

BRGB6N65DP

Rev.A Aug.-2023

描述 / Descriptions

TO-252 塑封封装绝缘栅双极晶体管。

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

特征 / Features

内置快恢复反并联二极管。

高效开启 di/dt 可控性。

低 $V_{CE(SAT)}$ 实现高效率。

低关断损耗和柔软度。

很好的电磁干扰和高短路强度。

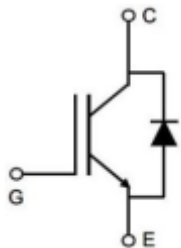
无卤产品。HF Product.

用途 / Applications

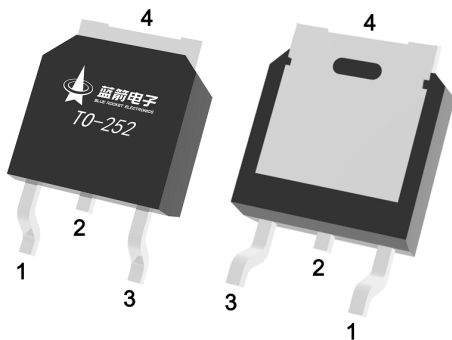
电机驱动，家用电器应用，风扇，泵，真空吸尘器，其他硬开关应用。

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

内部等效电路 / Equivalent Circuit



引脚排列 / Pinning



PIN 1 : G

PIN 2 : C

PIN 3 : E

PIN 4 : C

印章代码 / Marking

见印章说明。

See Marking Instructions.

极限参数 / Absolute Maximum Ratings($T_a=25^{\circ}\text{C}$)

参数 Parameter	符号 Symbol	数值 Rating	单位 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	$R_{\theta JA}$	40	$^{\circ}\text{C/W}$	
Maximum IGBT Junction-to-Case	$R_{\theta JC}$	1.8	$^{\circ}\text{C/W}$	
Maximum Diode Junction-to-Case	$R_{\theta JC}$	2.2	$^{\circ}\text{C/W}$	

电性能参数 / Electrical Characteristics($T_a=25^{\circ}\text{C}$)

参数 Parameter	符号 Symbol	测试条件 Test Conditions	最小值 Min	典型值 Typ	最大值 Max	单位 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	uA
			$T_J=125^{\circ}\text{C}$		100	
			$T_J=175^{\circ}\text{C}$		5000	

电性能参数 / Electrical Characteristics(Ta=25°C)

参数 Parameter	符号 Symbol	测试条件 Test Conditions	最小值 Min	典型值 Typ	最大值 Max	单位 Unit
Gate-Emitter leakage current	I _{GES}	V _{CE} =0V, V _{GE} = ±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} ≤5us, T _J ≤175°C		30		A
Gate resistance	R _g	f=1MHz		6		Ω
Turn-On Delay Time	t _{D(on)}	T _J =25°C, V _{GE} =15V, V _{CC} =400V, I _C =6A, R _G =60Ω		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°C, I _F =6A, di/dt=200A/us, V _{CC} =400V		91		ns
Diode Reverse Recovery Charge	Q _{rr}			0.25		uC
Diode Peak Reverse Recovery Current	I _{rm}			4.9		A
Turn-On Delay Time	t _{D(on)}	T _J =175°C, V _{GE} =15V, V _{CC} =400V, I _C =6A, R _G =60Ω		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°C, I _F =6A, di/dt=200A/us, V _{CC} =400V		122		ns
Diode Reverse Recovery Charge	Q _{rr}			0.44		uC
Diode Peak Reverse Recovery Current	I _{rm}			6.5		A

电参数曲线图 / Electrical Characteristic Curve

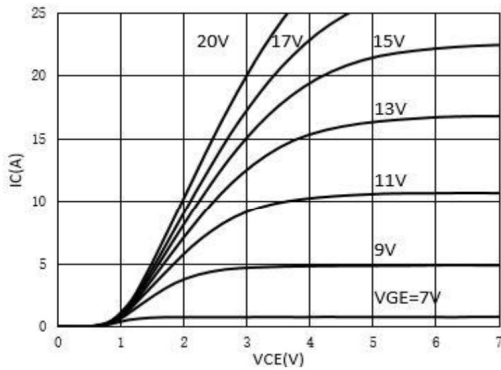


Figure1: Output Characteristics ($T_J=25^{\circ}\text{C}$)

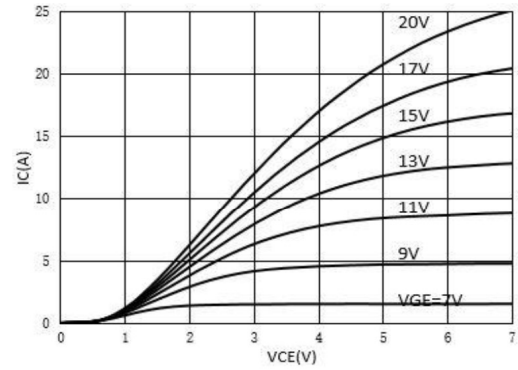


Figure 2: Output Characteristic ($T_J=175^{\circ}\text{C}$)

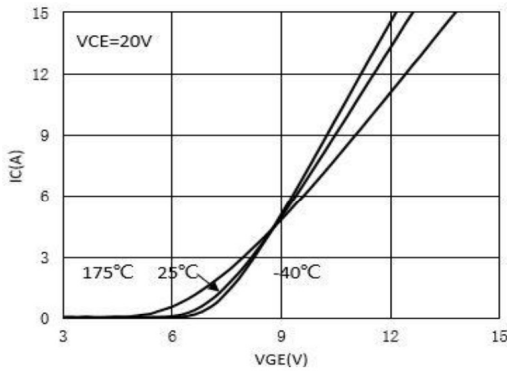


Figure3:Transfer Characteristic

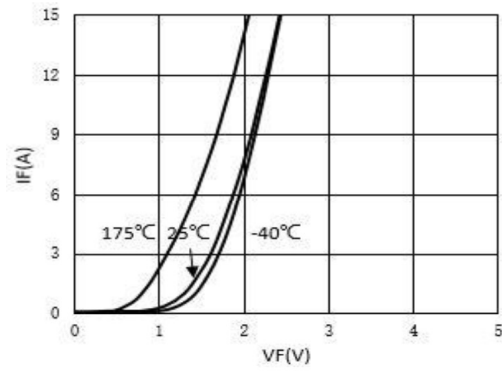


Figure 4: Diode Characteristic

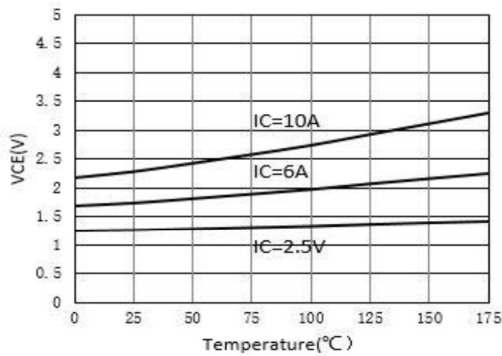


Figure 5: Collector-Emitter Saturation Voltage vs.Junction Temperature

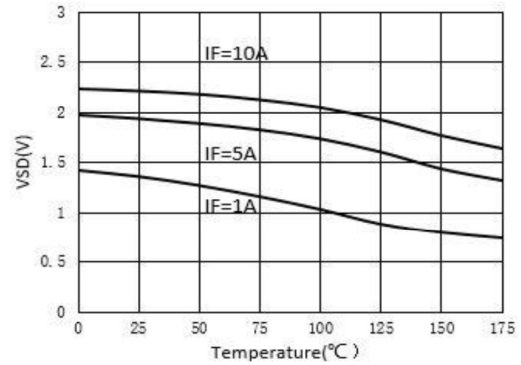


Figure 6:Diode Forward Voltage vs. Junction Temperature

电参数曲线图 / Electrical Characteristic Curve

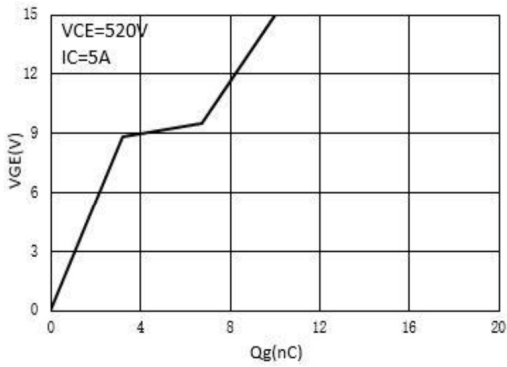


Figure 7: Gate-Charge Characteristics

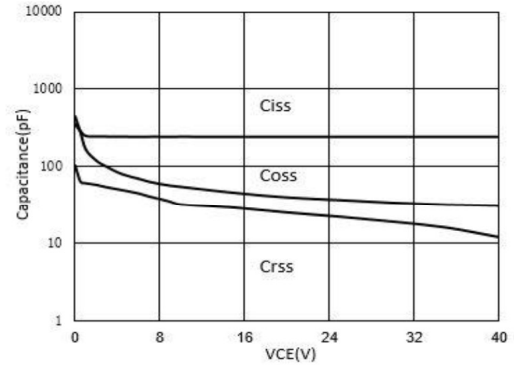


Figure 8: Capacitance Characteristics

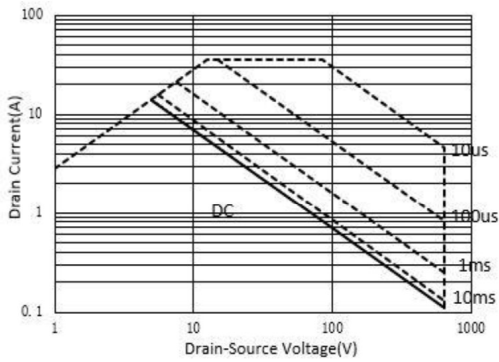


Figure 9: Forward Bias Safe Operating Area

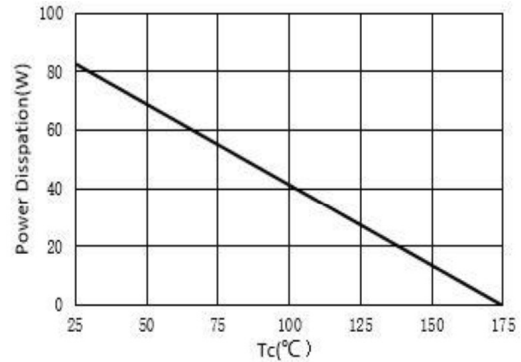


Figure 10: Power Dissipation as Function of Case

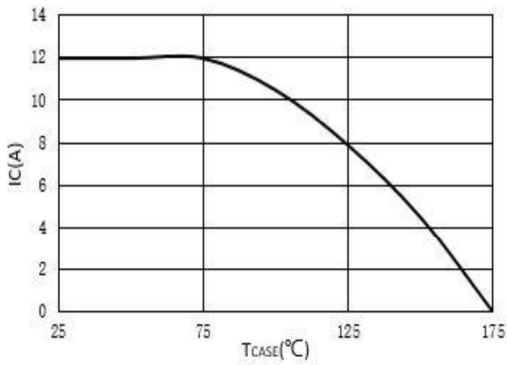


Figure 11: Current De-rating

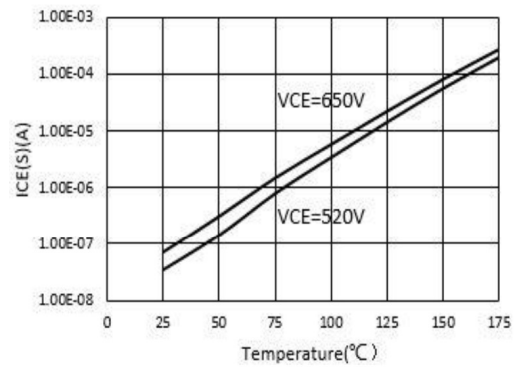


Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

电参数曲线图 / Electrical Characteristic Curve

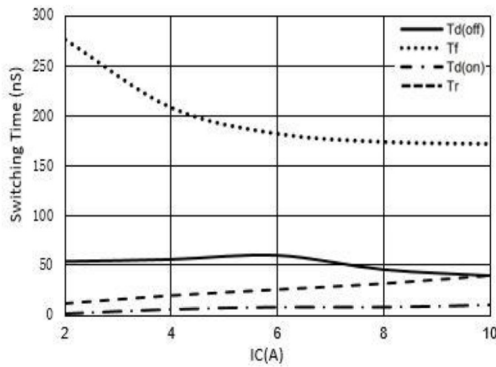


Figure 13: Switching Time vs. I_c
($T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=400\text{V}, R_g=60\Omega$)

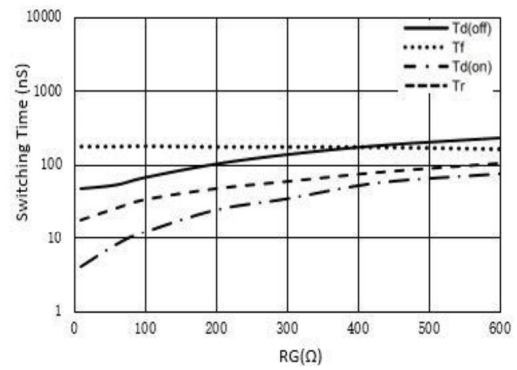


Figure 14: Switching Time vs. R_g
($T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=400\text{V}, I_c=6\text{A}$)

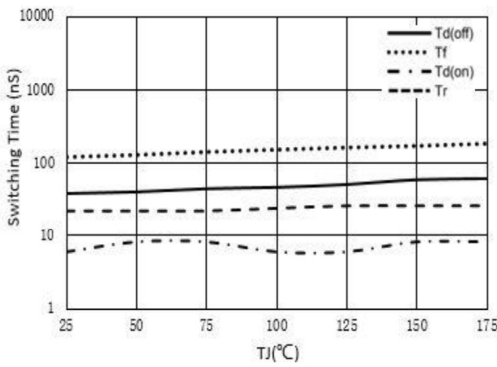


Figure 15: Switching Time vs. T_J
($V_{GE}=15\text{V}, V_{CE}=400\text{V}, I_c=6\text{A}, R_g=60\Omega$)

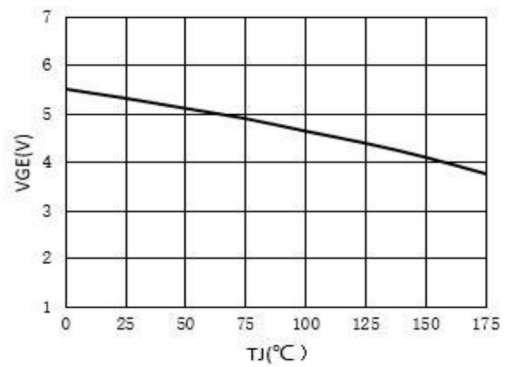


Figure 16: V_{CE} vs. T_J

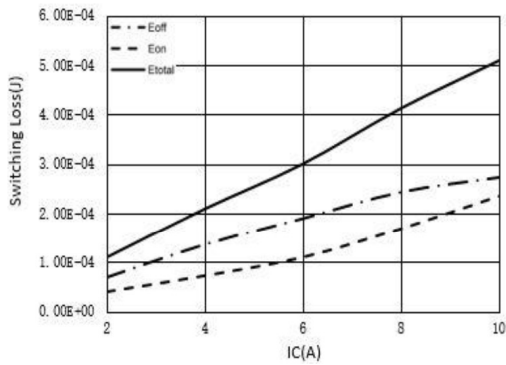


Figure 17: Switching Loss vs. I_c
($T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=400\text{V}, R_g=60\Omega$)

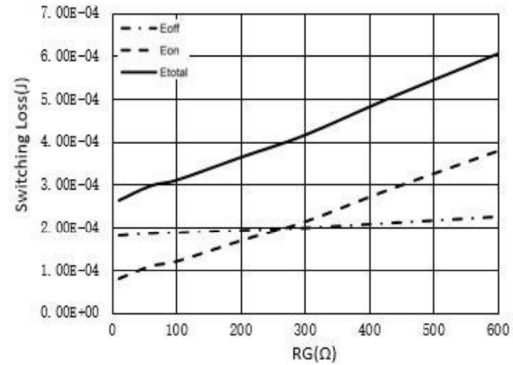


Figure 18: Switching Loss vs. R_g
($T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=400\text{V}, I_c=6\text{A}$)

电参数曲线图 / Electrical Characteristic Curve

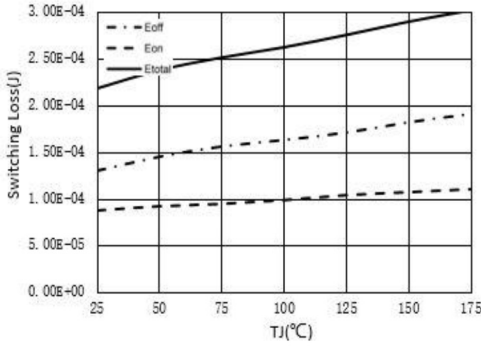


Figure 19: Switching Loss vs. T_J
($V_{GE}=15V, V_{CE}=400V, I_c=6A, R_g=60\Omega$)

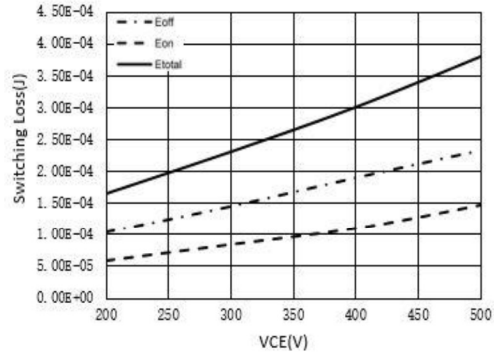


Figure 20: Switching Loss vs. V_{CE}
($T_J=175^\circ C, V_{GE}=15V, I_c=6A, R_g=60\Omega$)

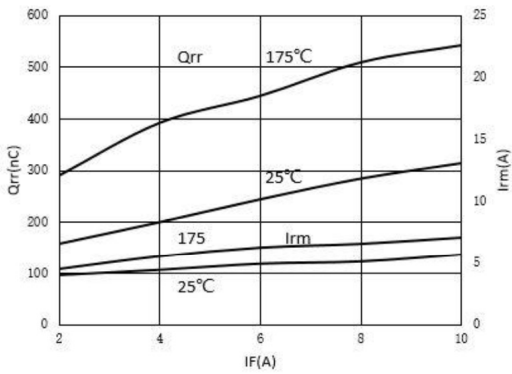


Figure 21: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current
($V_{GE}=15V, V_{CE}=400V, di/dt=200A/us$)

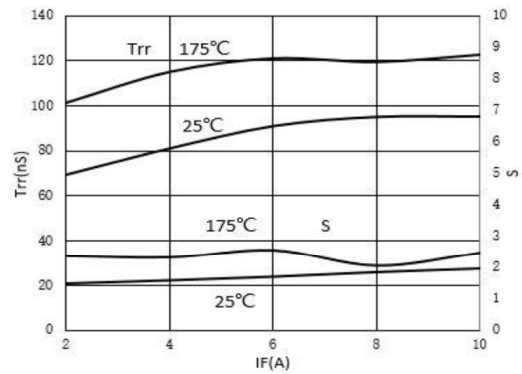


Figure 22: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current
($V_{GE}=15V, V_{CE}=400V, di/dt=200A/us$)

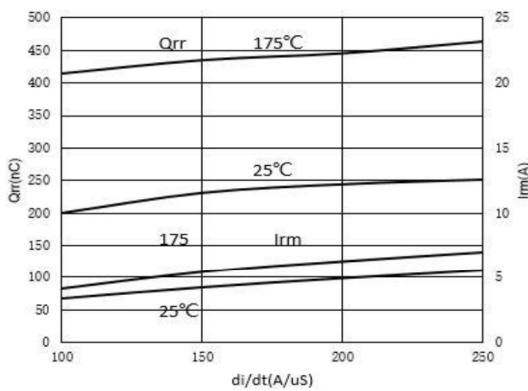


Figure 23: Diode Reverse Recovery Charge and Peak Current vs. di/dt
($V_{GE}=15V, V_{CE}=400V, di/dt=200A/us$)

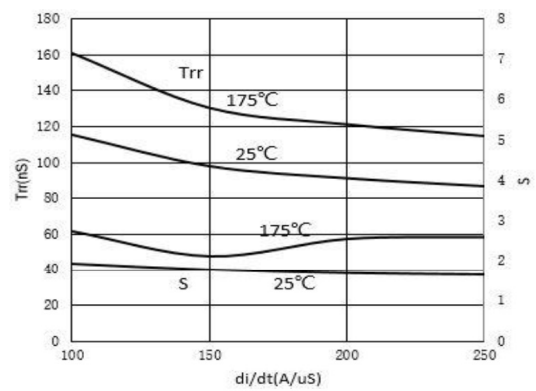


Figure 24: Diode Reverse Recovery Time and Softness Factor vs. di/dt
($V_{GE}=15V, V_{CE}=400V, di/dt=200A/us$)

电参数曲线图 / Electrical Characteristic Curve

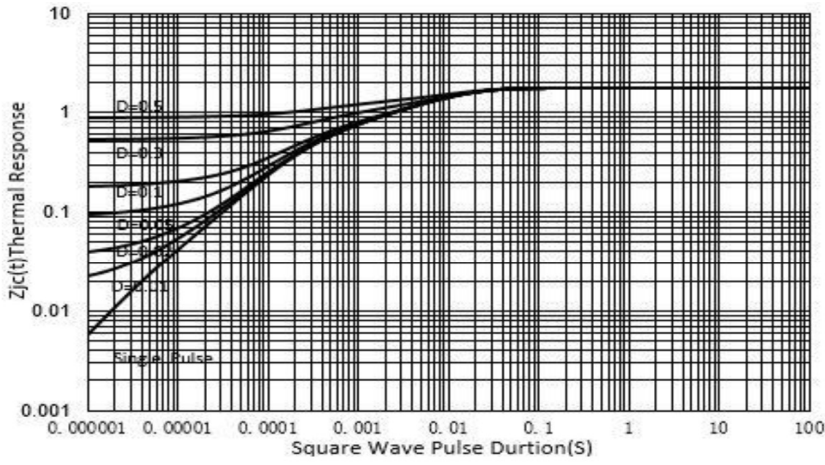


Figure 25: Normalized Maximum Transient Thermal Impedance for IGBT

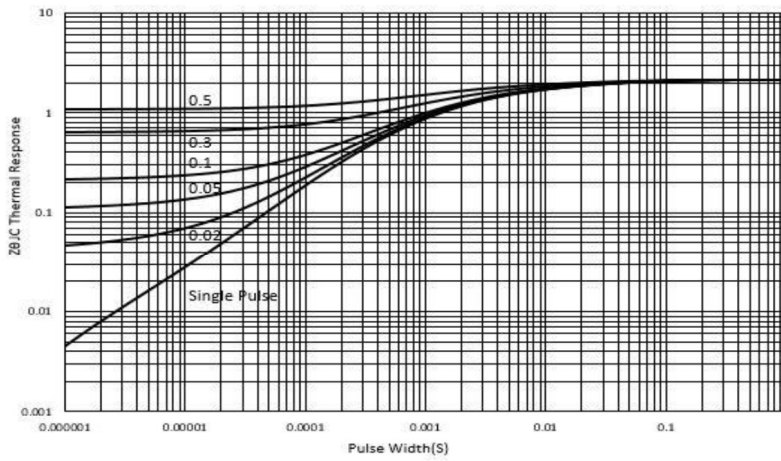
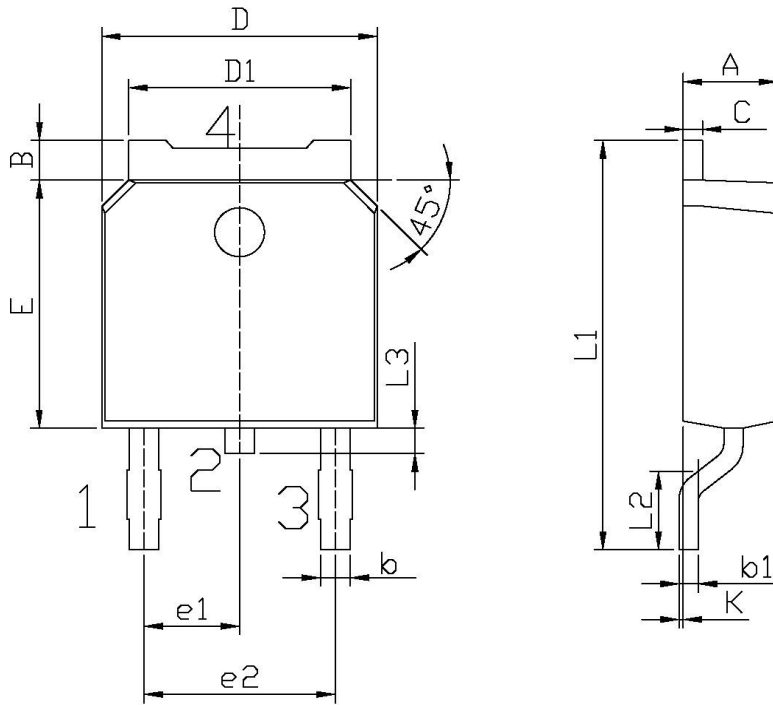


Figure 26: Normalized Maximum Transient Thermal Impedance for Diode

外形尺寸图 / Package Dimensions

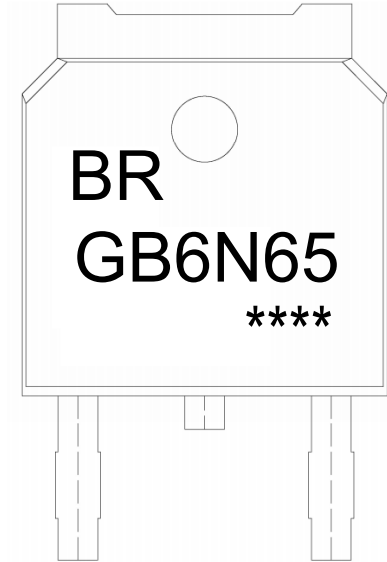


单位: mm

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
A	2.20	2.40	E	5.95	6.25
B	0.95	1.25	e1	2.24	2.34
b	0.70	0.90	e2	4.43	4.73
b1	0.45	0.55	L1	9.85	10.35
C	0.45	0.55	L2	1.70	2.00
D	6.45	6.75	L3	0.60	0.90
D1	5.10	5.50	K	0.00	0.10

TO-252

印章说明 / Marking Instructions



说明：

BR： 为公司代码

GB6N65： 为型号代码

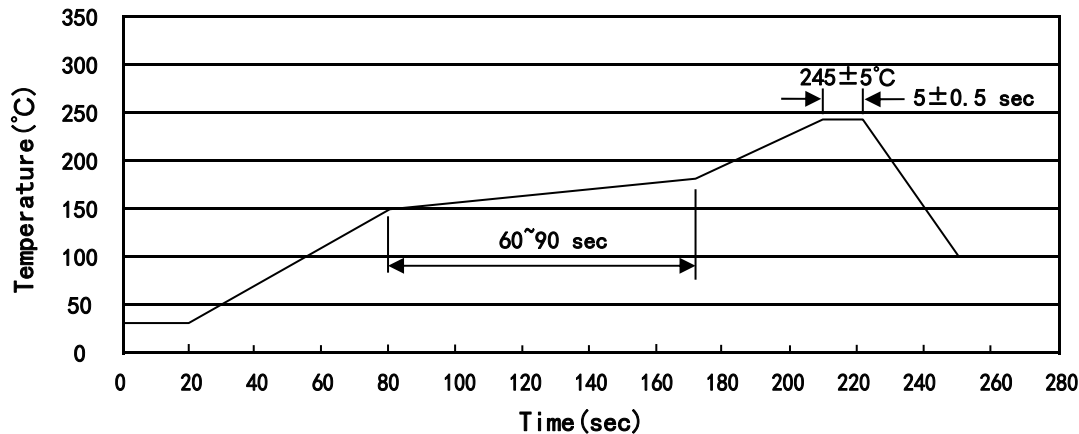
****： 为生产批号代码，随生产批号变化

Note:

BR: Company Code

GB6N65: Product Type Code

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

回流焊温度曲线图(无铅) / Temperature Profile for IR Reflow Soldering(Pb-Free)


说明：

- 1、预热温度 150~180°C，时间 60~90sec;
- 2、峰值温度 245±5°C，时间持续为 5±0.5sec;
- 3、焊接制程冷却速度为 2~10°C/sec.

Note:

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

耐焊接热试验条件 / Resistance to Soldering Heat Test Conditions

温度：260±5°C

时间：10±1 sec.

Temp.:260±5°C

Time:10±1 sec

包装规格 / Packaging SPEC.

卷盘包装 / REEL

Package Type 封装形式	Units 包装数量					Dimension 包装尺寸 (unit: mm ³)		
	Units/Reel 只/卷盘	Reels/Inner Box 卷盘/盒	Units/Inner Box 只/盒	Inner Boxes/Outer Box 盒/箱	Units/Outer Box 只/箱	Reel	Inner Box 盒	Outer Box 箱
TO-252	2,500	2	5,000	6	30,000	13" ×16	360×360×50	380×335×366

套管包装 / TUBE

Package Type 封装形式	Units 包装数量					Dimension 包装尺寸 (unit: mm ³)		
	Units/Tube 只/套管	Tubes/Inner Box 套管/盒	Units/Inner Box 只/盒	Inner Boxes/Outer Box 盒/箱	Units/Outer Box 只/箱	Tube 套管	Inner Box 盒	Outer Box 箱
TO-251/252	75	48	3,600	5	18,000	526×20.5×5.25	555×164×50	575×290×180

使用说明 / Notices