

Product Summary

V_{CE}	1200 V
I_C	75A @ $T_C=100^{\circ}\text{C}$
$V_{CE(sat), Typ}$	2.2V @ $I_C=75\text{A}$

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 Compliant

Applications

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

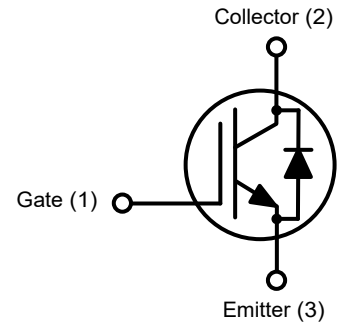
Package Pin Definitions

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

Package Parameters

Part Number	Marking	Package
BGH75N120HF1	BGH75N120HF1	TO-247-3

Package: TO-247-3



Maximum Ratings($T_c=25^\circ\text{C}$ 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}	$T_c=25^\circ\text{C}$	150	A
		$T_c=100^\circ\text{C}$	75	
$I_{C,pulse}$	Pulse Collector Current	$V_{GE}=15\text{V}$, limited by T_{jmax}	200	A
I_F	Diode Forward Current, limited by T_{jmax}	$T_c=25^\circ\text{C}$	76	A
		$T_c=100^\circ\text{C}$	45	
I_{FSM}	Non-repetitive forward surge current	$T_c=25^\circ\text{C}$, $t_p=10\text{ms}$ Half sine wave	180	A
P_{tot}	Power Dissipation	$T_c=25^\circ\text{C}$	568	W
T_j	Operating Junction Temperature		-40~175	$^\circ\text{C}$
T_{stg}	Storage Temperature		-55~150	$^\circ\text{C}$
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		$^\circ\text{C/W}$
$R_{th(j-c)}$	Diode Thermal Resistance-Junction to Case		0.41		$^\circ\text{C/W}$
$R_{th(j-a)}$	Thermal Resistance-Junction to Ambient		31		$^\circ\text{C/W}$

Electrical Characteristics (Defined at $T_j=25^\circ\text{C}$ Unless Otherwise Specified)
IGBT Static Characteristics

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15\text{V}$, $I_C=75\text{A}$	$T_j=25^\circ\text{C}$		2.2	2.65	V
			$T_j=100^\circ\text{C}$		2.6		
			$T_j=175^\circ\text{C}$		3.2		
I_{CES}	Zero Gate Voltage Drain Current	$V_{CE}=1200\text{V}$, $V_{GE}=0\text{V}$	$T_j=25^\circ\text{C}$		4	400	μA
			$T_j=175^\circ\text{C}$		400	5000	
		$V_{CE}=960\text{V}$, $V_{GE}=0\text{V}$	$T_j=25^\circ\text{C}$		0.3	90	
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$	$T_j=25^\circ\text{C}$		6	100	nA
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}$, $I_C=2.6\text{mA}$	$T_j=25^\circ\text{C}$	5	5.7	6.2	V

g_{fs}	Transconductance	$V_{CE}=20V, I_C=75A$		97		S
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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	$T_J=25^{\circ}C$ $V_{DC}=600V, I_C=37.5A$ $V_{GE}=0/15V, R_{G(ext)}=10\Omega$ $L_{\sigma}=60nH$		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 Switching Energy			2.68		
$t_{d(on)}$	Turn-On Delay Time	$T_J=125^{\circ}C$ $V_{DC}=600V, I_C=37.5A$ $V_{GE}=0/15V, R_{G(ext)}=10\Omega$ $L_{\sigma}=60nH$		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 Switching Energy			3.03		

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	$T_j=25^{\circ}\text{C}$ $V_{DC}=600\text{V}, I_C=75\text{A}$ $V_{GE}=0/15\text{V}, R_{G(ext)}=10\Omega$ $L_{\sigma}=60\text{nH}$		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 Switching Energy			7.07		
$t_{d(on)}$	Turn-On Delay Time	$T_j=125^{\circ}\text{C}$ $V_{DC}=600\text{V}, I_C=75\text{A}$ $V_{GE}=0/15\text{V}, R_{G(ext)}=10\Omega$ $L_{\sigma}=60\text{nH}$		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 Switching Energy			7.61		

SiC Schottky Barrier Diode Static Characteristics

Symbol	Parameter	Test conditions		Value		Unit
			Min.	Typ.	Max.	
V_F	Diode Forward Voltage	$I_F=20\text{A}, V_{GE}=0\text{V}$	$T_j=25^{\circ}\text{C}$	1.3	1.6	V
			$T_j=100^{\circ}\text{C}$	1.47		
			$T_j=175^{\circ}\text{C}$	1.78	2.7	
Q_C	Diode Capacitive Charge	$V_R=800\text{V}, T_j=25^{\circ}\text{C}$		120		nC
C	Diode Capacitance	$V_R=1\text{V}, f=1\text{MHz}$		1342		pF
		$V_R=400\text{V}, f=1\text{MHz}$		112		
		$V_R=800\text{V}, f=1\text{MHz}$		85		

Typical Performance

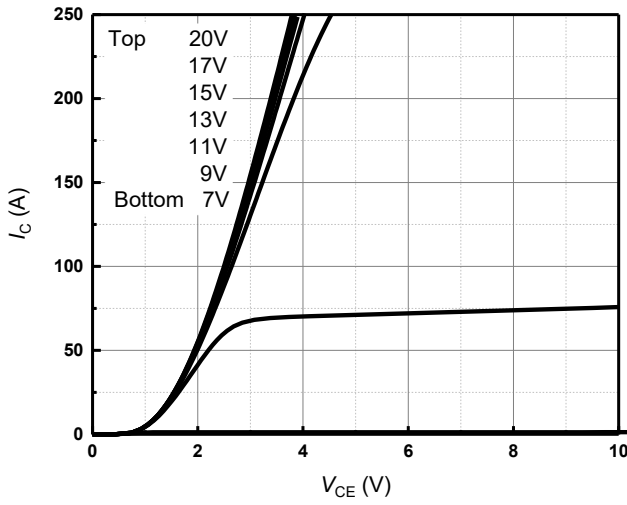


Figure 1 Output Characteristics
($T_j=25^\circ\text{C}$)

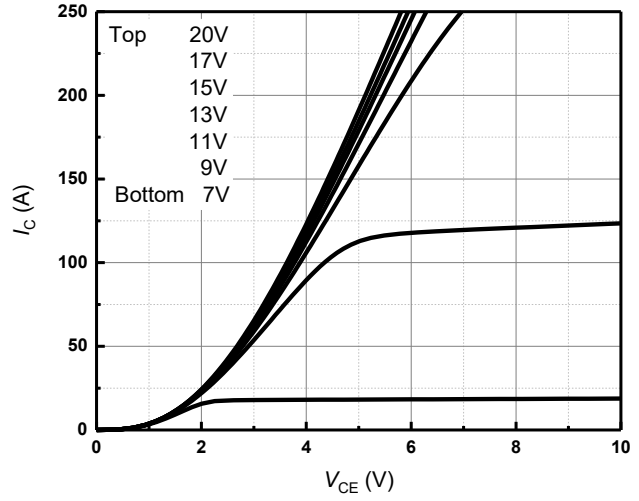


Figure 2 Output Characteristics
($T_j=175^\circ\text{C}$)

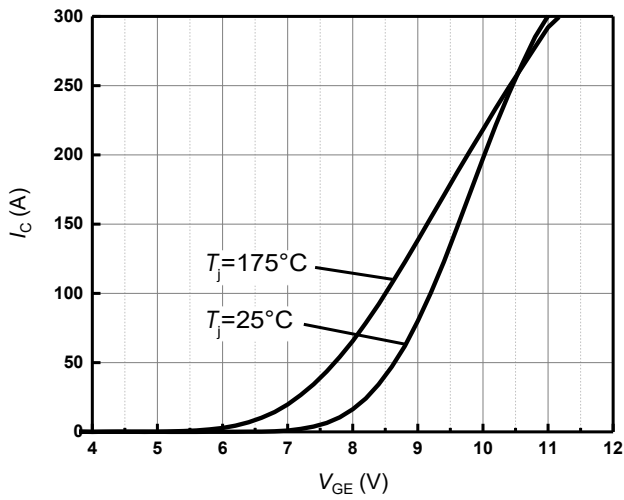


Figure 3 Transfer Characteristics for Various Temperature
($V_{ce}=20\text{V}$)

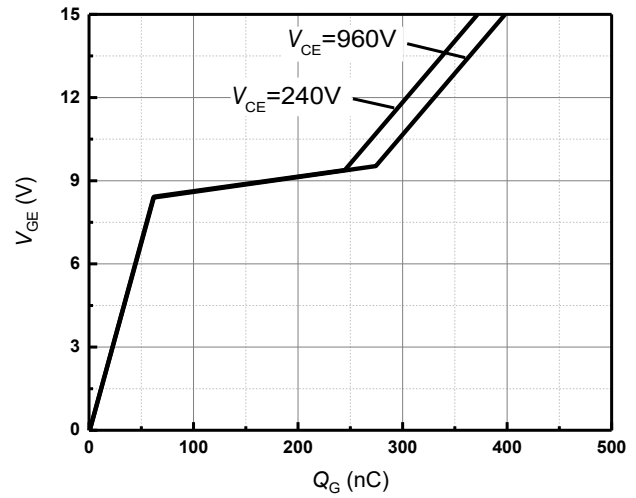


Figure 4 Gate Charge Characteristics
($I_c=75\text{A}$)

Typical Performance

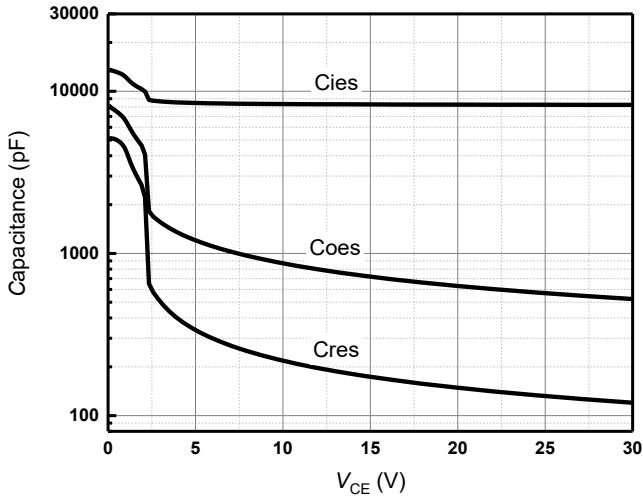


Figure 5 Capacitance Characteristics
($V_{GE}=0V$, $f=250kHz$)

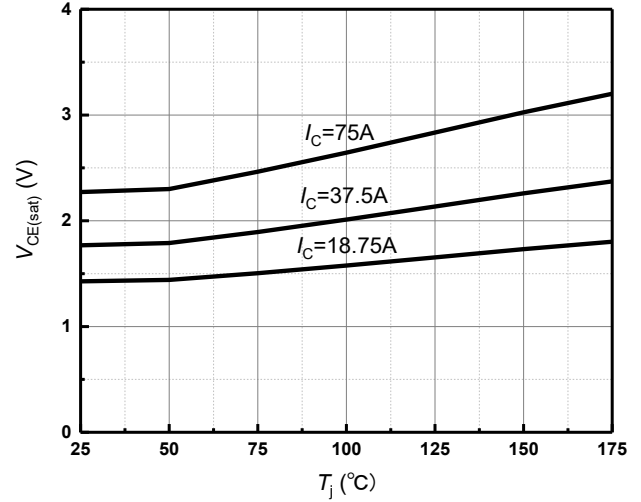


Figure 6 Collector-Emitter Saturation Voltage
vs. Junction Temperature for Various
Collector Current ($V_{GE}=15V$)

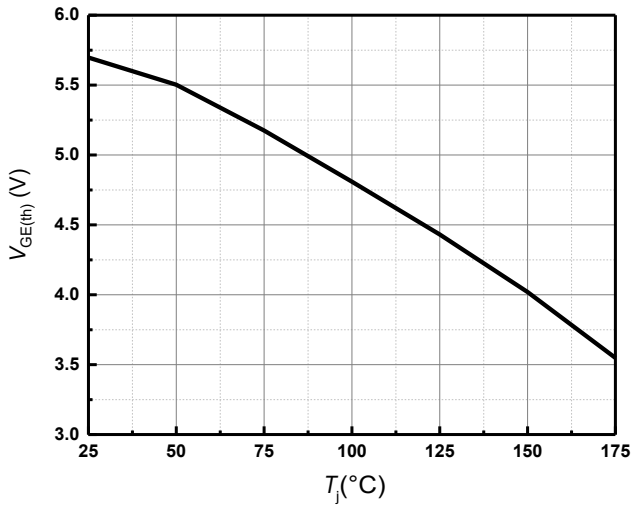


Figure 7 Gate-Emitter threshold Voltage
vs. Junction Temperature
($I_C=2.6mA$)

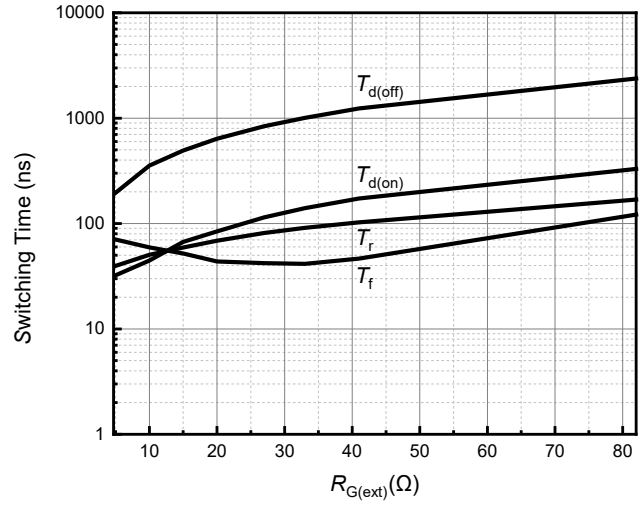


Figure 8 Switching Times vs. Gate Resistor
($V_{CC}=600V$, $V_{GE}=15V$, $I_C=75A$,
 $T_j=25°C$)

Typical Performance

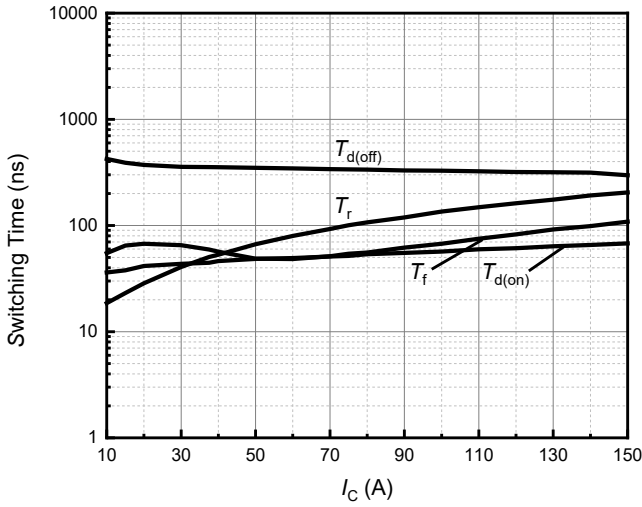


Figure 9 Switching Times vs. Collector Current ($V_{CC}=600V$, $V_{GE}=15V$, $R_{G(ext)}=10\Omega$, $T_j=25^\circ C$)

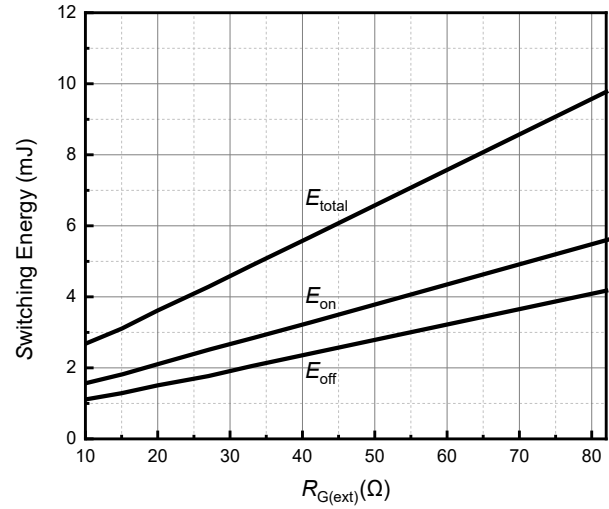


Figure 10 Switching Loss vs. Gate Resistor ($V_{CC}=600V$, $V_{GE}=15V$, $I_C=75A$, $T_j=25^\circ C$)

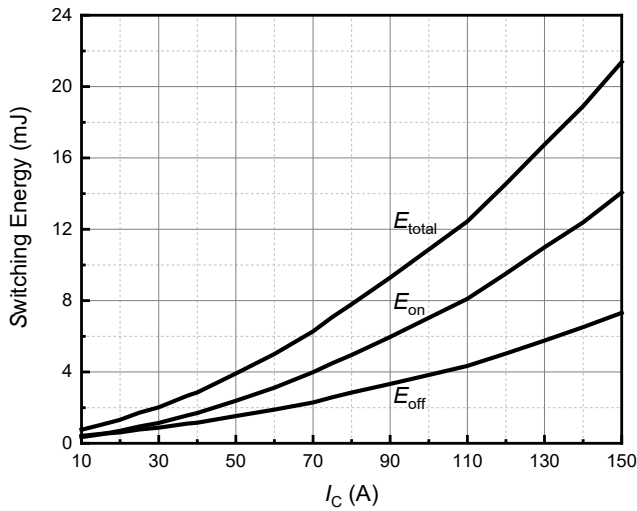


Figure 11 Switching Loss vs. Collector Current ($V_{CC}=600V$, $V_{GE}=15V$, $R_{G(ext)}=10\Omega$, $T_j=25^\circ C$)

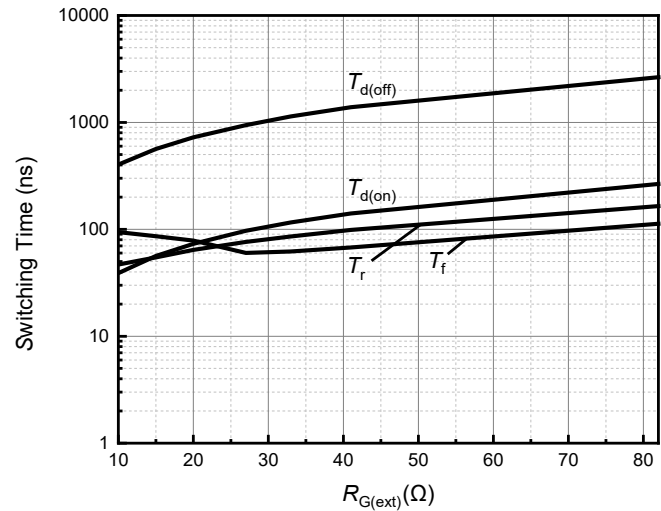


Figure 12 Switching Times vs. Gate Resistor ($V_{CC}=600V$, $V_{GE}=15V$, $I_C=75A$, $T_j=125^\circ C$)

Typical Performance

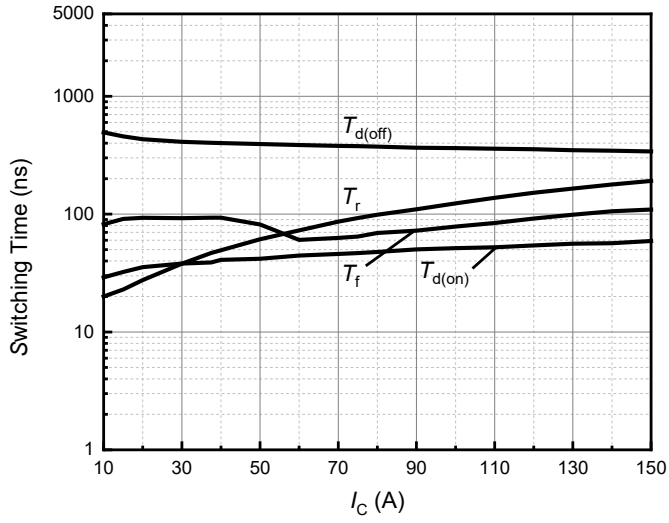


Figure 13 Switching Times vs. Collector Current ($V_{CC}=600V$, $V_{GE}=15V$, $R_{G(ext)}=10\Omega$, $T_j=125^\circ C$)

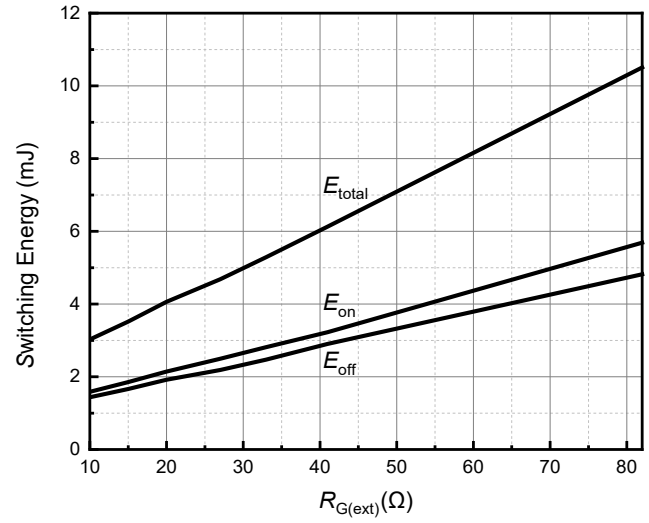


Figure 14 Switching Loss vs. Gate Resistor ($V_{CC}=600V$, $V_{GE}=15V$, $I_C=75A$, $T_j=125^\circ C$)

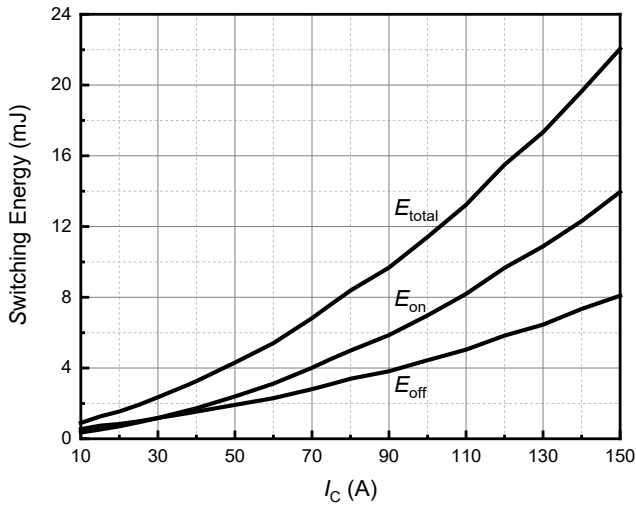


Figure 15 Switching Loss vs. Collector Current ($V_{CC}=600V$, $V_{GE}=15V$, $R_{G(ext)}=10\Omega$, $T_j=125^\circ C$)

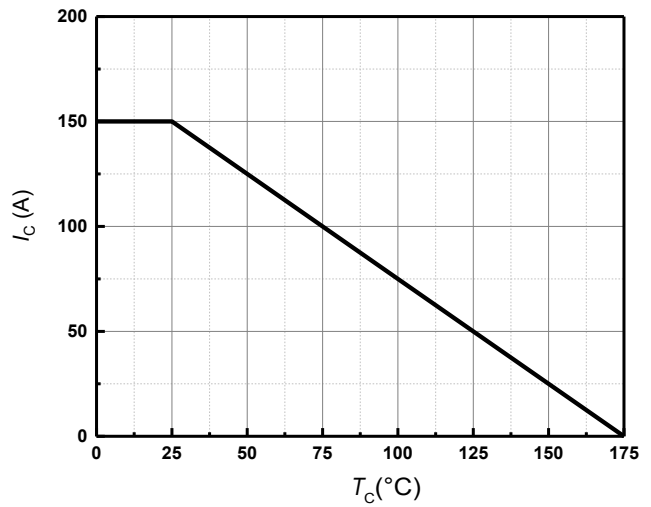


Figure 16 Maximum Collector current vs. Case Temperature

Typical Performance

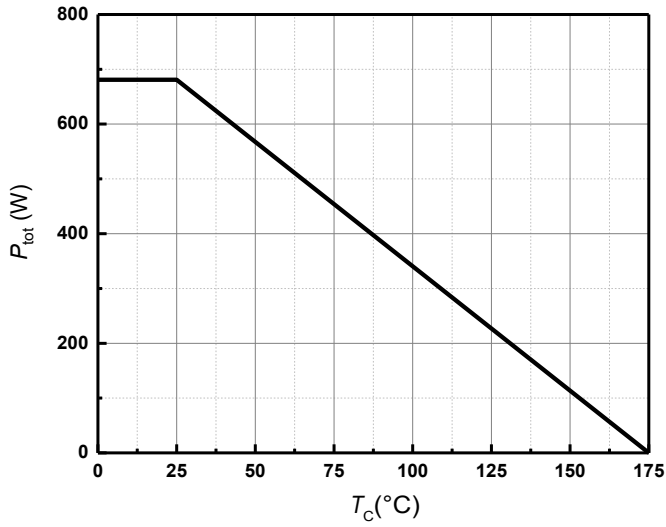


Figure 17 Power Dissipation as a Function of T_c

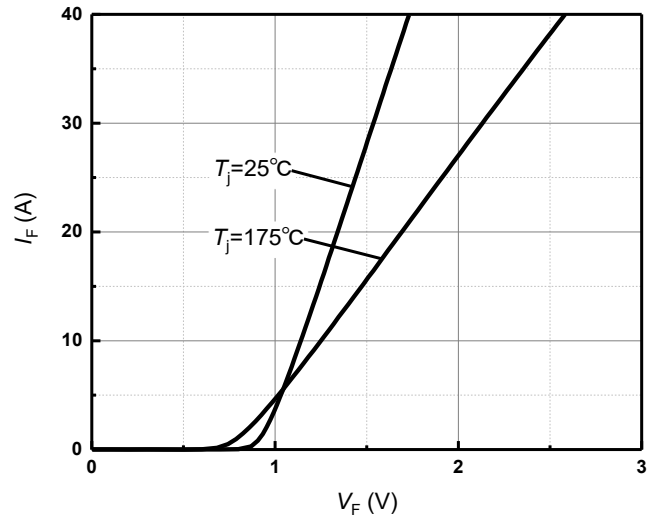


Figure 18 Forward characteristic of Diode

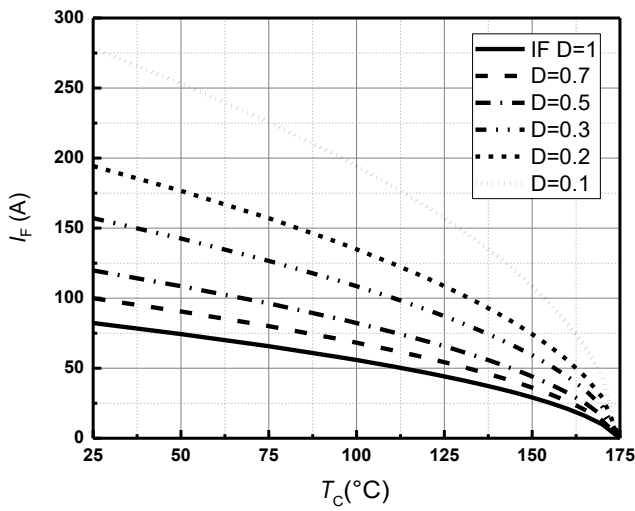


Figure 19 Diode forward current as function of temperature, D=duty cycle

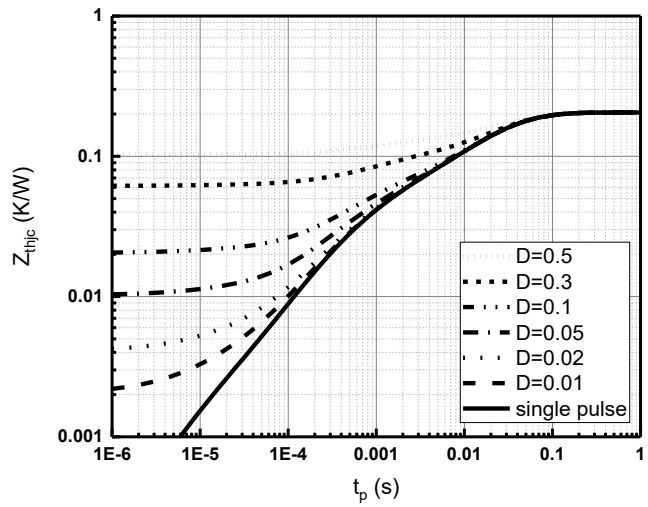


Figure 20 IGBT Transient Thermal Response Curve

Typical Performance

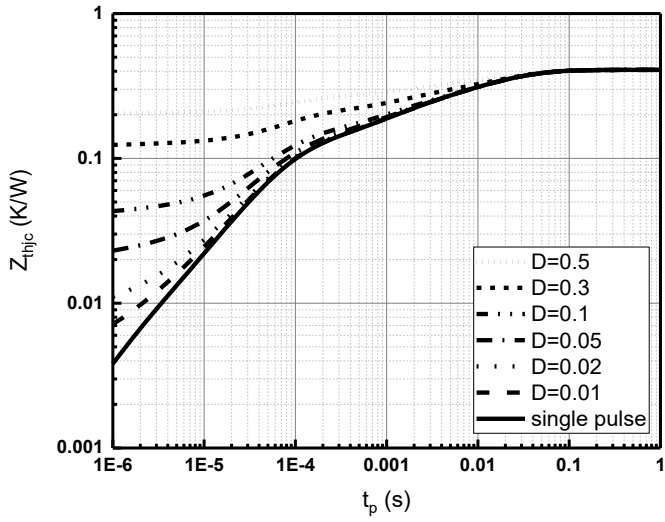
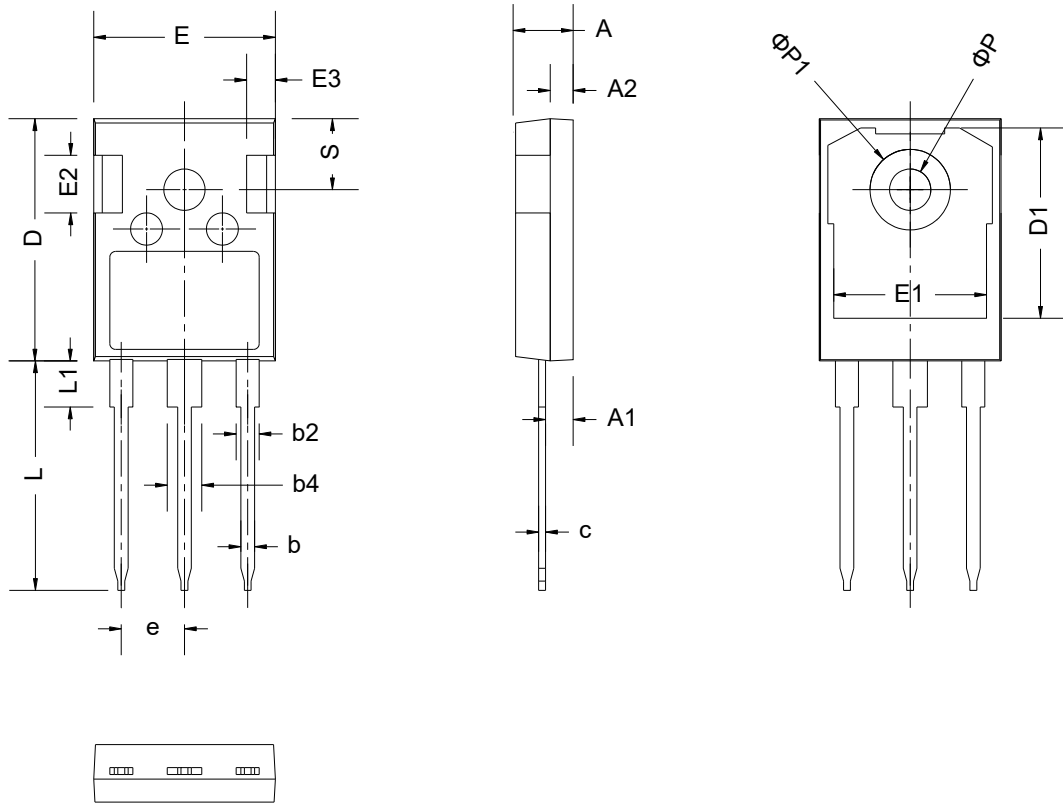


Figure 21 Diode Transient Thermal Response Curve

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
Φ P	3.40	3.60	3.80
Φ P1	-	-	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.
Rev. 0.2	2023-06-26	Update features.
Rev. 0.3	2023-07-28	Update features.

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