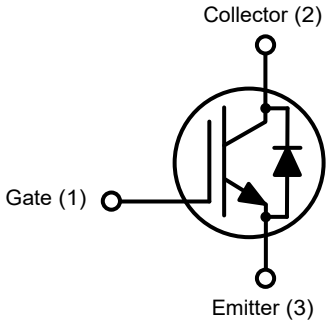
BGH50N65HF1

Hybrid SiC Discrete Devices

Product Summary

V_{CE}	650 V
I_C	50A @T_C=100°C
$V_{CE(sat).Typ}$	1.55V @I_C=50A

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
- On-board Charger
- Totem Pole Bridgeless PFC
- High Frequency Motor Drive

Package Pin Definitions

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

Package Parameters

Part Number	Marking	Package
BGH50N65HF1	BGH50N65HF1	TO-247-3

Maximum Ratings(T_c=25℃ Unless Otherwise Noted)

Symbol	Parameter		Value	Unit
V_{CE}	Collector-Emitter Voltage ,T_j≥25℃		650	V
V_{GE}	Gate-Emitter Voltage		±20	
	Transient Gate-Emitter Voltage		±30	
I_C	DC Collector Current, limited by T_{jmax}	T_C=25℃	114	A
		T_C=100℃	50	
I_F	Diode Forward Current, limited by T_{jmax}	T_C=25℃	50	A
		T_C=100℃	34	
$I_{C,pulse}$	Pulse Collector Current	V_{GE} =15V, t_p limited by T_{jmax}	200	A
P_{tot}	Power Dissipation	T_C=25℃	297	W
T_j	Operating Junction Temperature		-40~150	°C
T_{stg}	Storage Temperature Range		-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		0.42		K/W
$R_{th(j-c)}$	Diode Thermal Resistance-Junction to Case		0.81		K/W
$R_{th(j-a)}$	Thermal Resistance-Junction to Ambient		32		K/W

Electrical Characteristics (Defined at T_j=25℃ 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=50A	T_j=25℃		1.55	2.1	V
			T_j=100℃		1.75		
			T_j=150℃		1.88		
I_{CES}	Zero Gate Voltage Drain Current	V_{CE}=650V, V_{GE}=0V	T_j=25℃			100	μA
			T_j=150℃			1000	
		V_{CE}=480V, V_{GE}=0V	T_j=25℃			80	
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=±20V, V_{CE}=0V	T_j=25℃			100	nA

$V_{GE(th)}$	Gate Threshold Voltage	V_{GE}=V_{CE}, I_C=500μA	T_j=25℃	4.2	5	5.8	V
g_{fs}	Transconductance	V_{CE}=20V, I_C=40A			82		S

Dynamic Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{ies}	Input Capacitance	V_{GE}=0V, V_{CE}=25V f=250kHz		5692		pF
C_{oes}	Output Capacitance			339		pF
C_{res}	Reverse Transfer Capacitance			95		pF
Q_G	Internal Gate Resistance	V_{CC}=520V, V_{GE}=15V, I_C=50A		308		nC

Switching Characteristics,Inductive Load

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	T_j=25℃ V_{DC}=400V, I_C=25A V_{GE}=0/15V, $R_{G(ext)}$=10Ω L_σ=60nH		23		ns
t_r	Rise Time			27		
$t_{d(off)}$	Turn-Off Delay Time			333		
t_f	Fall Time			42		
E_{on}	Turn-On Energy			357		uJ
E_{off}	Turn-Off Energy			343		
E_{total}	Total Switiching Energy			700		

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℃		1.51		V
			T_j=100℃		1.62		
			T_j=150℃		1.76		
Q_C	Diode Capacitive Charge	V_R=400V, T_j=25℃			46		nC
C	Diode Capacitance	V_R=1V, f=1MHz			713		pF
		V_R=300V, f=1MHz			79		

Typical Performance

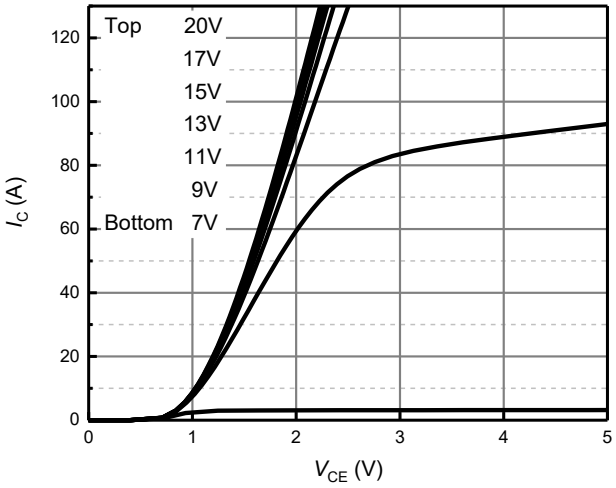


Figure 1 Output Characteristics (T_j=25℃)

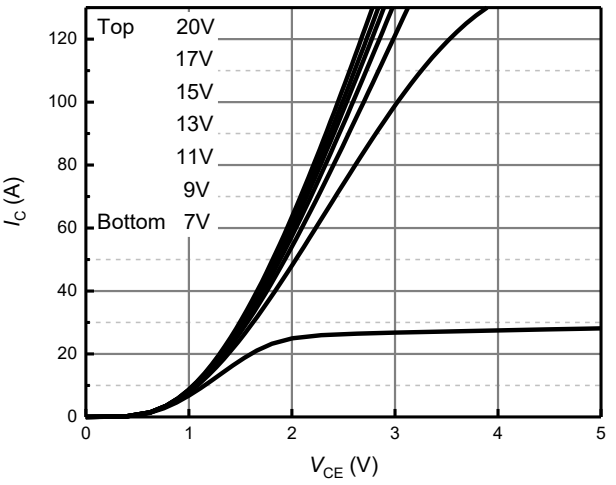


Figure 2 Output Characteristics (T_j=150℃)

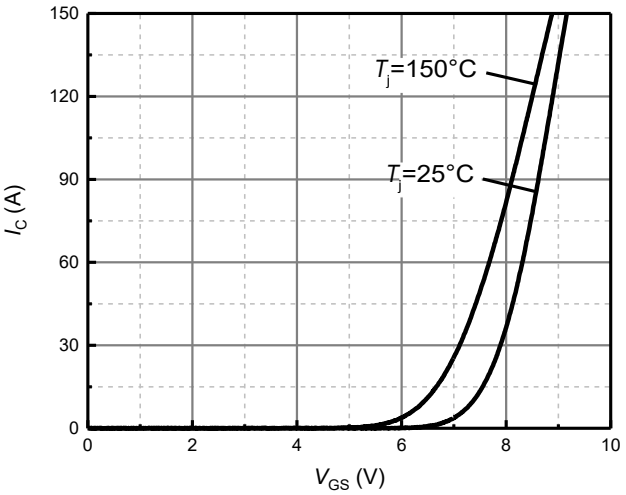


Figure 3 Transfer Characteristics for Various Temperature (V_{CE}=20V)

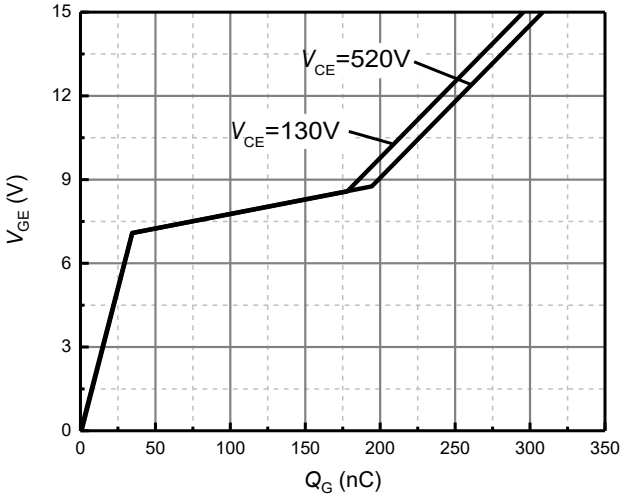


Figure 4 Gate Charge Characteristics (I_C=50A)

Typical Performance

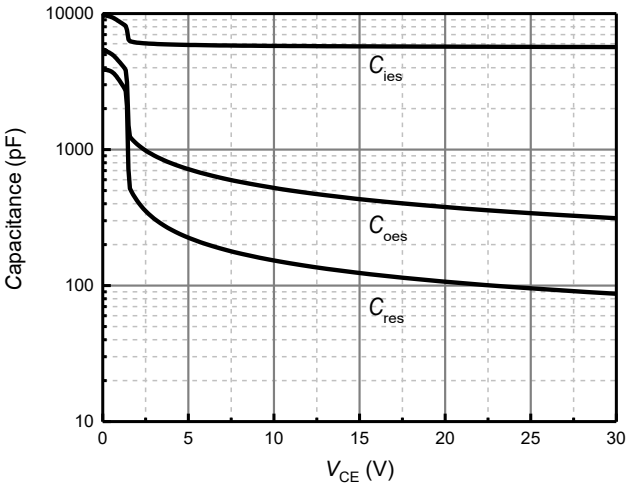


Figure 5 Capacitance Characteristics (V_{GE}=0V , f=250kHZ)

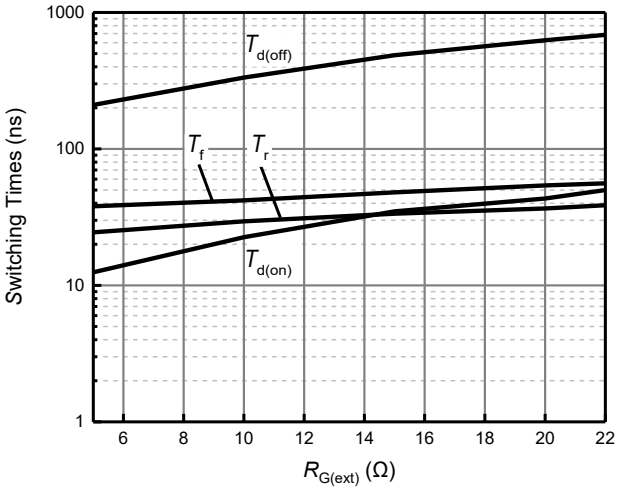


Figure 6 Switching Times vs. Gate Resistor (V_{DC}=400V , V_{GE}=0/15V , I_C=25A , T_j=25℃)

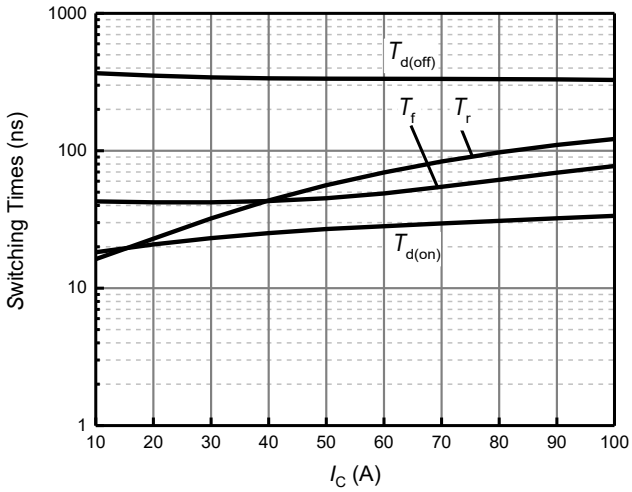


Figure 7 Switching Times vs. Collector Current(V_{DC}=400V , V_{GE}=0/15V , $R_{G(ext)}$=10Ω , T_j=25℃)

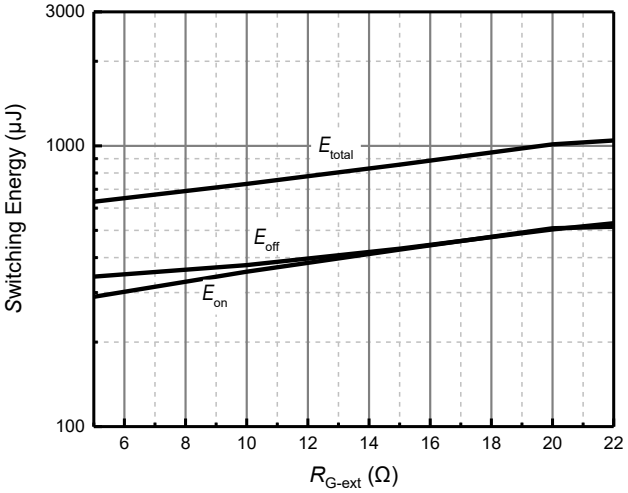


Figure 8 Switching Loss vs. Gate Resistor (V_{DC}=400V , V_{GE}=0/15V , I_C=25A , T_j=25℃)

Typical Performance

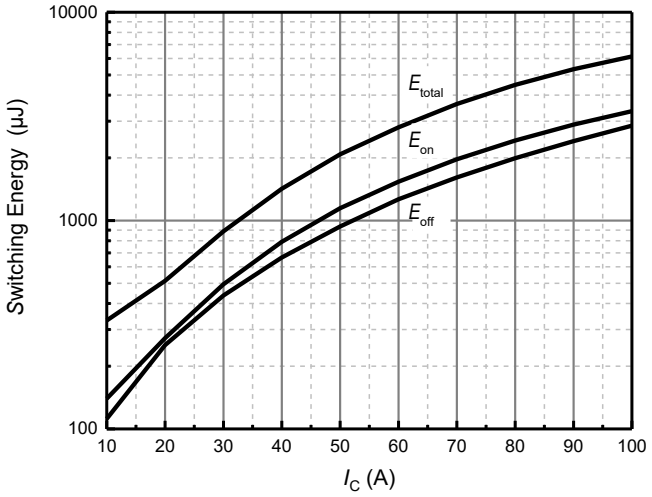


Figure 9 Switching Loss vs. Collector current(V_{DC}=400V , V_{GE}=0/15V , $R_{G(ext)}$=10Ω , T_j=25℃)

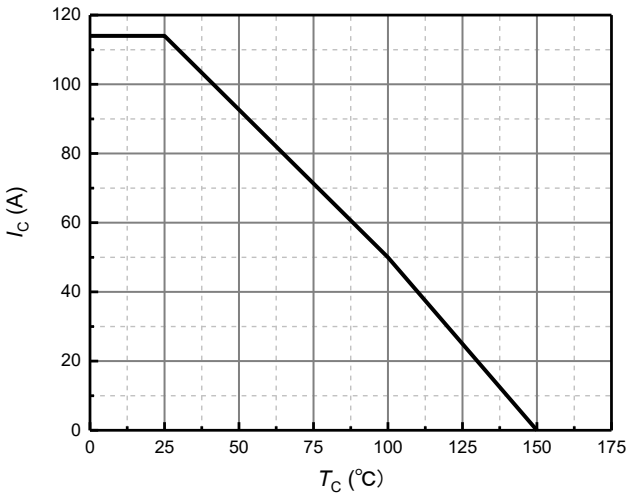


Figure 10 Collector current vs. Case Temperature

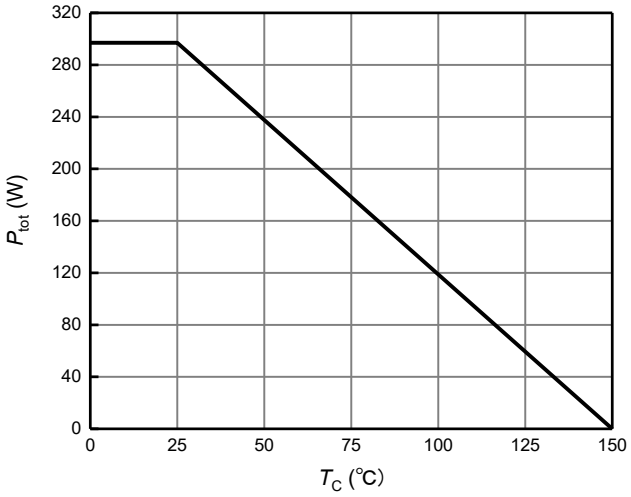


Figure 11 Power Dissipation vs. Case Temperature

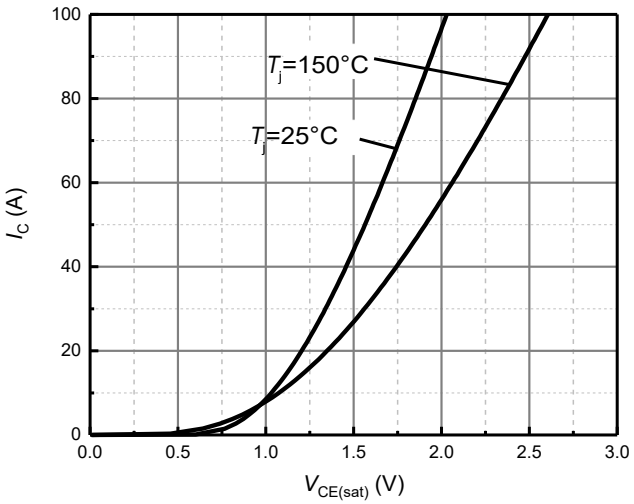


Figure 12 Collector-emitter saturation voltage for Various Temperature (V_{GE}=15V)

Typical Performance

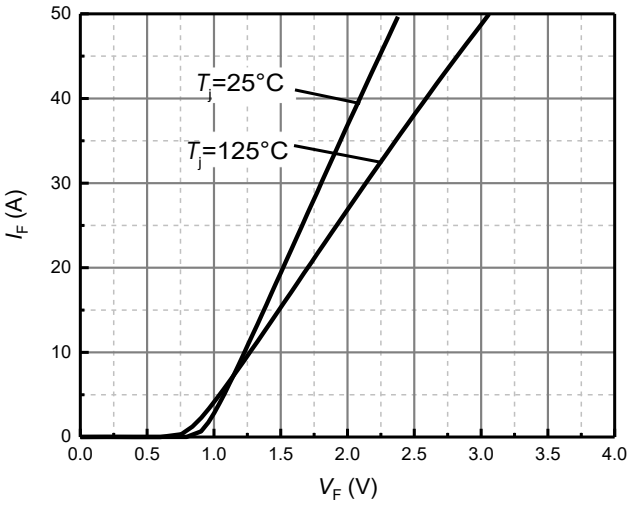


Figure 13 Forward characteristic of Diode

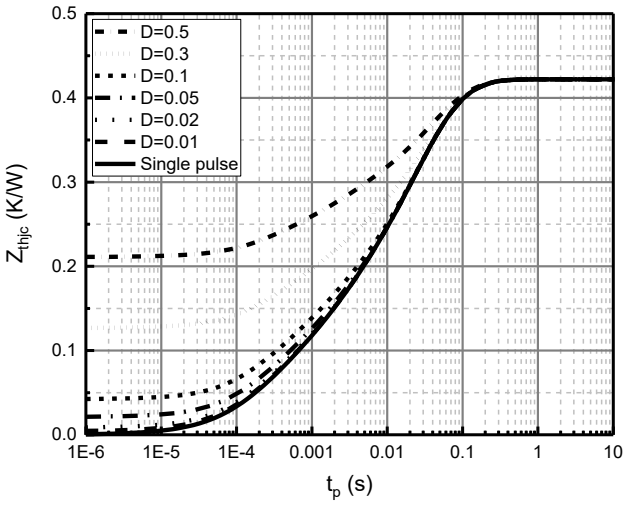


Figure 14 IGBT Transient Thermal Response Curve

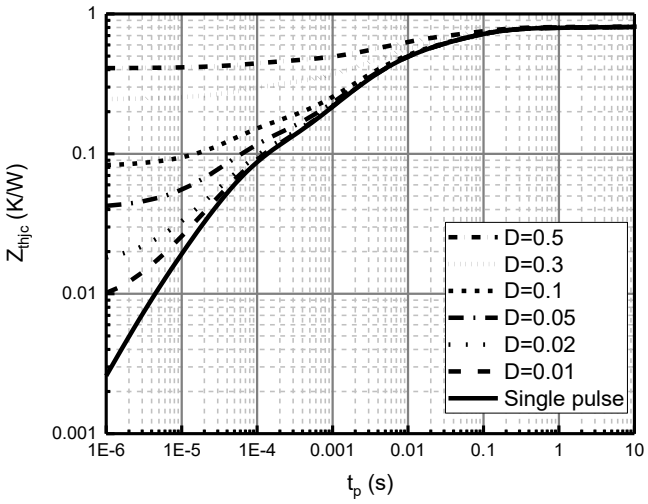


Figure 15 Diode Transient Thermal Response Curve

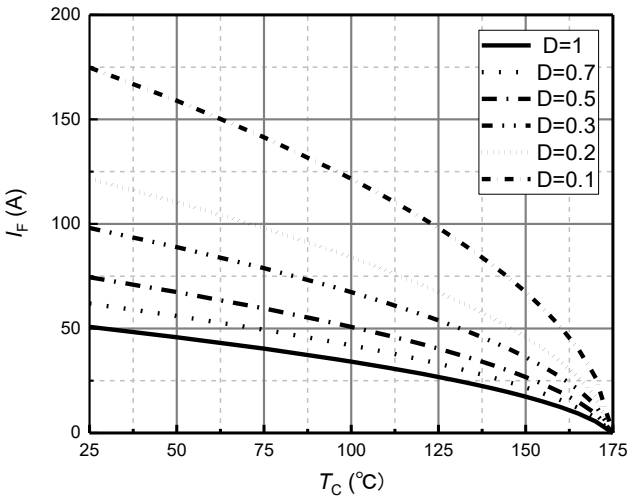
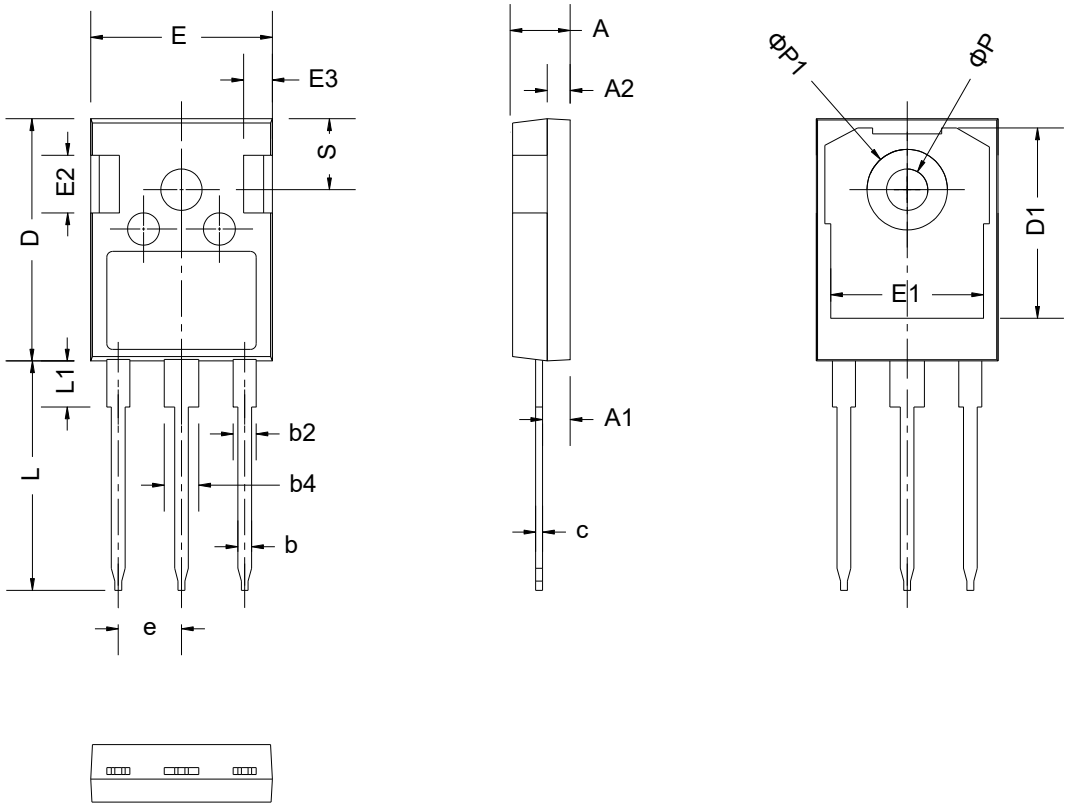


Figure 16 Diode forward current as function of temperature, D=duty cycle

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	2022-05-16	Draft datasheet created.

Information

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