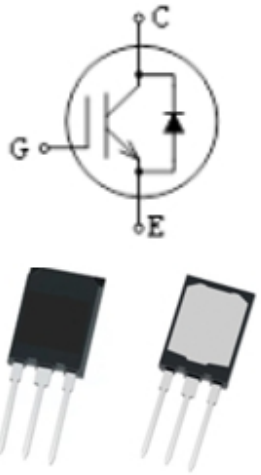
BGM160T65SD

IGBT in advanced TrenchFS Technology with soft and fast recovery anti-parallel diode
具有先进 TrenchFS 技术的 IGBT 且反并联软快恢复二极管

Features:
特性

- 650V TrenchFS technology
  650V 沟槽栅场终止技术
- Low conduction and switching losses
  低导通和开关损耗
- Positive temperature coefficient
  饱和电压正温度系数
- Short Circuit withstand time-5μs
  具备5μs短路承受能力



Applications:
应用

- Automobile motor drives
  汽车电机驱动

Type 型号	V_{CE}[V] 集电极-发射极电压	I_C[A] 集电极电流	V_{CEsat}[V] 饱和电压	T_{jmax}[℃] 最高结温	Marking 标记	Package 封装
BGM160T65SD	650	160	1.6	175	160T65SD	TO247Plus

Maximum Rated Values
最大额定参数

Parameter 参数	Symbol 符号	Value 值	Unit 单位
Collector-emitter voltage, T_j≥25℃ 集电极-发射极电压,T_j≥25℃	V_{CE}	650	V
Collector current,T_C=25℃ 集电极电流，Tc=25℃	I_C	320	A
Collector current,T_C=100℃ 集电极电流，Tc=100℃	I_C	160	
Pulsed collector current，t_p limited by $T_{j\,max}$ 集电极脉冲电流，脉宽时间受 $T_{j\,max}$ 限制	I_{Cpuls}	320	
Diode forward current,T_C=25℃ 二极管正向电流，Tc=25℃	I_F	320	
Diode forward current,T_C=100℃ 二极管正向电流，Tc=100℃	I_F	160	
Diode pulsed current 二极管脉冲电流	I_{Fpuls}	640	
Gate-emitter voltage 栅极-发射极电压	V_{GE}	±20	V
Short Circuit withstand time V_{GE}=15V,V_{CC}≤400V,T_j≤150℃ 短路耐受时间	t_{sc}	5	us
Total power dissipation, T_C=25℃ 总耗散功率，Tc=25℃	P_{tot}	833	W
Operating junction temperature 最高结温	T_{jmax}	175	℃
Operating junction temperature 工作结温	T_{jop}	-40…+150	
Storage temperature 储存温度	T_{stg}	-55…+150	
Soldering temperature,1.6mm from case for 10s 焊接温度	T_{st}	300	

Thermal Resistance
热阻

Parameter 参数	Symbol 符号	Value 值	Unit 单位
IGBT Thermal resistance junction to case IGBT 结-管壳热阻	$R_{th(j-c)}$	0.18	℃/W
Diode Thermal resistance junction to case 二极管结-管壳热阻	$R_{th(j-c)}$	0.30	℃/W
Thermal resistance junction to ambient 结-环境热阻	$R_{th(j-a)}$	40	℃/W

Electrical Characteristic at Tj = 25℃ （unless otherwise specified）
Tj=25℃时电学特性（除非特别声明）

Parameter 参数	Symbol 符号	Conditions 条件		Value 值			Unit 单位
				Min. 最小值	Typ. 典型值	Max. 最大值	
Static Characteristic **静态特性**							
Collector-emitter breakdown voltage 集电极-发射极击穿电压	$V_{(BR)CES}$	V_{GE}=0V, I_C=100uA		650	-	-	V
Collector-emitter saturation voltage 集电极-发射极饱和电压	Vcesat	V_{GE}=15V, I_C=160A	T_j=25℃	-	1.6	2.0	
			T_j=150℃	-	2.1	2.5	
Diode forward voltage 二极管正向电压	VF	V_{GE}=0V, I_F=160A	T_j=25℃	-	2.0	2.3	
			T_j=150℃	-	2.0	-	
Gate-emitter threshold voltage 栅极-发射极阈值电压	$V_{GE(th)}$	I_C=3mA, V_{CE}=V_{GE}		5.0	6.0	7.0	
Collector-emitter cut-off current 集电极-发射极截止电流	I_{CES}	V_{CE}=650V, V_{GE}=0V		-	-	100	μA
Gate-emitter leakage current 栅极-发射极漏电流	I_{GES}	V_{CE}=0V, V_{GE}=±20V		-200	-	200	nA
Dynamic Characteristic **动态特性**							
Input capacitance 输入电容	C_{ies}	V_{CE}=25V, V_{GE}=0V, f=1MHz		-	9800	-	pF
Output capacitance 输出电容	C_{oes}			-	470	-	
Reverse transfer capacitance 反向传输电容	C_{res}			-	60	-	

Gate charge 门极电量	Q_G	V_{CC}=400V,I_C=160A, V_{GE}=15V	-	270	-	nC
Short circuit current 短路电流	$I_{C(sc)}$	V_{CC}=400V,V_{GE}=15V, tpsc≤5us,T_j=150℃	-	770	-	A

Switching Characteristic at T_j=25℃（Inductive Load）

T_j=25℃时开关特性（感性负载）

Parameter 参数	Symbol 符号	Conditions 条件	Value 值			Unit 单位
			Min. 最小值	Typ. 典型值	Max. 最大值	
IGBT Characteristic **IGBT 特性**						
Turn-on delay time 开通延迟时间	$t_{d(on)}$	T_j=25℃， V_{CC}=400V, I_C=160A, V_{GE}=-7.5/15V, R_G=5Ω, Energy losses include “tail” and diode reverse recovery.	-	168	-	ns
Rise time 上升时间	t_r		-	300	-	
Turn-off delay time 关断延迟时间	$t_{d(off)}$		-	176	-	
Fall time 下降时间	t_f		-	164	-	
Turn-on energy 开通损耗	E_{on}		-	15.5	-	mJ
Turn-off energy 关断损耗	E_{off}		-	6.8	-	
Total switching energy 总开关损耗	E_{ts}		-	24.3	-	
Anti-Parallel Diode Characteristic **反并联二极管特性**						
Reverse recovery time 反向恢复时间	t_{rr}	T_j=25℃, V_R=400V, I_F=160A, diF/dt=1900A/μs	-	226	-	ns
Recovered charge 恢复电荷	Q_r		-	6.5	-	μC
Peak reverse recovery current 反向恢复峰值电流	I_{RM}		-	14	-	A
Reverse recovered energy 反向恢复损耗	E_{rec}		-	0.32	-	mJ

Switching Characteristic at T_j=150℃（Inductive Load）

T_j=150℃时开关特性（感性负载）

Parameter 参数	Symbol 符号	Conditions 条件	Value 值			Unit 单位
			Min. 最小值	Typ. 典型值	Max. 最大值	
IGBT Characteristic **IGBT 特性**						
Turn-on delay time 开通延迟时间	$t_{d(on)}$	T_j=150℃， V_{CC}=400V, I_C=160A, V_{GE}=-7.5/15V, R_G=5Ω, Energy losses include “tail” and diode reverse recovery.	-	166	-	ns
Rise time 上升时间	t_r		-	278	-	
Turn-off delay time 关断延迟时间	$t_{d(off)}$		-	198	-	
Fall time 下降时间	t_f		-	180	-	
Turn-on energy 开通损耗	E_{on}		-	16.1	-	mJ
Turn-off energy 关断损耗	E_{off}		-	10.3	-	
Total switching energy 总开关损耗	E_{ts}		-	26.4	-	
Anti-Parallel Diode Characteristic **反并联二极管特性**						
Reverse recovery time 反向恢复时间	t_{rr}	T_j=150℃, V_R=400V, I_F=160A, diF/dt=1900A/μs	-	305	-	ns
Recovered charge 恢复电荷	Q_r		-	13	-	μC
Peak reverse recovery current 反向恢复峰值电流	I_{RM}		-	23	-	A
Reverse recovered energy 反向恢复损耗	E_{rec}		-	0.81	-	mJ

ELECT
RICAL CHARACTERISTICS
特性曲线

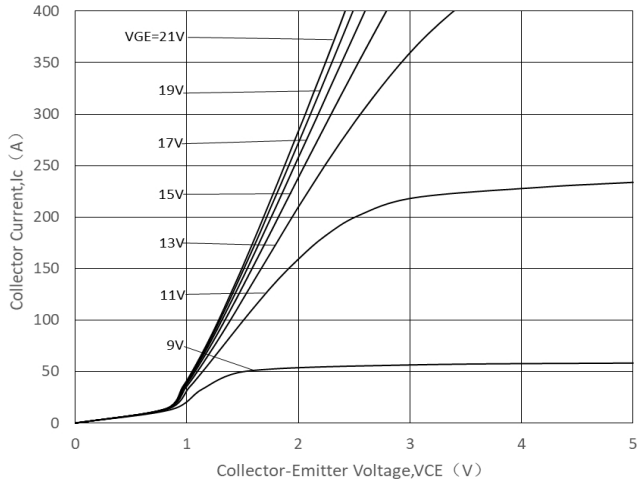


Figure 1. Typical output characteristic(Tj=25℃)

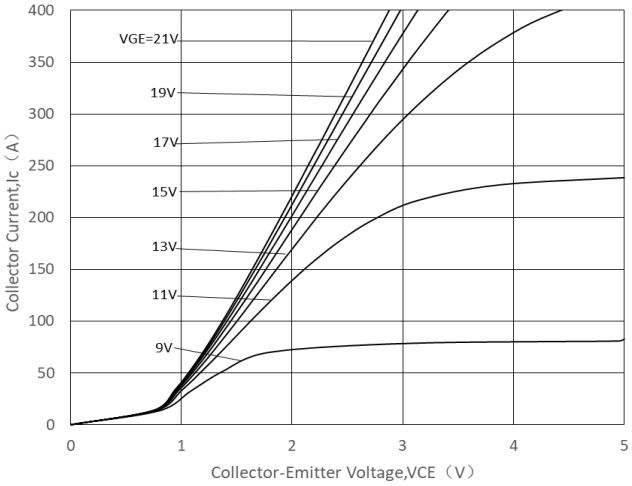


Figure 2. Typical output characteristic(Tj=150℃)

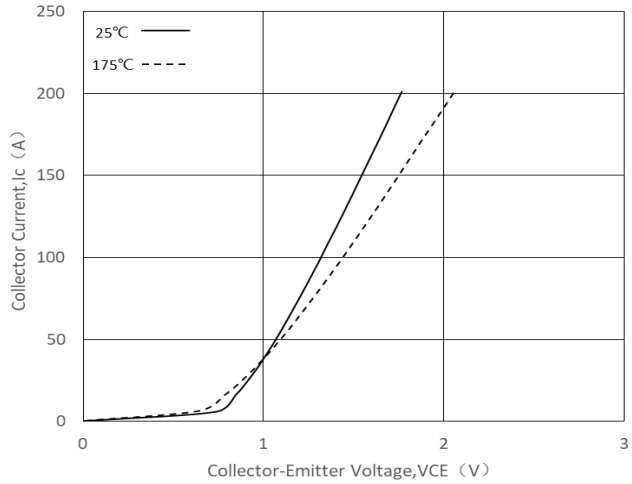


Figure 3. Typical collector-emitter saturation voltage Characteristic(V_{GE}=15V)

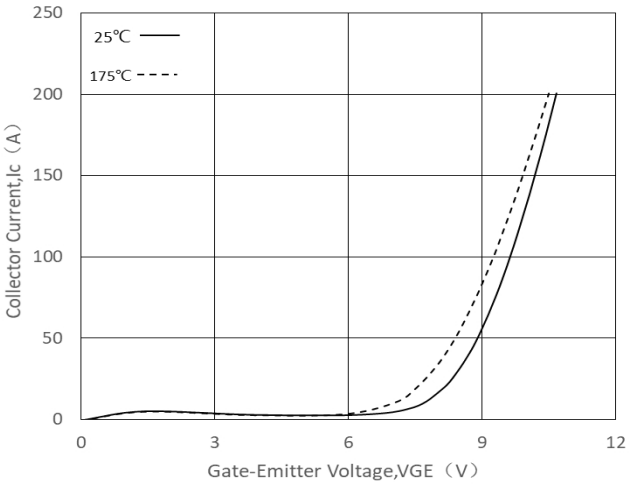


Figure 4. Typical transfer voltage(V_{CE}=20V)

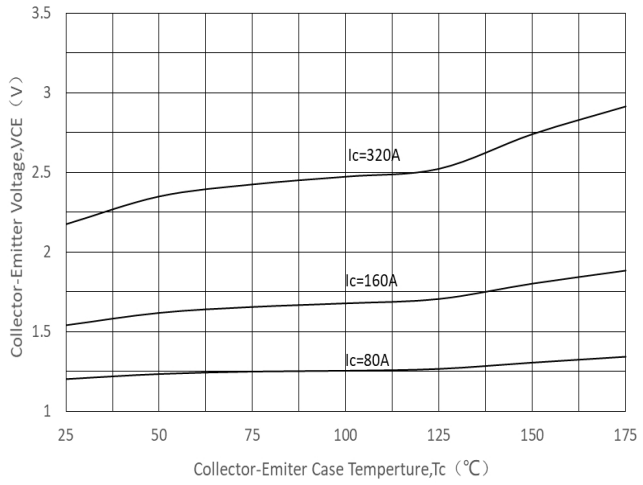


Figure 5. Saturation Voltage vs. Case Temperature

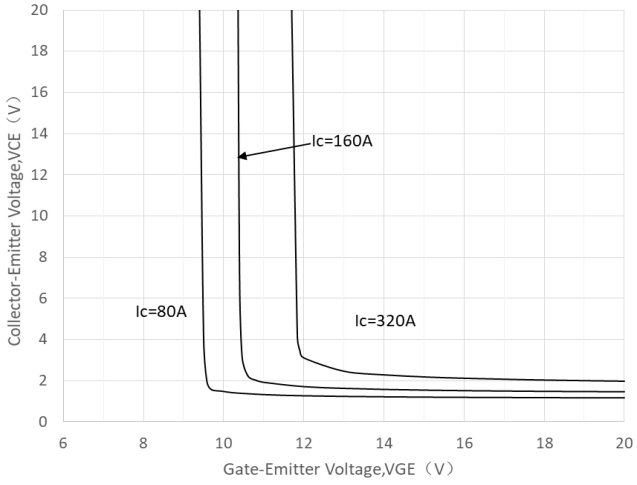


Figure 6. Saturation Voltage vs. V_{GE}(Tj=25℃)

at Variant Current Level(V_{GE}=15V)

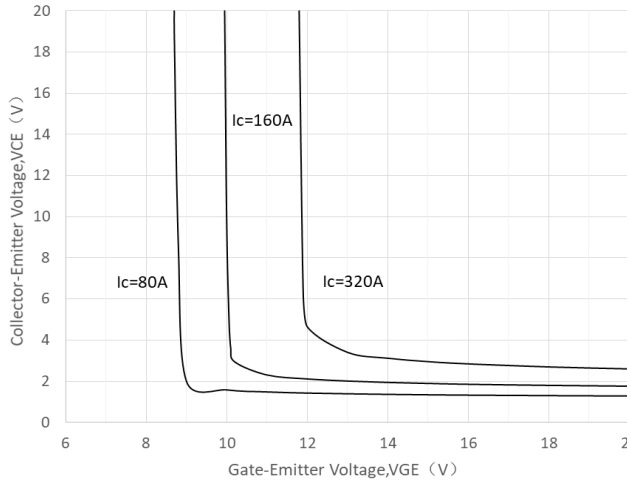


Figure 7. Saturation Voltage vs.V_{GE}(Tj=175℃)

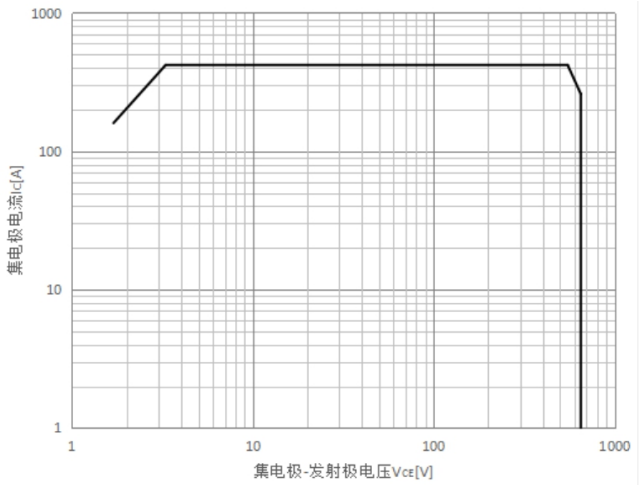


Figure 8. Turn Off Switching SOA Characteristics

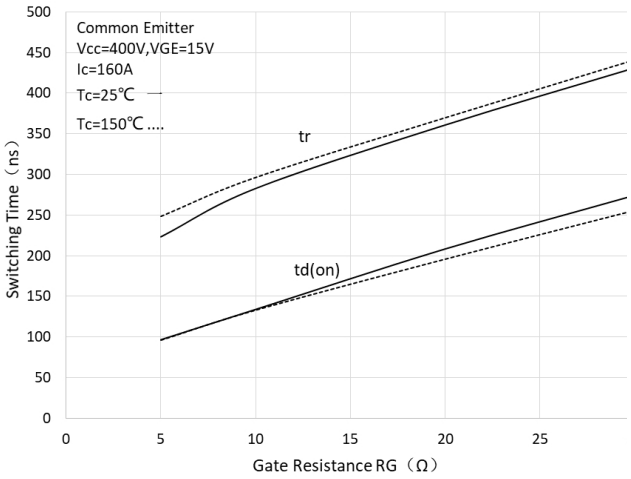


Figure 9. Turn−on Characteristics vs. Gate Resistance

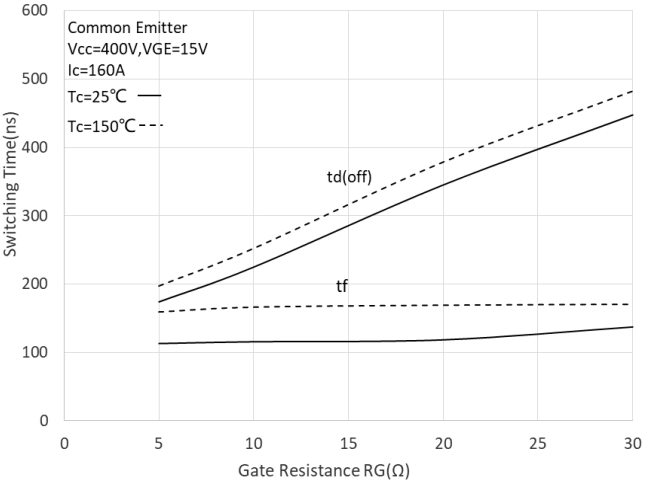


Figure 10. Turn−off Characteristics vs. Gate Resistance

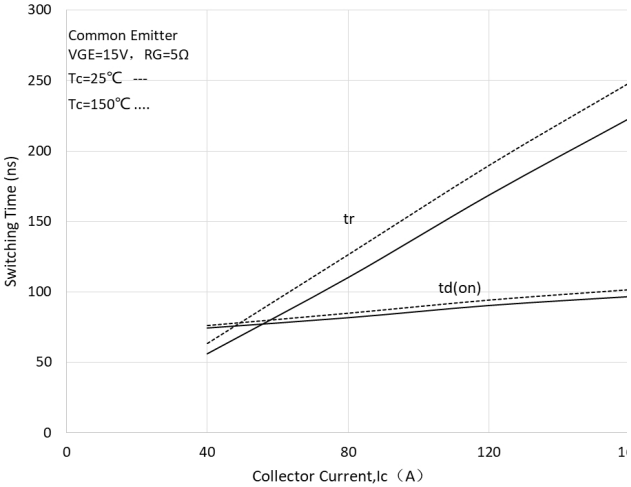


Figure 11. Turn−on Characteristics vs. Collector Current

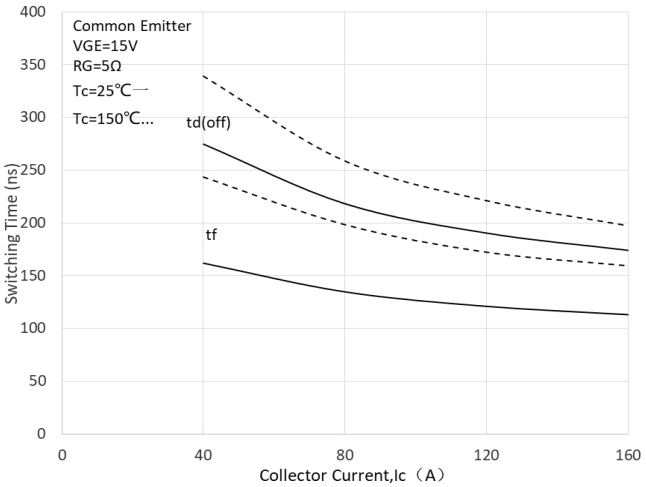


Figure 12. Turn−off Characteristics vs. Collector Current

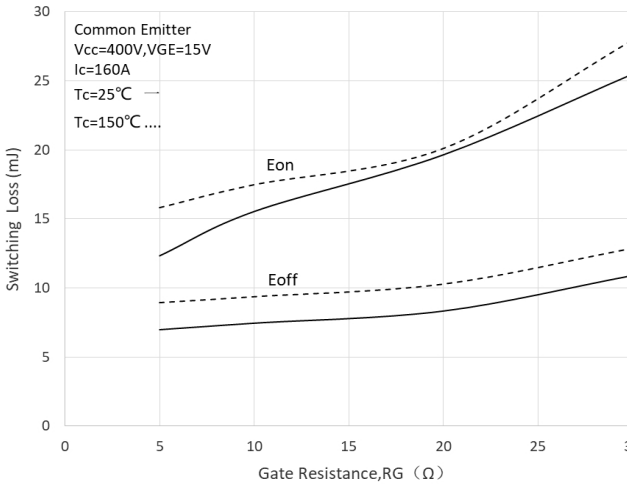


Figure 13. Switching Loss vs. Gate Resistance

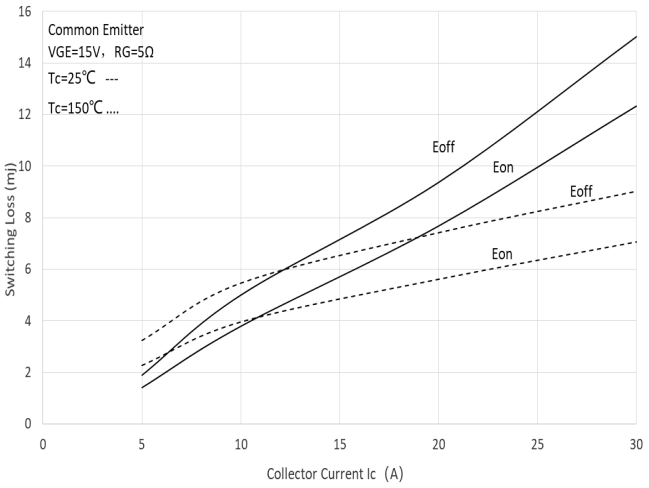


Figure 14. Switching Loss vs. Collector Current

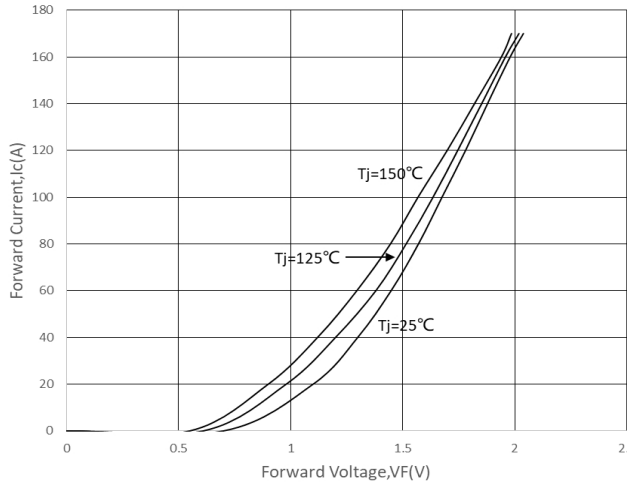


Figure 15. Forward Characteristics

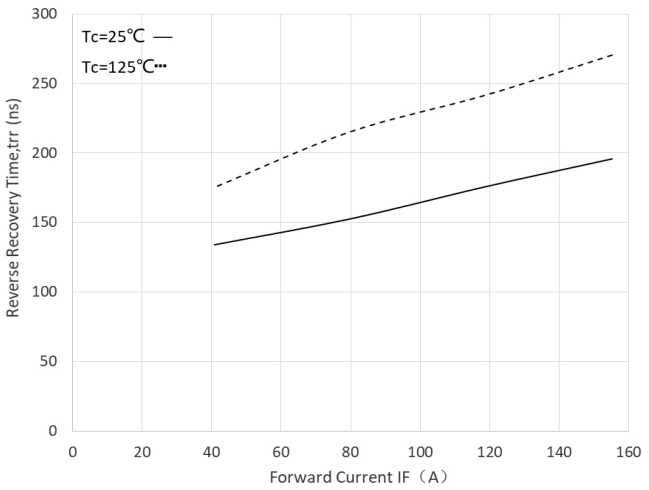


Figure 16. Reverse Recovery Time

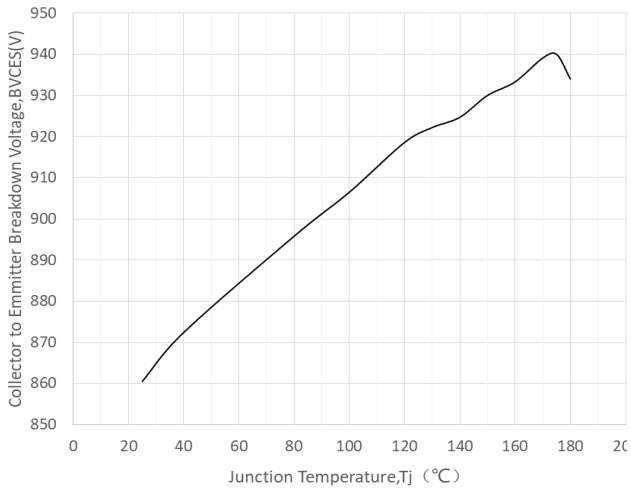


Figure 17. Collector to Emitter Breakdown Voltage vs. Junction Temperature(Ic=1mA)

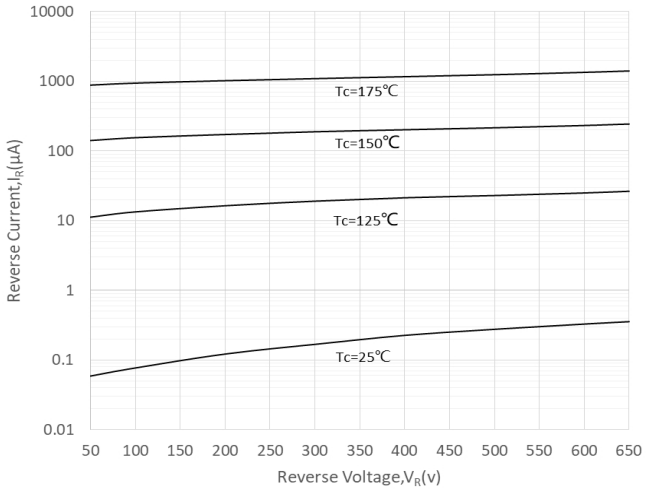


Figure 18. Reverse Current

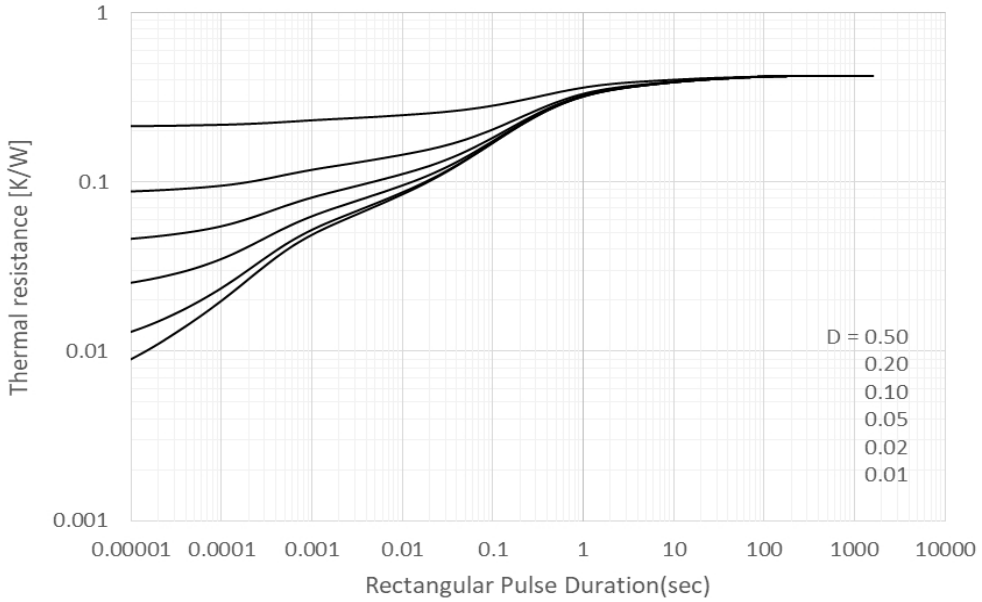


Figure 19. Transient Thermal Impedance of IGBT

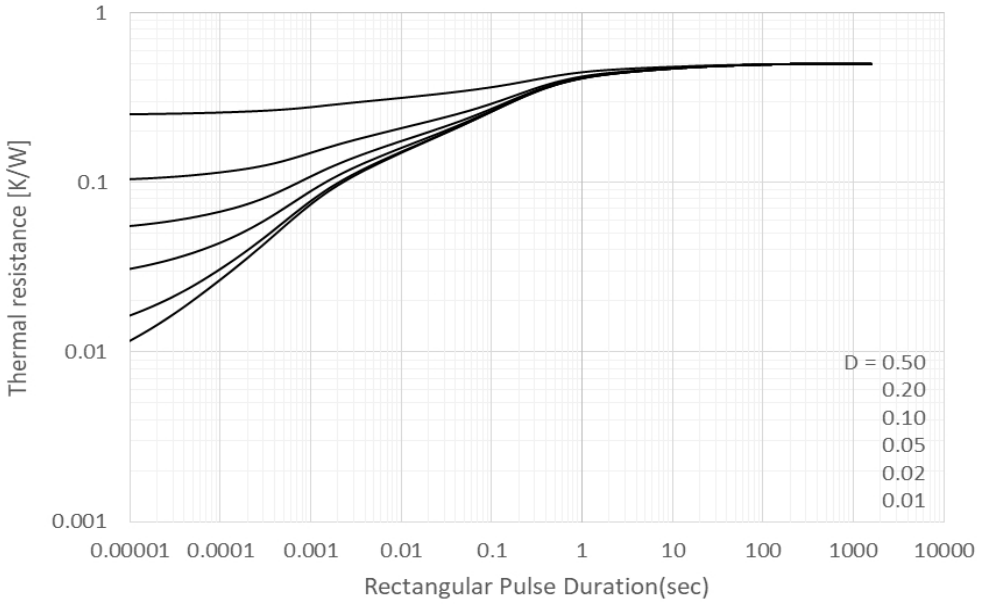
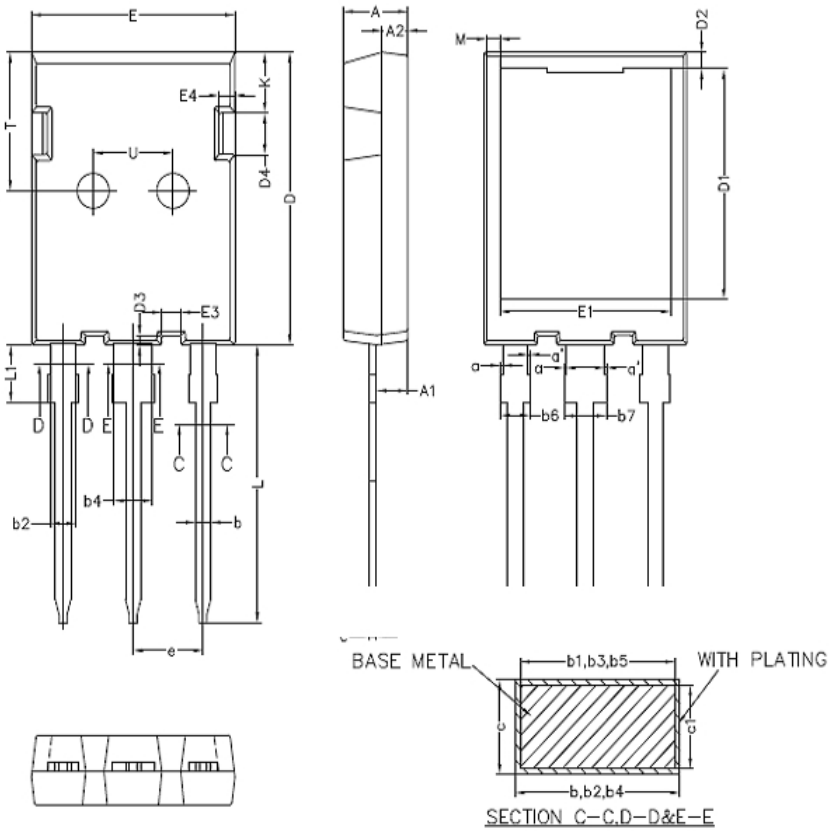


Figure 20. Transient Thermal Impedance of Diode

TO247Plus Outline Dimensions:
TO247Plus 外形尺寸



Common Dimensions (Units:Millimeter)			
Symbol	Min.	Nom.	Max.
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
a	0.00	-	0.15
a'	0.00	-	0.15
b	1.16	-	1.26
b1	1.15	1.20	1.22
b2	1.96	-	2.06
b3	1.95	2.00	2.02
b4	2.96	-	3.06
b5	2.95	3.00	3.02
b6	-	-	2.25
b7	-	-	3.25
c	0.59	-	0.66
c1	0.58	0.60	0.62
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.17	1.35
D3	0.58	0.68	0.78
D4	2.90	3.00	3.10
E	15.70	15.80	15.90
E1	13.10	13.26	13.50
E3	1.35	1.45	1.55
E4	1.14	1.24	1.34
e	5.34	5.44	5.54
K	4.25	4.35	4.45
L	19.80	19.92	20.10
L1	3.90	-	4.30
M	0.70	-	1.30
P	2.40	2.50	2.60
R1	0.30REF		
T	9.80	-	10.20
U	6.00	-	6.40
V	35°	-	45°

Packing
包装

Packing	pcs/tube	tube/ inner box	inner box/ carton	pcs/carton
Tube	30	12	6	2160

RESTRICTIONS ON PRODUCT USE

- The information contained herein is subject to change without notice.

- **BYD Semiconductor Company Limited** exerts the greatest possible effort to ensure high quality and reliability. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing products, to comply with the standards of safety in making a safe design for the entire system, including redundancy, fire-prevention measures, and malfunction prevention, to prevent any accidents, fires, or community damage that may ensue. In developing your designs, please ensure that products are used within specified operating ranges as set forth in the most recent products specifications.

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