

BRGB6N65DP

Rev.A Aug.-2023

/ Descriptions

TO-252

Insulated-Gate Bipolar Transistor in a TO-252 Plastic Package.

/ Features

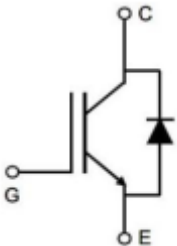
di/dt
 $V_{CE(SAT)}$

HF Product.

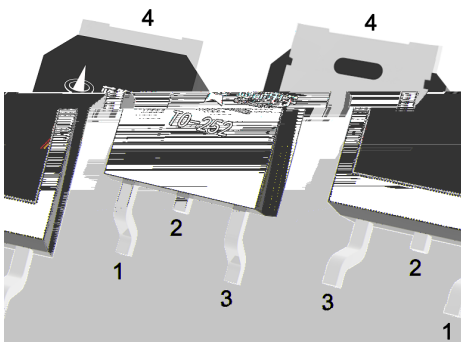
/ Applications

Motor Drives, Home Appliance Applications, Fan, Pumps, Vacuum Cleaner, Other Hard Switching Applications.

/ Equivalent Circuit



/ Pinning



PIN1 G

PIN 2 C

PIN 3 E

PIN 4 C

/ Marking

See Marking Instructions.

/ Absolute Maximum Ratings($T_a=25$)

Parameter	Symbol	Rating	Unit	
Collector-Emitter Voltage	V_{CE}	650	V	
Gate-Emitter Voltage	V_{GE}	± 30	V	
Continuous Collector Current	I_C	$T_C=+25^\circ\text{C}$	12	A
		$T_C=+100^\circ\text{C}$	6	A
Pulsed Collector Current , Limited by T_{Jmax}	I_{CM}	35	A	
Turn off SOA, $V_{CE}\leq 650\text{V}$, Limited by T_{Jmax}	I_{LM}	35	A	
Continuous Diode Forward Current	I_F	$T_C=+25^\circ\text{C}$	12	A
		$T_C=+100^\circ\text{C}$	6	A
Short Circuit with standing time $V_{GE}=15\text{V}, V_{CC}\leq 400\text{V}, T_J\leq 175^\circ\text{C}$	tsc	5	us	
Power Dissipation	P_D	$T_C=+25^\circ\text{C}$	69	W
		$T_C=+100^\circ\text{C}$	28	W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$	
Maximum lead temperature for soldering purpose, 1/8" from case for 5s	T_L	300	$^\circ\text{C}$	
Maximum Junction-to-Ambient	R_{JA}	40	$^\circ\text{C/W}$	
Maximum IGBT Junction-to-Case	R_{JC}	1.8	$^\circ\text{C/W}$	
Maximum Diode Junction-to-Case	R_{JC}	2.2	$^\circ\text{C/W}$	

/ Electrical Characteristics($T_a=25$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Emitter Breakdown Voltage	BV_{CES}	$I_C=1\text{mA}, V_{GE}=0\text{V}$	650			V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15\text{V}, I_C=6\text{A}$	$T_J=25^\circ\text{C}$	1.73	1.98	V
			$T_J=125^\circ\text{C}$	2.05		
			$T_J=175^\circ\text{C}$	2.21		
Diode Forward Voltage	V_F	$V_{GE}=0\text{V}, I_C=6\text{A}$	$T_J=25^\circ\text{C}$	1.9	2.4	V
			$T_J=125^\circ\text{C}$	1.58		
			$T_J=175^\circ\text{C}$	1.3		
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{CE}=5\text{V}, I_C=1\text{mA}$		5.3		V
Zero Gate Voltage Collector current	I_{CES}	$V_{CE}=650\text{V}, V_{GE}=0\text{V}$	$T_J=25^\circ\text{C}$		10	μA
			$T_J=125^\circ\text{C}$		100	
			$T_J=175^\circ\text{C}$		5000	

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Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}= \pm 30V$			± 100	nA
Forward Trans conductance	g_{FS}	$V_{CE}=20V, I_C=6A$		2.8		S
Input Capacitance	C_{ies}	$V_{GE}=0V, V_{CC}=25V,$ $f=1MHz$		243		pF
Output Capacitance	C_{oes}			36		pF
Reverse Transfer Capacitance	C_{res}			22		pF
Total Gate Charge	Q_g	$V_{GE}=15V, V_{CC}=520V,$ $I_C=6A$		10		nC
Gate to Emitter Charge	Q_{ge}			3.2		nC
Gate to Collector Charge	Q_{gc}			3.5		nC
Short circuit collector current	$I_{C(SC)}$	$V_{GE}=15V, V_{CC}=400V,$ $t_{SC} 5\mu s, T_J 175$		30		A
Gate resistance	R_g	$f=1MHz$		6		
Turn-On Delay Time	$t_{D(on)}$	$T_J=25^\circ C,$ $V_{GE}=15V, V_{CC}=400V,$ $I_C=6A, R_G=60$		6		ns
Turn-On Rise Time	t_r			21		ns
Turn-Off Delay Time	$t_{D(off)}$			39		ns
Turn-Off Fall Time	T_f			121		ns
Turn-On Energy	E_{on}			0.09		mJ
Turn-Off Energy	E_{off}			0.13		mJ
Total Switching Energy	E_{total}			0.22		mJ
Diode Reverse Recovery Time	t_{rr}	$T_J=25^\circ C, I_F=6A,$ $di/dt=200A/\mu s,$ $V_{CC}=400V$		91		ns
Diode Reverse Recovery Charge	Q_{rr}			0.25		μC
Diode Peak Reverse Recovery Current	I_{rm}			4.9		A
Turn-On Delay Time	$t_{D(on)}$	$T_J=175^\circ C,$ $V_{GE}=15V, V_{CC}=400V,$ $I_C=6A, R_G=60$		8		ns
Turn-On Rise Time	t_r			27		ns
Turn-Off Delay Time	$t_{D(off)}$			57		ns
Turn-Off Fall Time	T_f			180		ns
Turn-On Energy	E_{on}			0.11		mJ
Turn-Off Energy	E_{off}			0.19		mJ
Total Switching Energy	E_{total}			0.3		mJ
Diode Reverse Recovery Time	t_{rr}	$T_J=175^\circ C, I_F=6A,$ $di/dt=200A/\mu s,$ $V_{CC}=400V$		122		ns
Diode Reverse Recovery Charge	Q_{rr}			0.44		μC
Diode Peak Reverse Recovery Current	I_{rm}			6.5		A

/ Electrical Characteristic Curve

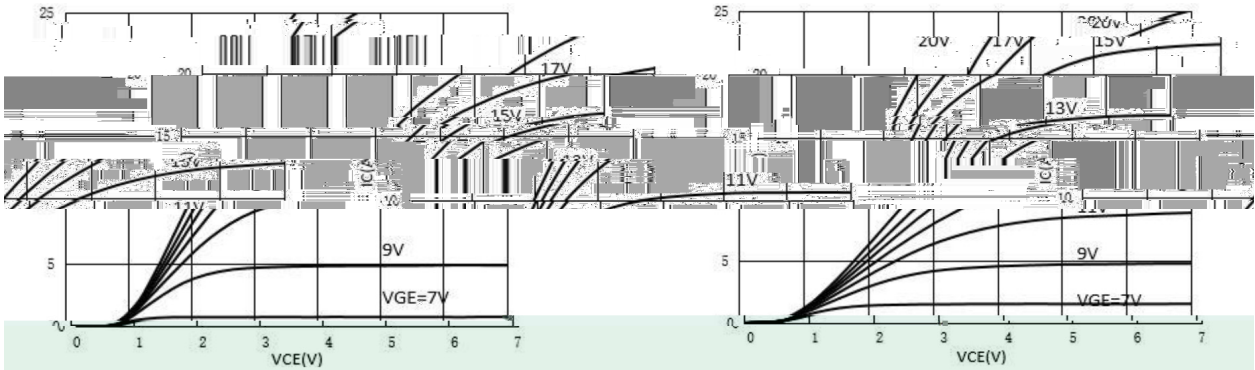


Figure1: Output Characteristics ($T_j = 25^\circ\text{C}$)

Figure2: Output Characteristics ($T_j = 175^\circ\text{C}$)

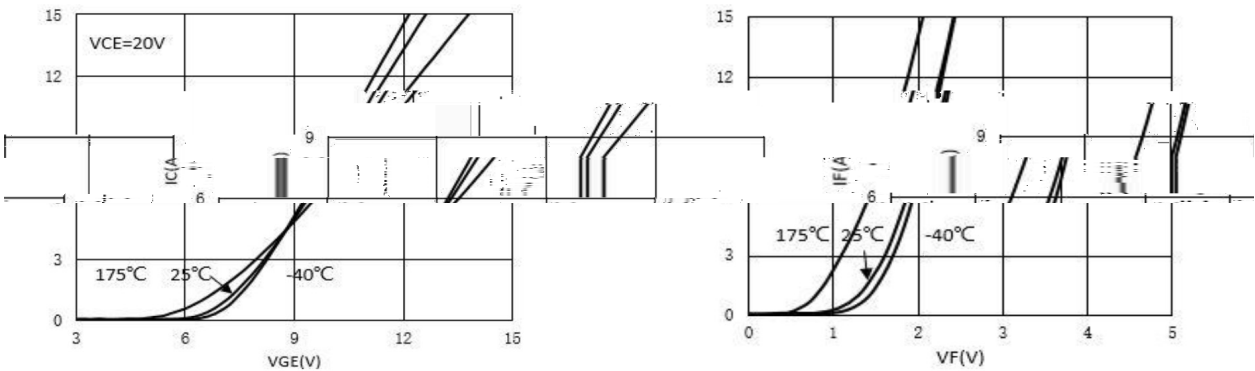


Figure3: Transfer Characteristic

Figure 4: Diode Characteristic

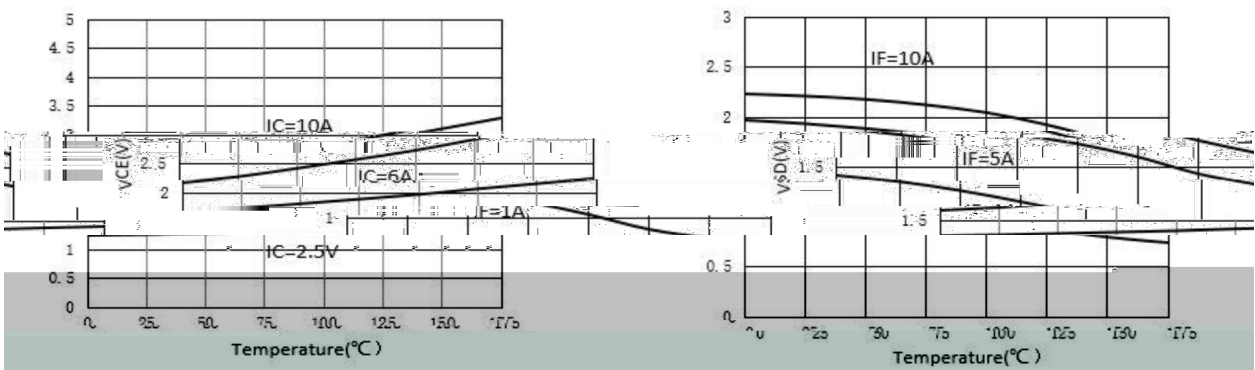


Figure 5: Collector-Emitter Saturation Voltage

Figure 6: Diode Forward Voltage vs. Junction

/ Electrical Characteristic Curve



Figure 7: Gate Charge Characteristics

Figure 8: Capacitance Characteristics

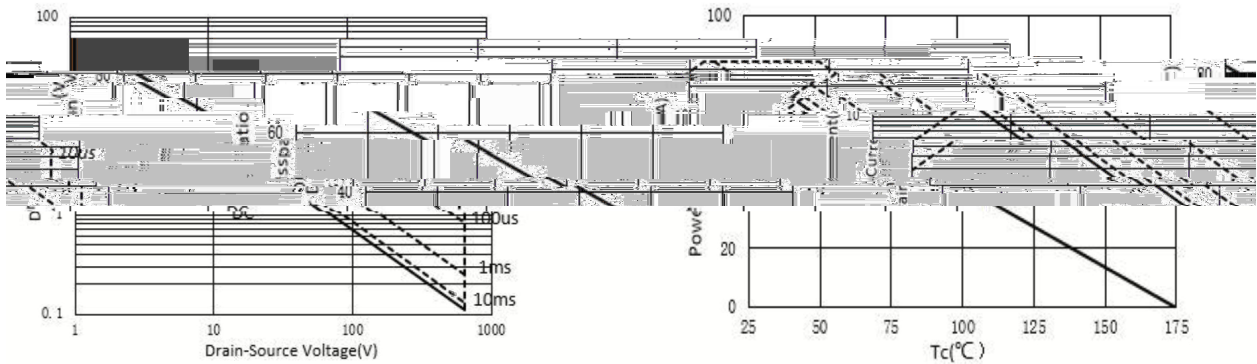


Figure 9: Forward Bias Safe Operating Area

Figure 10: Power Dissipation as Function of Case

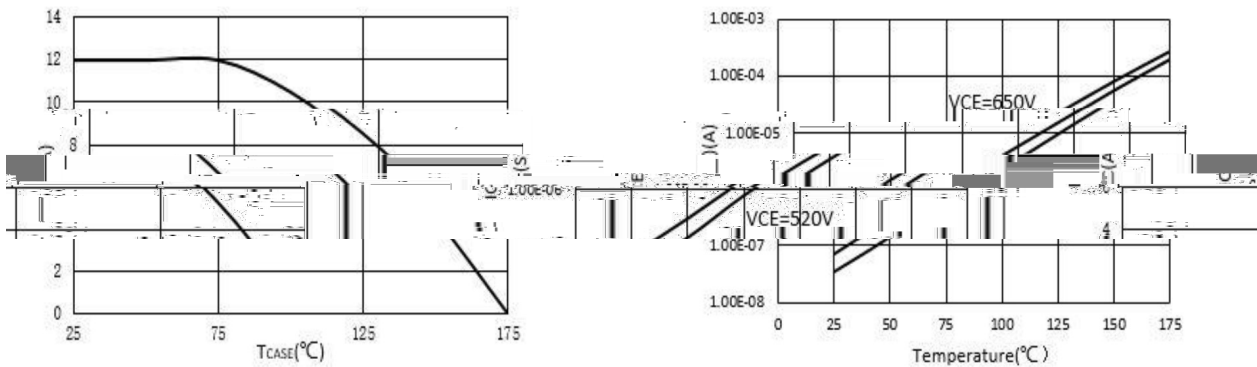
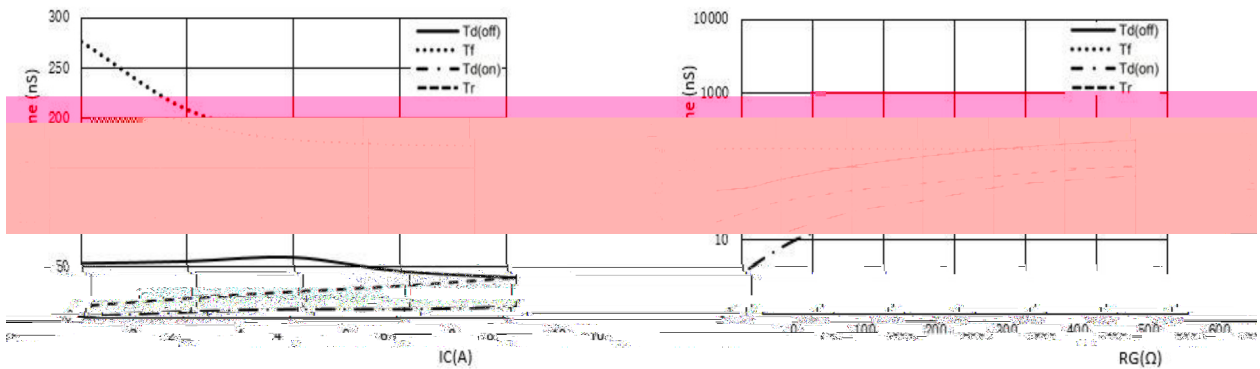


Figure 11: Current Derating

Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

/ Electrical Characteristic Curve



vs. R_g Figure 13: Switching Time vs. I_c Figure 14: Switching Time vs. R_g
 $(V_{GE}=15V, V_{CE}=400V, I_c=6A)$ $(T_J=175^\circ C, V_{GE}=15V, V_{CE}=400V, I_c=6A)$ $(T_J=175^\circ C, V_{GE}=15V, V_{CE}=400V, I_c=6A)$

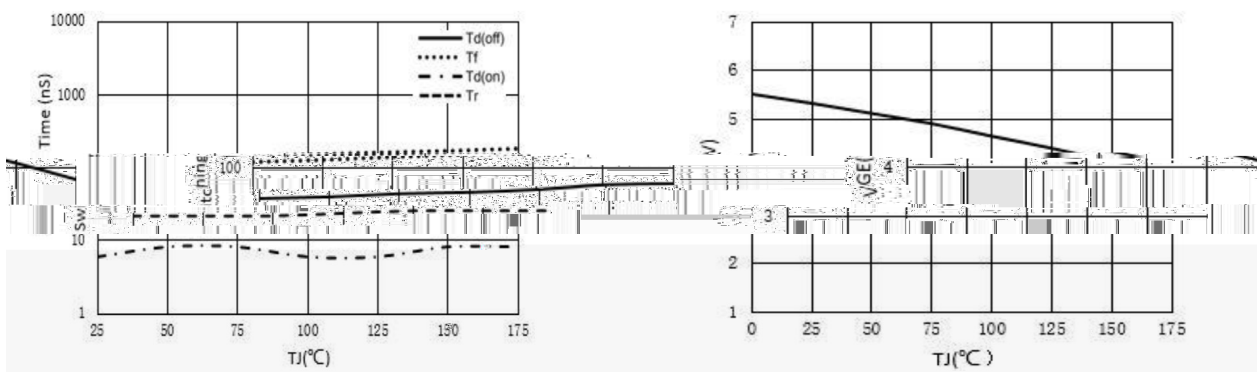


Figure 15: Switching Time vs. T_j Figure 16: V_{CE} vs. T_j
 $(V_{GE}=15V, V_{CE}=400V, I_c=6A, R_g=60\Omega)$

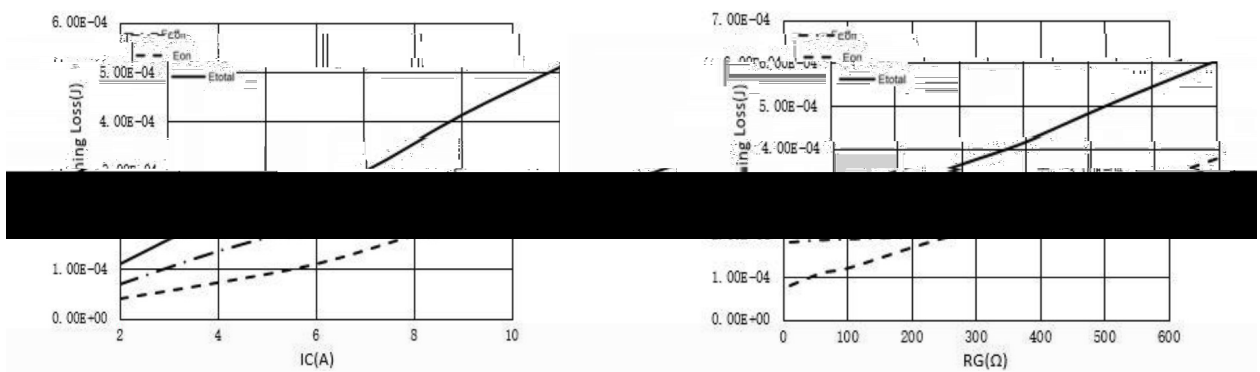


Figure 17: Switching Loss vs. I_c Figure 18: Switching Loss vs. R_g
 $(T_J=175^\circ C, V_{GE}=15V, V_{CE}=400V, R_g=60\Omega)$ $(T_J=175^\circ C, V_{GE}=15V, V_{CE}=400V, I_c=6A)$

/ Electrical Characteristic Curve

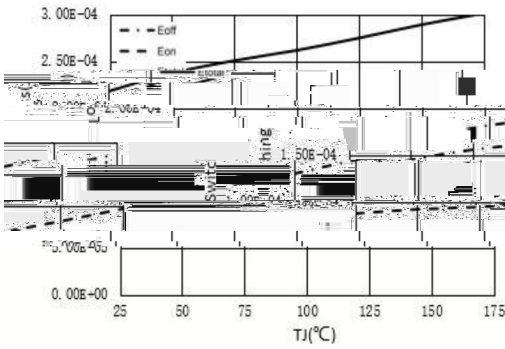


Figure 19: Switching Loss vs. T_j

($V_{GE}=15V, V_{CE}=400V, I_C=6A, R_{\theta Jc}=60\Omega$)

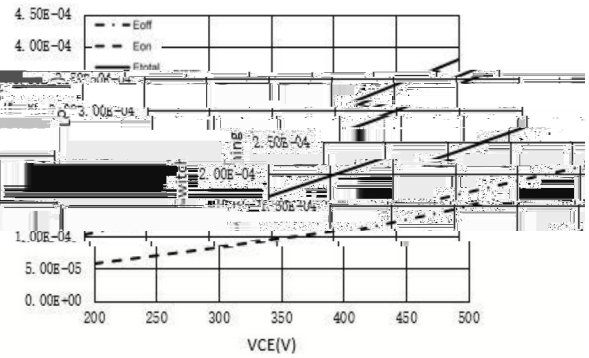


Figure 20: Switching Loss vs. V_{CE}

($T_j=175^\circ C, V_{GE}=15V, I_C=6A, R_{\theta Jc}=60\Omega$)

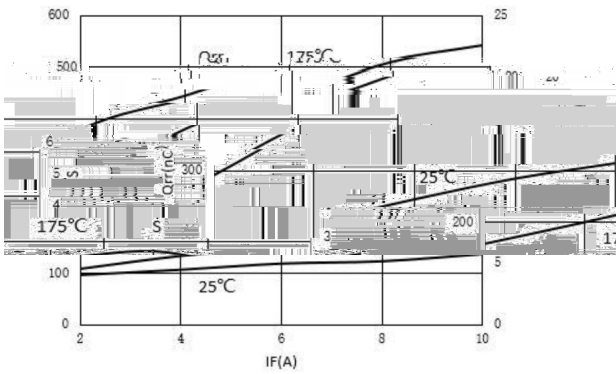


Figure 21: Diode Reverse Recovery Charge

and Reverse Current vs. Conduction Current.
($V_{GE}=15V, V_{CE}=400V, I_{RR}=2A, I_{SM}=20A, I_{SM}(\mu s)$)

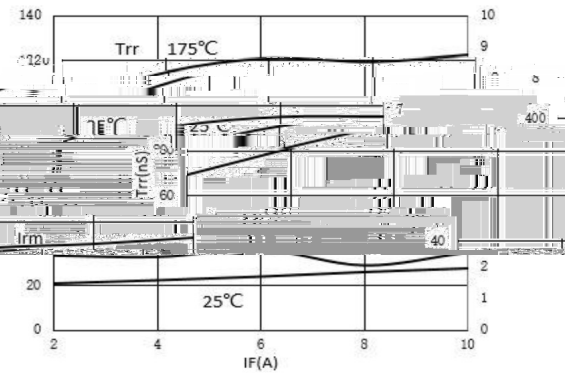


Figure 22: Diode Reverse Recovery Time

and Storage Factor vs. Conduction Current.
($V_{GE}=15V, V_{CE}=400V, I_{RR}=2A, I_{SM}=20A, I_{SM}(\mu s)$)

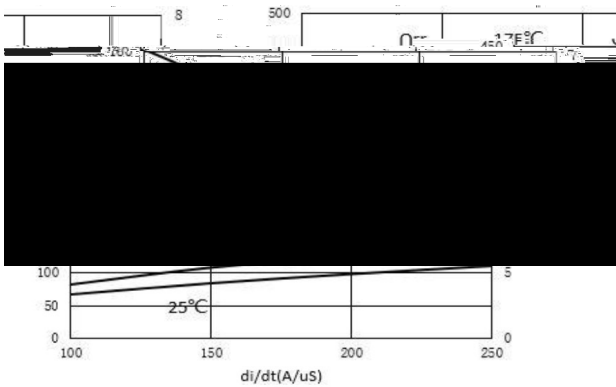


Figure 23: Diode Reverse Recovery Charge

and Reverse Current vs. di/dt



Figure 24: Diode Reverse Recovery Time

and Storage Factor vs. di/dt

/ Electrical Characteristic Curve

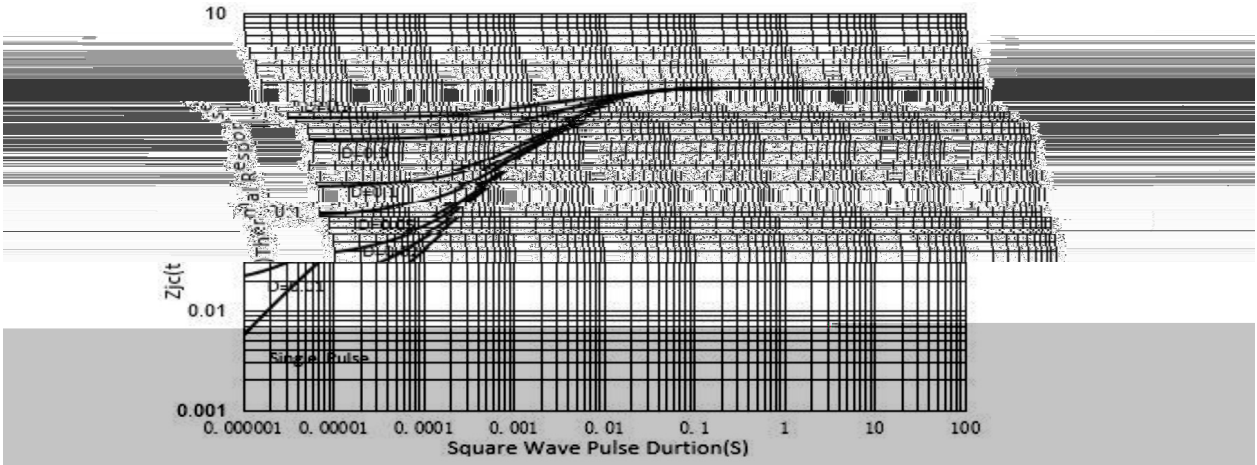


Figure 25: Normalized Maximum Transient Thermal Impedance for IGBT.

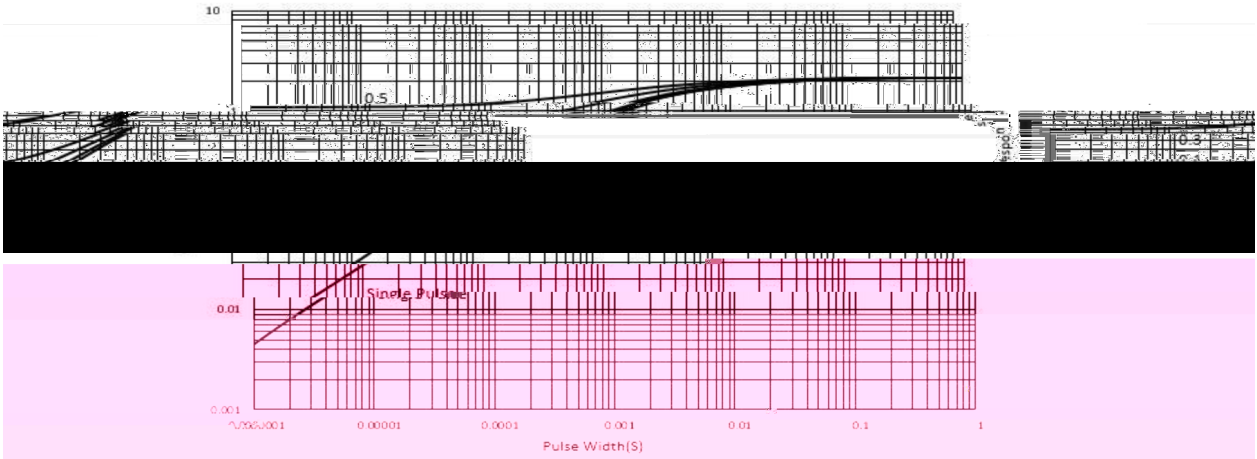
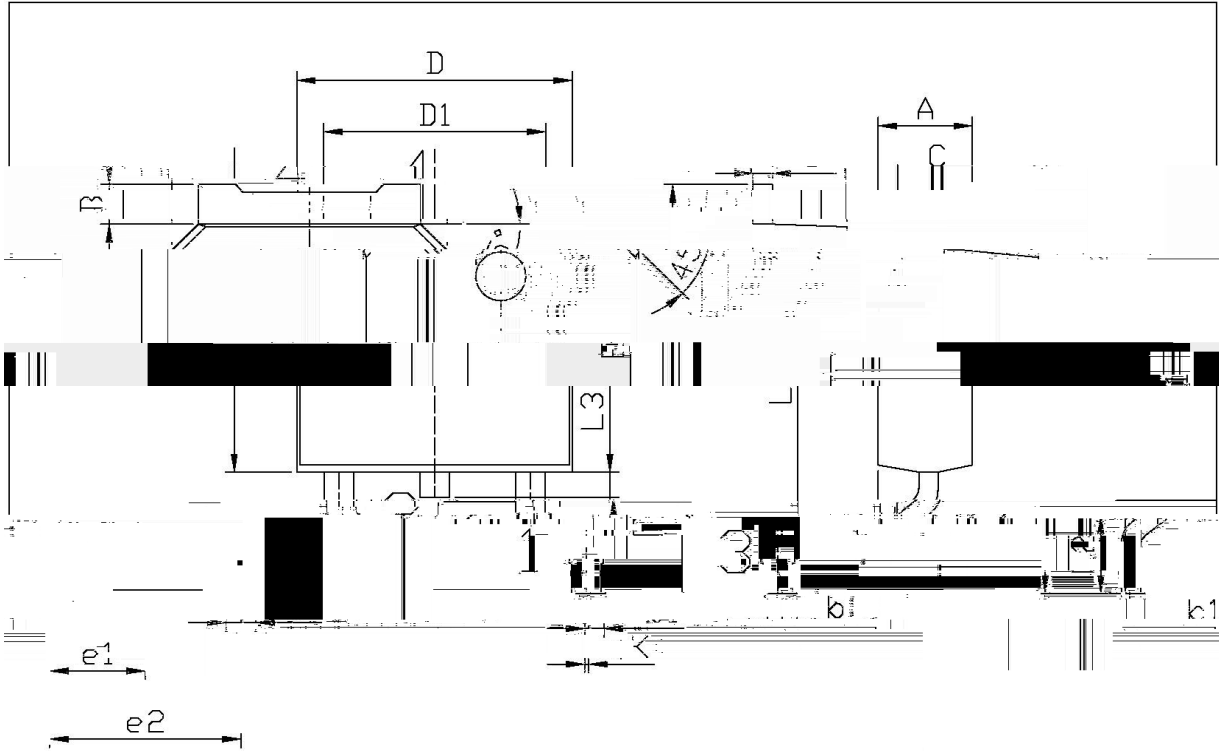


Figure 26: Normalized Maximum Transient Thermal Impedance for Diode.

/ Package Dimensions

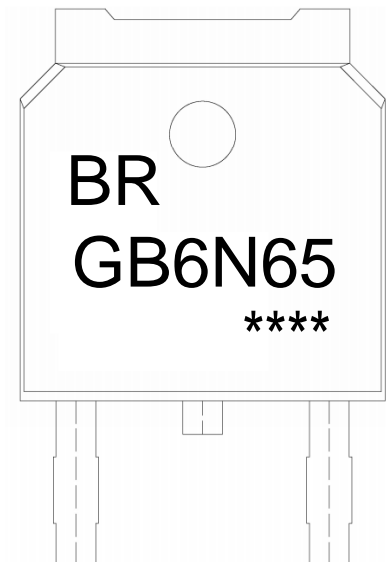


单位: mm

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
6.25		2.20	2.40	5.95	
2.34	0.95		1.25	2.24	
1.73	0.39	0.80	0.80	1.42	
10.35	0.45	0.55	0.55	9.85	
	0.45	0.55	1.30	2.00	
6.75	0.60	0.90		6.45	

T0-252

/ Marking Instructions



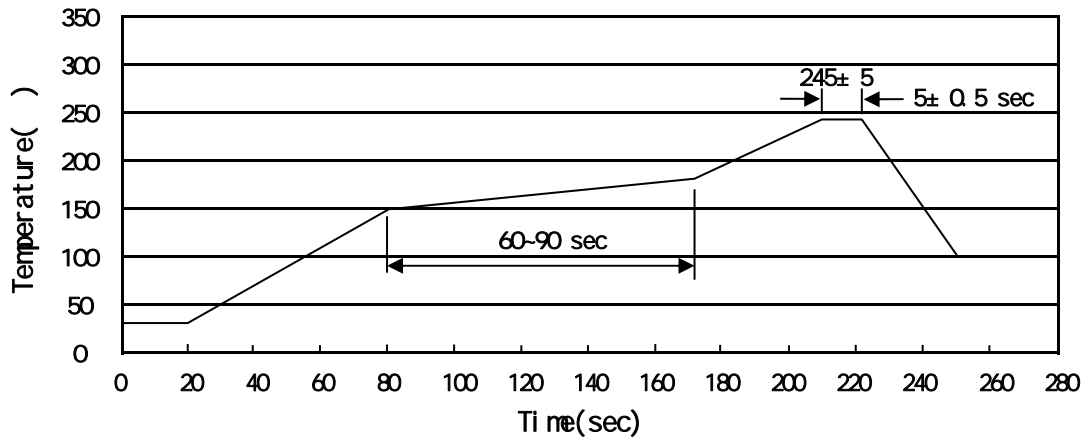
Note:

BR: Company Code

GB6N65: Product Type Code

****: Lot No. Code, code change with Lot No

() / Temperature Profile for IR Reflow Soldering(Pb-Free)



Note:

- 1 150 180 60 90sec; 1.Preheating:150~180 , Time:60~90sec.
- 2 245 5 5 0.5sec; 2.Peak Temp.:245 5 , Duration:5 0.5sec.
- 3 2 10 /sec. 3. Cooling Speed: 2~10 /sec.

/ Resistance to Soldering Heat Test Conditions

260 5 10 1 sec. Temp.:260±5 Time:10±1 sec

/ Packaging SPEC.

/ REEL

Package Type	Units					Dimension (unit mm ³)		
	Units/Reel	Reels/Inner Box	Units/Inner Box	Inner Boxes/Outer Box	Units/Outer Box	Reel	Inner Box	Outer Box
TO-252	2,500	2	5,000	6	30,000	13" x16	360x360x50	380x335x366

/ TUBE

Package Type	Units					Dimension (unit mm ³)		
	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Boxes/Outer Box	Units/Outer Box	Tube	Inner Box	Outer Box
TO-251/252	75	48	3,600	5	18,000	526x20.5x5.25	555x164x50	575x290x180

/ Notices