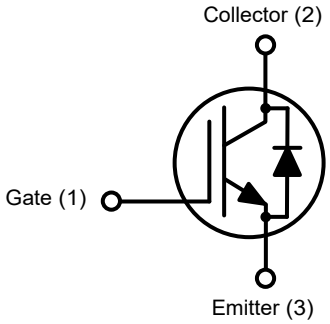
BGH75N65HS1

Hybrid SiC Discrete Devices

Product Summary

V_{CE}	650 V
I_C	75A @T_C=100°C
$V_{CE(sat).Typ}$	1.64V @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 Device
- Halogen Free, RoHS Complian

Applications

- UPS
- PV Inverter
- Welding Machine
- On-board Charger
- Totem Pole Bridgeless PFC

Package Pin Definitions

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

Package Parameters

Part Number	Marking	Package
BGH75N65HS1	BGH75N65HS1	TO-247-3

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

Symbol	Parameter		Value	Unit
V_{CE}	Collector-Emitter Voltage ,T_j≥25°C		650	V
V_{GE}	Gate-Emitter Voltage		±20	
	Transient Gate-Emitter Voltage		±30	
T_j	Operating Junction Temperature		-40~175	°C
T_{stg}	Storage Temperature Range		-55~150	°C
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	109	A
		T_C=100°C	74	
I_{CM}	Pulse Collector Current	V_{GE} =15V, t_p limited by T_{jmax}	300	A
P_{tot}	Power Dissipation	T_C=25°C	405	W

Thermal Characteritics

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	IGBT Thermal Resistance-Junction to Case	0.37	K/W
$R_{th(j-c)}$	Diode Thermal Resistance-Junction to Case	0.30	K/W
$R_{th(j-a)}$	Thermal Resistance-Junction to Ambient	30	K/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		1.64	2.1	V
			T_j=100°C		1.95		
			T_j=175°C		2.22		
I_{CES}	Zero Gate Voltage Collector Current	V_{CE}=650V, V_{GE}=0A	T_j=25°C		5	500	μA
			T_j=175°C		500	5000	
		V_{CE}=480V, V_{GE}=0A	T_j=25°C			200	
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE}=V_{CE}, I_C=750μA	T_j=25°C	4.2	5	5.8	V
I_{GES}	Gate-Emitter Leakage Current	V_{CE}=0V, V_{GE}=±20V	T_j=25°C			100	nA
g_{fs}	Transconductance	V_{CE}=20V, I_C=75A			94		S

Dynamic Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{ies}	Input Capacitance	V_{GE}=0V, V_{CE}=25V f=250kHz		8164		pF
C_{oes}	Output Capacitance			556		pF
C_{res}	Reverse Transfer Capacitance			137		pF
Q_G	Total Gate Charge	V_{CC}=520V, V_{GE}=15V, I_C=75A		444		nC

Switching Characteristics,Inductive Load

Symbol	Parameter	Test Conditions		Value			Unit
				Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on delay time	V_{DC}=400V, I_C=37.5A V_{GE}=0/15V, $R_{G(ext)}$=4.7Ω L_σ=60nH	T_j=25°C		30		ns
			T_j=150°C		27		
t_r	Rise time		T_j=25°C		35		
			T_j=150°C		33		
$t_{d(off)}$	Turn-off delay time		T_j=25°C		288		
			T_j=150°C		332		
t_f	Fall time		T_j=25°C		29		
			T_j=150°C		49		
E_{on}	Turn-on energy		T_j=25°C		721		μJ
			T_j=150°C		712		
E_{off}	Turn-off energy		T_j=25°C		460		
			T_j=150°C		611		
E_{total}	Total Switiching Energy		T_j=25°C		1181		
			T_j=150°C		1323		

Switching Characteristics,Inductive Load

Symbol	Parameter	Test Conditions		Value			Unit
				Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on delay time	V_{DC}=400V, I_C=75A V_{GE}=0/15V, $R_{G(ext)}$=4.7Ω L_σ=60nH	T_j=25°C		35		ns
			T_j=150°C		32		
t_r	Rise time		T_j=25°C		77		
			T_j=150°C		72		
$t_{d(off)}$	Turn-off delay time		T_j=25°C		277		
			T_j=150°C		313		
t_f	Fall time		T_j=25°C		53		
			T_j=150°C		63		
E_{on}	Turn-on energy		T_j=25°C		2119		μJ
			T_j=150°C		2132		
E_{off}	Turn-off energy		T_j=25°C		1313		
			T_j=150°C		1531		
E_{total}	Total Switiching Energy		T_j=25°C		3432		
			T_j=150°C		3663		

SiC Schottky Barrier Diode Characteristics

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	V_{GE}=0V, I_F=30A	T_j=25°C		1.40	1.54	V
			T_j=100°C		1.56		
			T_j=175°C		1.82	2.2	
Q_C	Diode Capacitive Charge	V_R=400V,T_j=25°C			83		nC
C	Diode Capacitance	V_R=1V, f=1MHz			1284		pF
		V_R=300V, f=1MHz			140		

Typical Performance

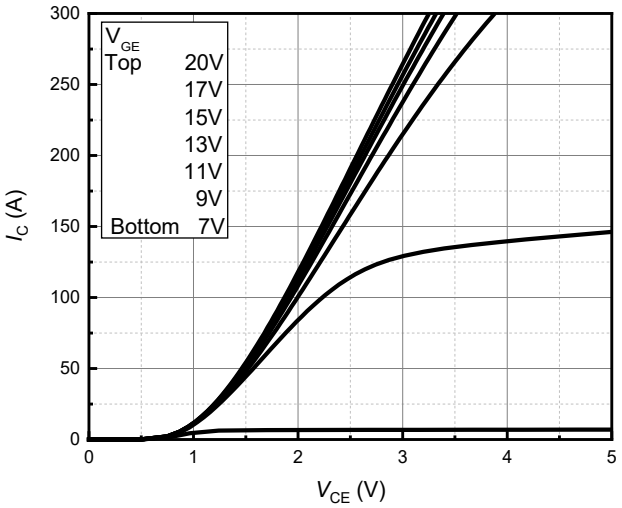


Figure 1 Output Characteristics (T_j=25°C)

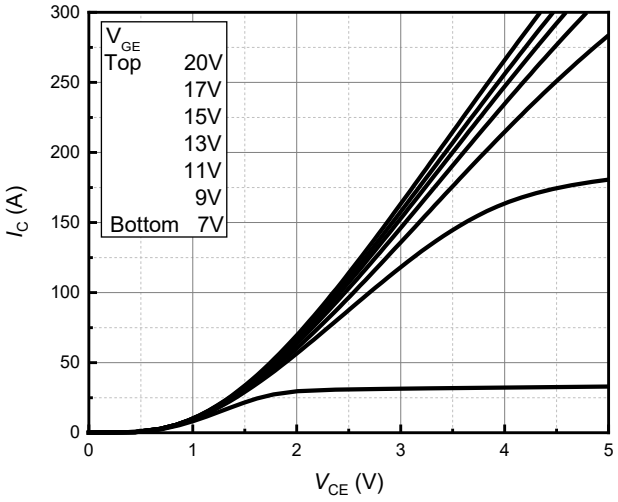


Figure 2 Output Characteristics (T_j=150°C)

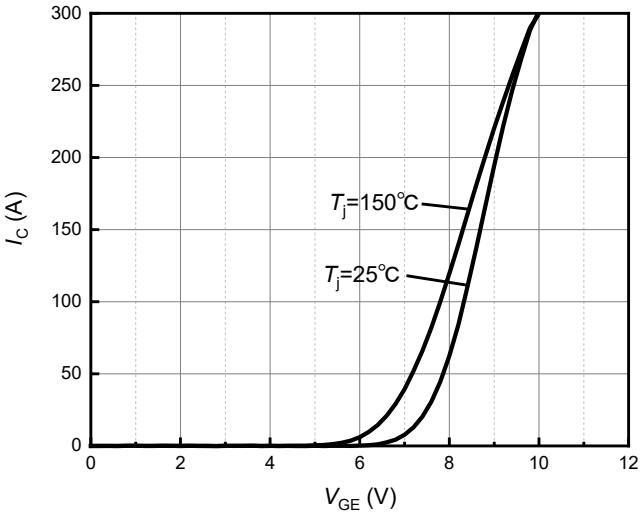


Figure 3 Transfer Characteristics for Various Temperature (V_{CE}=20V)

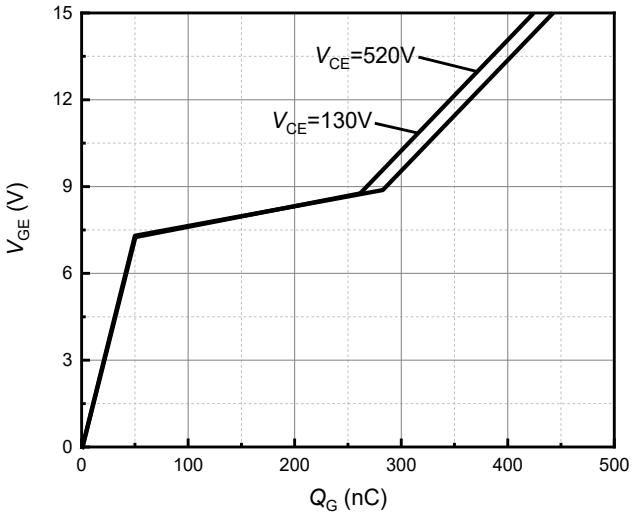


Figure 4 Gate Charge Characteristics (I_C=75A)

Typical Performance

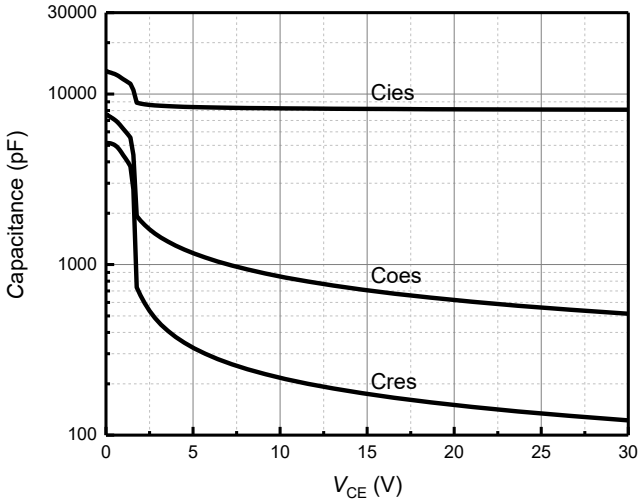


Figure 5 Capacitance Characteristics (V_{GE}=0V, f=250kHz)

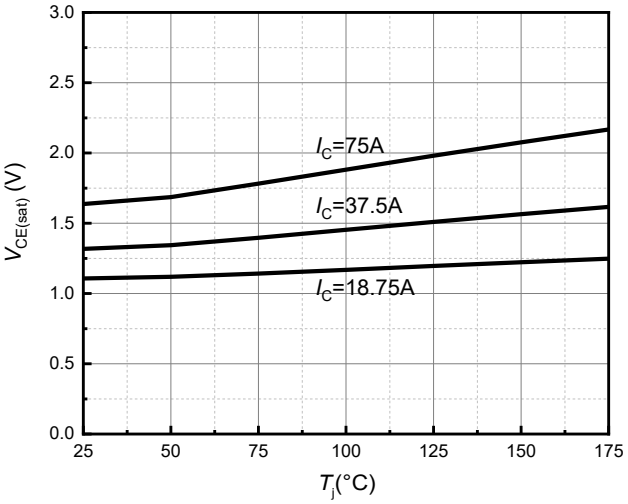


Figure 6 Collector-Emitter Saturation Voltage vs. Junction Temperature for Various Collector Current (V_{GE}=15V)

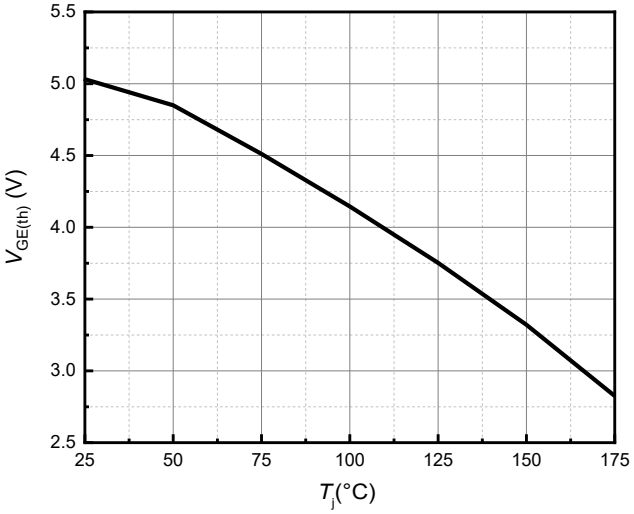


Figure 7 Gate-Emitter threshold Voltage vs. Junction Temperature (I_C=0.75mA)

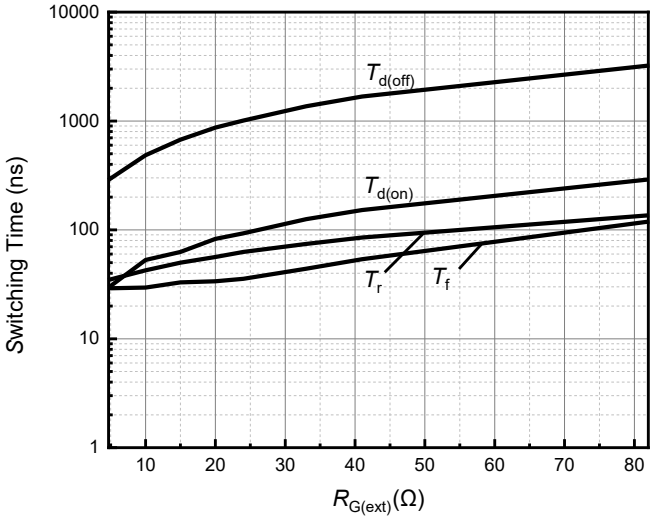


Figure 8 Switching Times vs. Gate Resistor (V_{DC}=400V, V_{GE}=15V, I_C=37.5A, T_j=25°C)

Typical Performance

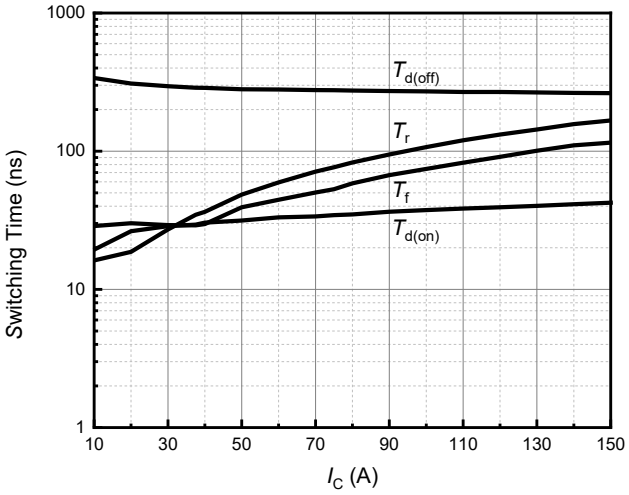


Figure 9 Switching Times vs. Collector Current(V_{DC}=400V, V_{GE}=15V, $R_{G(ext)}$=4.7Ω, T_j=25°C)

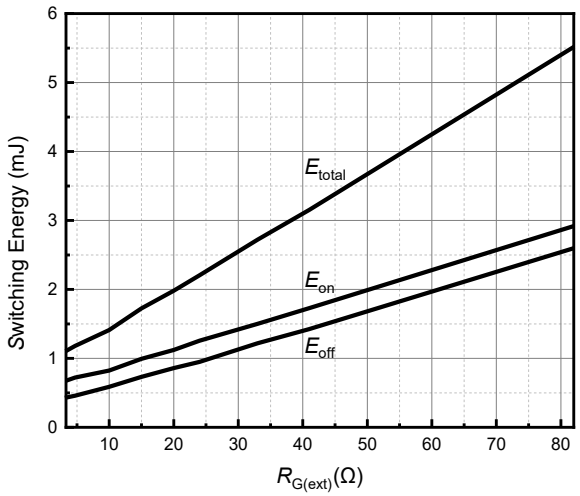


Figure 10 Switching Loss vs. Gate Resistor (V_{DC}=400V, V_{GE}=15V, I_C=37.5A, T_j=25°C)

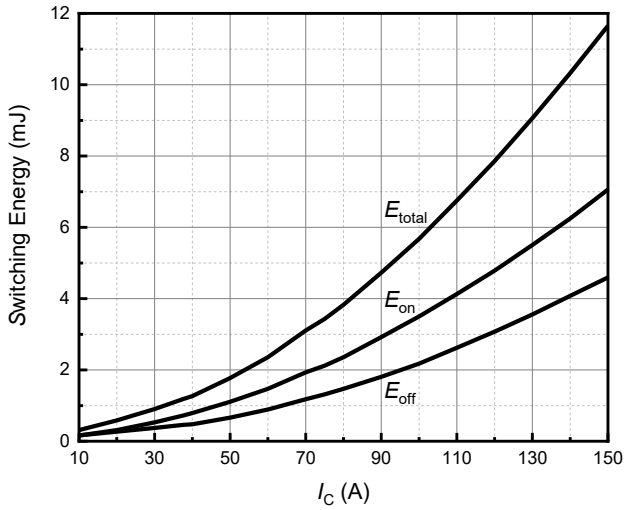


Figure 11 Switching Loss vs. Collector Current (V_{DC}=400V, V_{GE}=15V, $R_{G(ext)}$=4.7Ω, T_j=25°C)

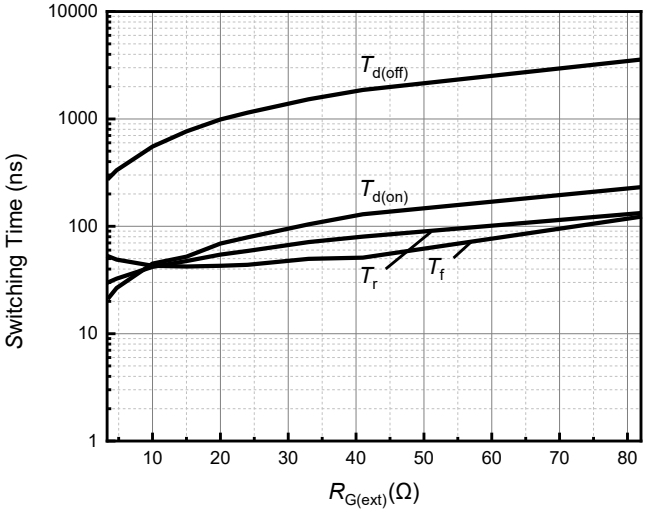


Figure 12 Switching Times vs. Gate Resistor (V_{DC}=400V, V_{GE}=15V, I_C=37.5A, T_j=150°C)

Typical Performance

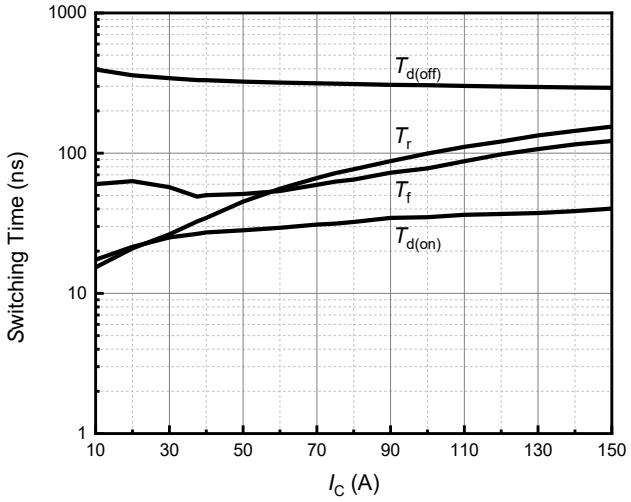


Figure 13 Switching Times vs. Collector Current (V_{DC}=400V, V_{GE}=15V, $R_{G(ext)}$=4.7Ω, T_j=150°C)

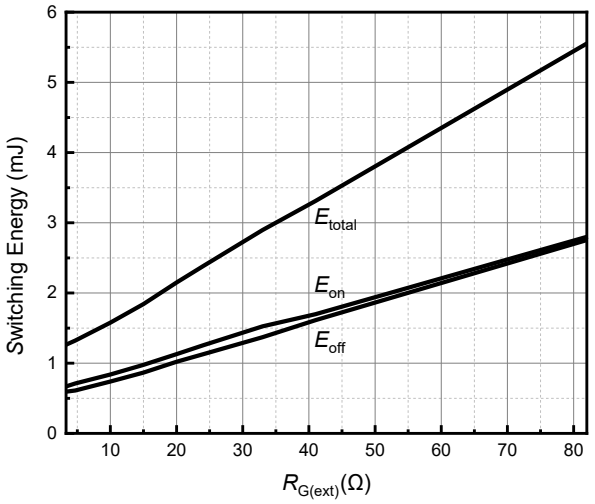


Figure 14 Switching Loss vs. Gate Resistor (V_{DC}=400V, V_{GE}=15V, I_C=37.5A, T_j=150°C)

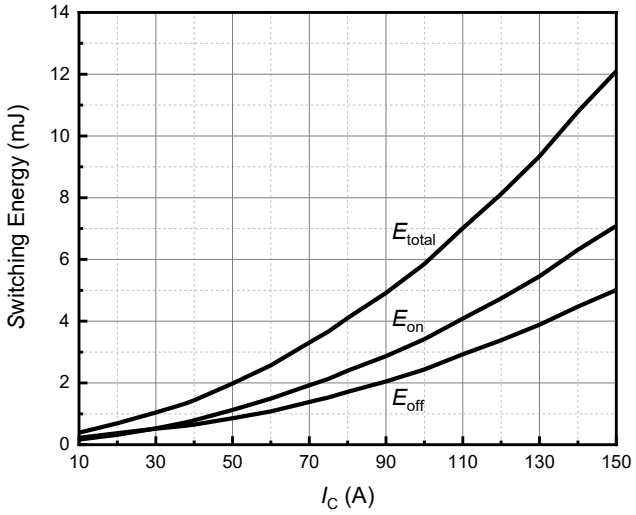


Figure 15 Switching Loss vs. Collector Current (V_{DC}=400V, V_{GE}=15V, $R_{G(ext)}$=4.7Ω, T_j=150°C)

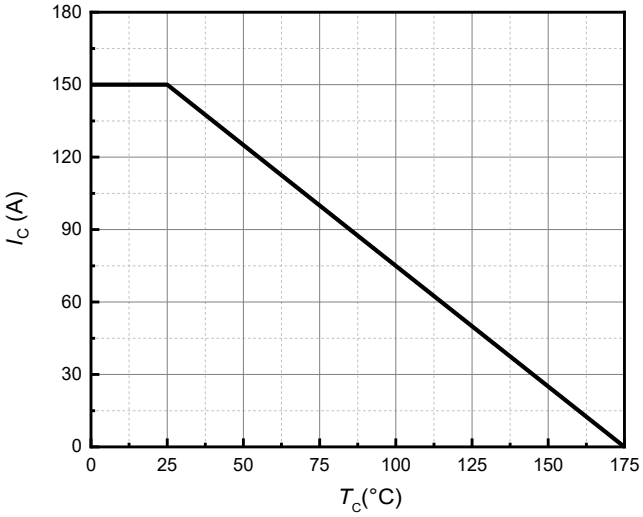


Figure 16 Maximum Collector current vs. Case Temperature

Typical Performance

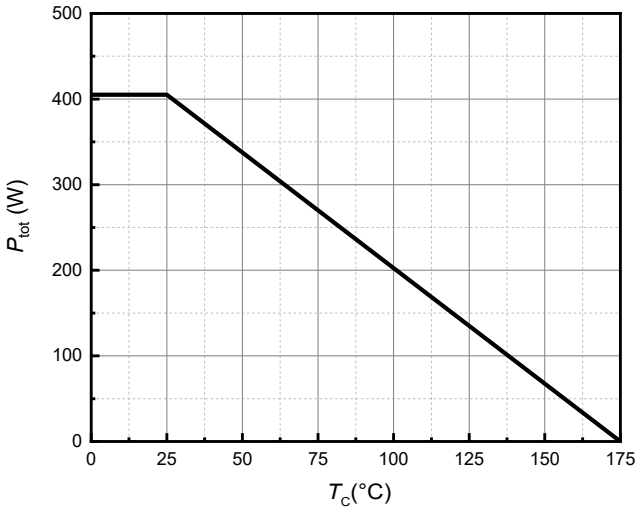


Figure 17 Power Dissipation as a Funcation of T_c

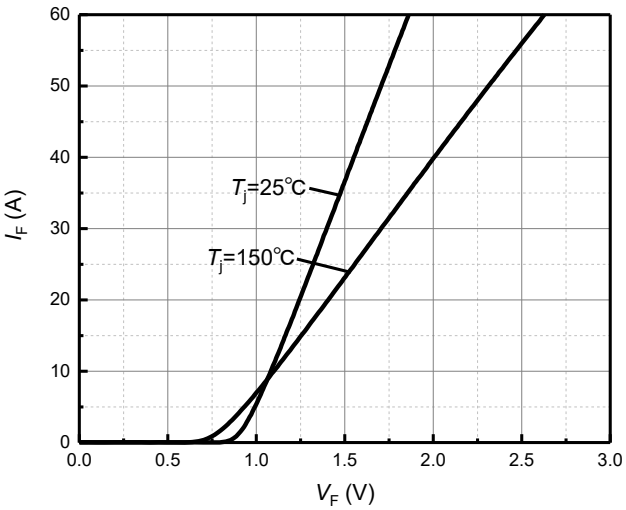


Figure 18 Forward characteristic of Diode

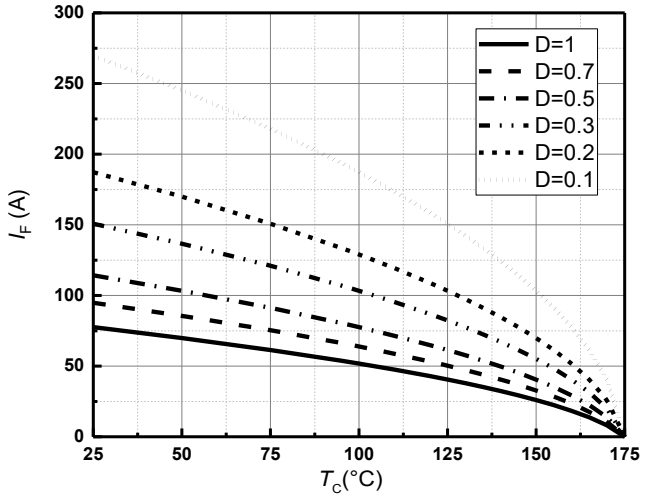


Figure 19 Diode forward current as function of temperature, D=duty cycle

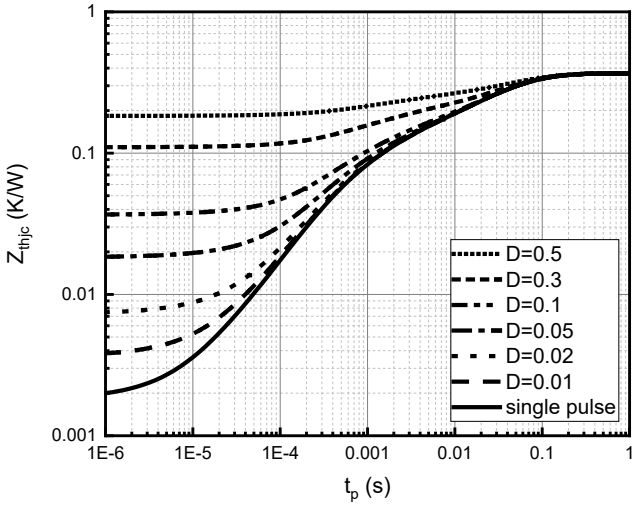


Figure 20 IGBT Transient Thermal Response Curve

Typical Performance

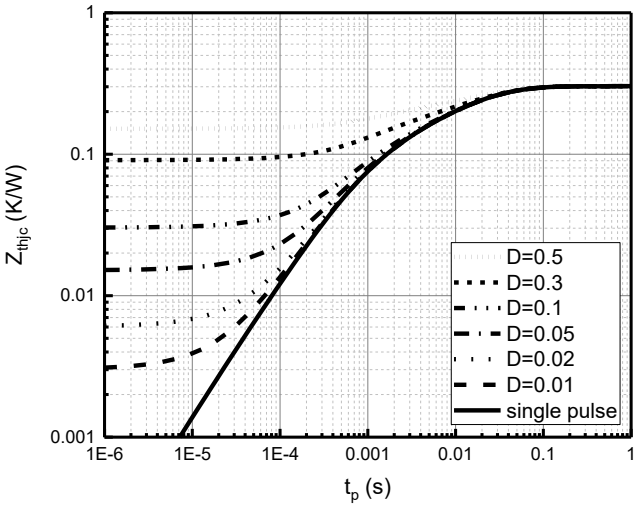
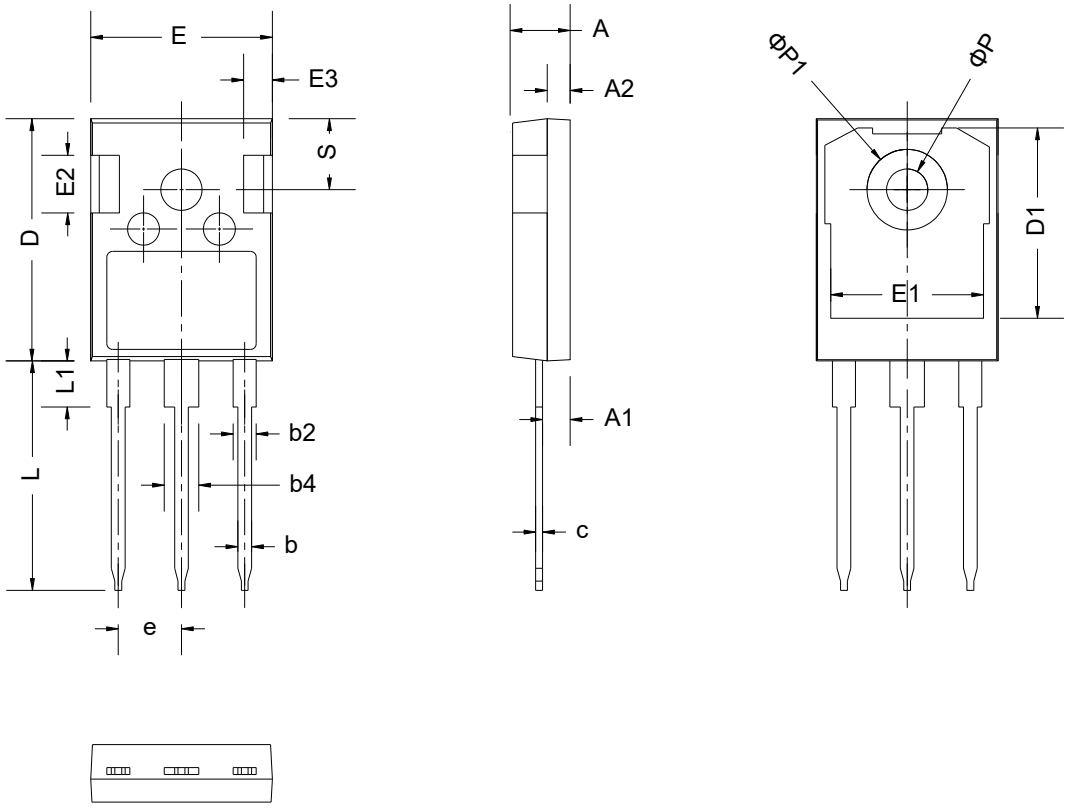


Figure 21 Diode Transient Thermal Response Curve

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	2023-10-09	Draft datasheet created.

Information

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

Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, BASiC semiconductor Ltd. hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, BASiC semiconductor Ltd. hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.