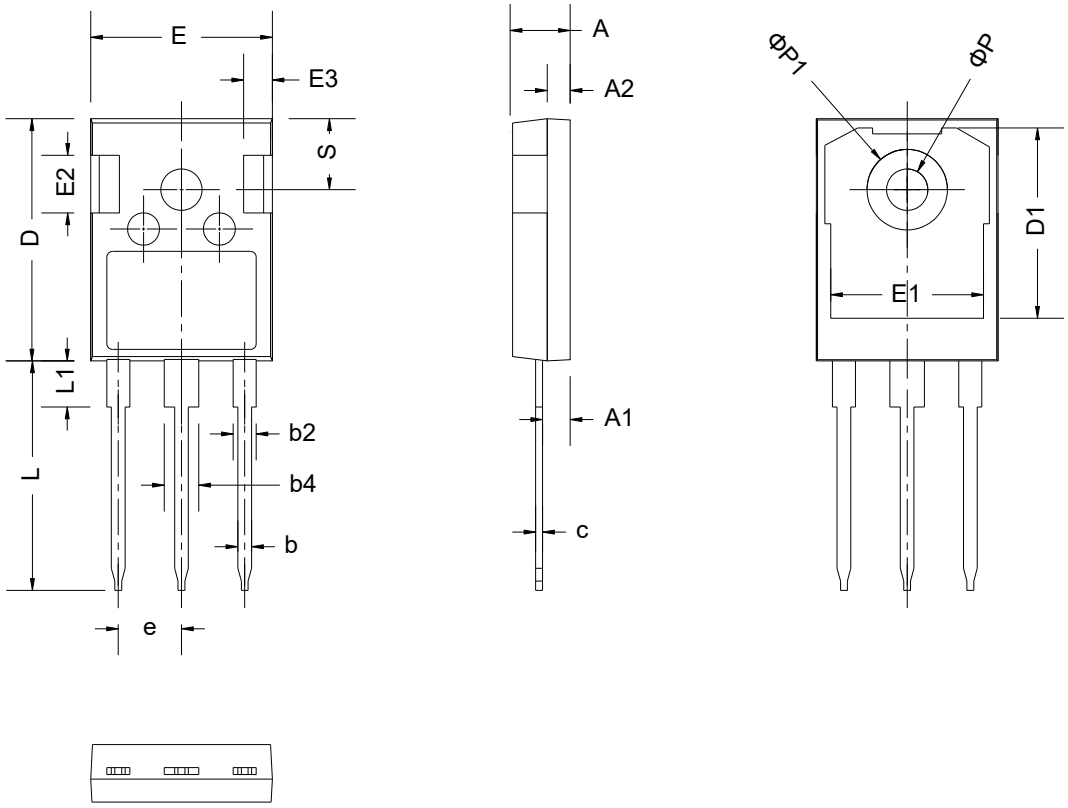


Figure 21 Diode Transient Thermal Response Curve

Package Dimensions



Items	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.80	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.8	5.00	5.20
E3	2.3	2.50	2.70
e	5.44 BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.16 BSC		

Revision History

Document Version	Date of Release	Description of Changes
Rev. 0.0	2023-03-22	Draft datasheet created.
Rev. 0.1	2023-05-05	Update features.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest BASiC Semiconductor Office

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