



BGNE40Q120SD

本产品符合 AEC-Q101 标准要求

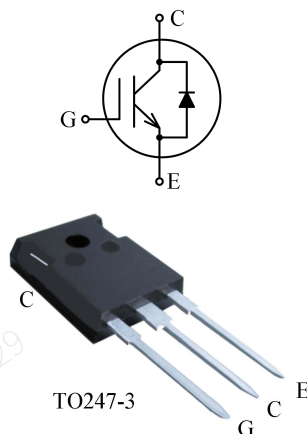
IGBT in advanced FS Technology with soft and fast recovery anti-parallel diode

具有先进 FS 技术的 IGBT 且反并联软快恢复二极管

Features:

特性

- 1200V planar field-stop technology
1200V 平面栅场终止技术
- Low switching losses
低开关损耗
- Positive temperature coefficient
饱和电压正温度系数
- Positive temperature coefficient of forward voltage
正向电压正温度系数
- Short Circuit withstand time-10 μ s
具备10 μ s短路承受能力



Applications:

应用

- Electric Automotive Air-Condition Compressor
电动汽车空调压缩机
- Electric Automotive PTC Heater
汽车PTC加热
- General Inverter
通用变频器

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	$T_{jmax}[^{\circ}C]$ 最高结温	Marking 标记	Package 封装
BGNE40Q120SD	1200	40	2.2	175	40Q120SD	TO-247-3L



BGNE40Q120SD

Maximum Rated Values

最大额定参数

Parameter 参数	Symbol 符号	Value 值	Unit 单位
Collector-emitter voltage, $T_j \geq 25^\circ\text{C}$ 集电极-发射极电压, $T_j \geq 25^\circ\text{C}$	V_{CE}	1200	V
Collector current, $T_C = 25^\circ\text{C}$ 集电极电流, $T_C = 25^\circ\text{C}$	I_C	80	A
Collector current, $T_C = 100^\circ\text{C}$ 集电极电流, $T_C = 100^\circ\text{C}$	I_C	40	
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}	160	
Diode forward current, $T_C = 25^\circ\text{C}$ 二极管正向电流, $T_C = 25^\circ\text{C}$	I_F	80	
Diode forward current, $T_C = 100^\circ\text{C}$ 二极管正向电流, $T_C = 100^\circ\text{C}$	I_F	40	
Diode pulsed current 二极管脉冲电流	I_{Fpuls}	160	V
Gate-emitter voltage 栅极-发射极电压	V_{GE}	± 20	
Short Circuit withstand time $V_{GE} = 15\text{V}, V_{CC} \leq 800\text{V}, T_j \leq 150^\circ\text{C}$ 短路耐受时间	t_{sc}	10	
Total power dissipation, $T_C = 25^\circ\text{C}$ 总耗散功率, $T_C = 25^\circ\text{C}$	P_{tot}	428	
Maximum junction temperature 最高结温	$T_{j\max}$	175	
Operating junction temperature 工作结温	T_{jop}	$-40 \dots +150$	$^\circ\text{C}$
Storage temperature 储存温度	T_{stg}	$-55 \dots +150$	
Soldering temperature, 1.6mm from case for 10s 焊接温度	T_{st}	260	
Mounting Torque M3 锁装力矩	M_d	0.6	Nm



BGNE40Q120SD

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	$R_{th(j-c)}$	0.35	$^{\circ}\text{C}/\text{W}$
Diode Thermal resistance junction to case 二极管结-管壳热阻	$R_{th(j-c)}$	0.58	$^{\circ}\text{C}/\text{W}$
Thermal resistance junction to ambient 结-环境热阻	$R_{th(j-a)}$	40	$^{\circ}\text{C}/\text{W}$

Electrical Characteristic at $T_j = 25^{\circ}\text{C}$ (unless otherwise specified)

$T_j=25^{\circ}\text{C}$ 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	$V_{(BR)CES}$	$V_{GE}=0\text{V},$ $I_C=1\text{mA}$	1200	-	-	V
Collector-emitter saturation voltage 集电极-发射极饱和电压	V_{cesat}	$V_{GE}=15\text{V},$ $I_C=40\text{A}$	$T_j=25^{\circ}\text{C}$	-	2.2	2.5
			$T_j=150^{\circ}\text{C}$	-	2.4	-
Diode forward voltage 二极管正向电压	V_F	$V_{GE}=0\text{V},$ $I_F=40\text{A}$	$T_j=25^{\circ}\text{C}$	-	2.45	2.85
			$T_j=150^{\circ}\text{C}$	-	2.4	-
Gate-emitter threshold voltage 栅极-发射极阈值电压	$V_{GE(th)}$	$I_C=1.6\text{mA},$ $V_{CE}=V_{GE}$	5.0	5.8	7.0	μA
Collector-emitter cut-off current 集电极-发射极截止电流	I_{CES}	$V_{CE}=1200\text{V},$ $V_{GE}=0\text{V}$	-	-	100	
Gate-emitter leakage current 栅极-发射极漏电流	I_{GES}	$V_{CE}=0\text{V},$ $V_{GE}=\pm 20\text{V}$	-200	-	200	nA

Dynamic Characteristic

动态特性

Input capacitance 输入电容	C_{ies}	$V_{CE}=25\text{V},$ $V_{GE}=0\text{V},$ $f=1\text{MHz}$	-	3825	-	pF
Output capacitance 输出电容	C_{oes}		-	205	-	
Reverse transfer capacitance 反向传输电容	C_{res}		-	110	-	



BGNE40Q120SD

Gate charge 门极电量	Q_G	$V_{CC}=600V, I_C=40A,$ $V_{GE}=15V$	-	142	-	nC
Internal emitter inductance 内部发射极电感	L_E	-	-	13	-	nH
Short circuit current 短路电流	$I_{C(sc)}$	$V_{CC}=800V, V_{GE}=15V,$ $T_j=150^\circ C$	-	200	-	A
Reverse bias safe operating area 反偏安全工作区	RBSOA	$V_{CC}=800V, V_{GE}=15V,$ $T_j \leq 150^\circ C$	80	-	-	

Switching Characteristic at $T_j=25^\circ C$ (Inductive Load)

$T_j=25^\circ C$ 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°C, V _{CC} =600V, I _C =40A, V _{GE} =-7.5/15V, R _G =10Ω, Energy losses include “tail” and diode reverse recovery.	-	50	-	ns
Rise time 上升时间	t _r		-	90	-	
Turn-off delay time 关断延迟时间	t _{d(off)}		-	130	-	
Fall time 下降时间	t _f		-	90	-	
Turn-on energy 开通损耗	E _{on}		-	2.9	-	mJ
Turn-off energy 关断损耗	E _{off}		-	1.65	-	
Total switching energy 总开关损耗	E _{ts}		-	4.55	-	

Anti-Parallel Diode Characteristic

反并联二极管特性

Reverse recovery time 反向恢复时间	t_{rr}	$T_j=25^\circ C,$ $V_R=600V,$ $I_F=40A,$ $diF/dt=380A/\mu s$	-	415	-	ns
Recovered charge 恢复电荷	Q_r		-	2.4	-	μC
Peak reverse recovery current 反向恢复峰值电流	I_{RM}		-	13	-	A
Reverse recovered energy 反向恢复损耗	E_{rec}		-	0.9	-	mJ



BGNE40Q120SD

Switching Characteristic at $T_j=150^{\circ}\text{C}$ (Inductive Load)

$T_j=150^{\circ}\text{C}$ 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°C, V _{CC} =600V, I _C =40A, V _{GE} =-7.5/15V, R _G =10Ω, Energy losses include “tail” and diode reverse recovery.	-	48	-	ns
Rise time 上升时间	t _r		-	94	-	
Turn-off delay time 关断延迟时间	t _{d(off)}		-	177	-	
Fall time 下降时间	t _f		-	155	-	
Turn-on energy 开通损耗	E _{on}		-	5.7	-	mJ
Turn-off energy 关断损耗	E _{off}		-	2.6	-	
Total switching energy 总开关损耗	E _{ts}		-	8.3	-	

Anti-Parallel Diode Characteristic

反并联二极管特性

Reverse recovery time 反向恢复时间	t_{rr}	$T_j=150^{\circ}\text{C}$, $V_R=600\text{V}$, $I_F=40\text{A}$, $diF/dt=345\text{A}/\mu\text{s}$	-	635	-	ns
Recovered charge 恢复电荷	Q_r		-	5.1	-	μC
Peak reverse recovery current 反向恢复峰值电流	I_{RM}		-	15	-	A
Reverse recovered energy 反向恢复损耗	E_{rec}		-	1.88	-	mJ



BGNE40Q120SD

ELECTRICAL CHARACTERISTICS

特性曲线

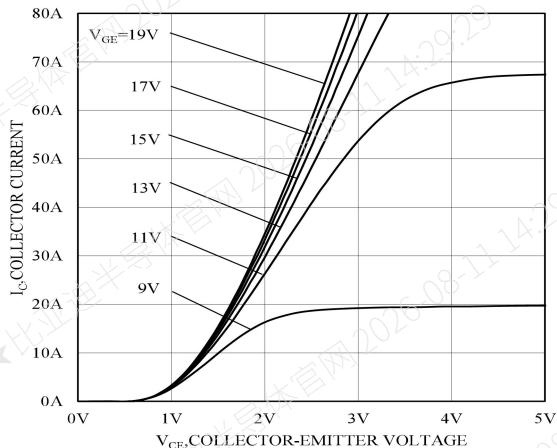


Figure 1. Typical output characteristic($T_j=25^{\circ}\text{C}$)

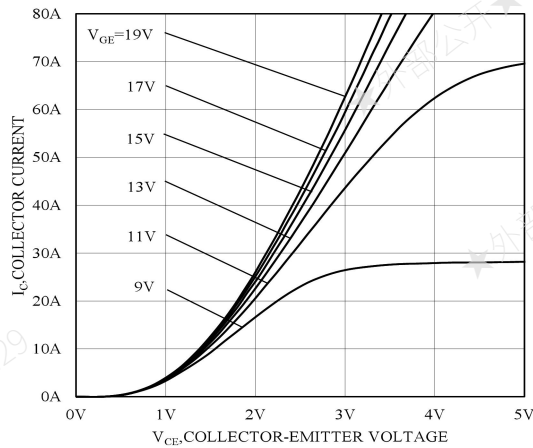


Figure 2. Typical output characteristic($T_j=150^{\circ}\text{C}$)

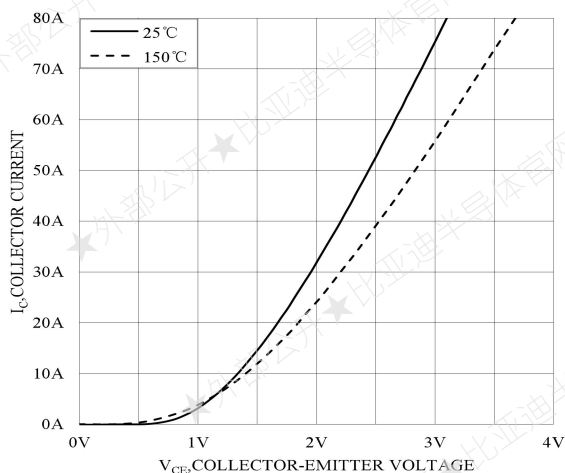


Figure 3. Typical on-state Characteristic($V_{GE}=15\text{V}$)

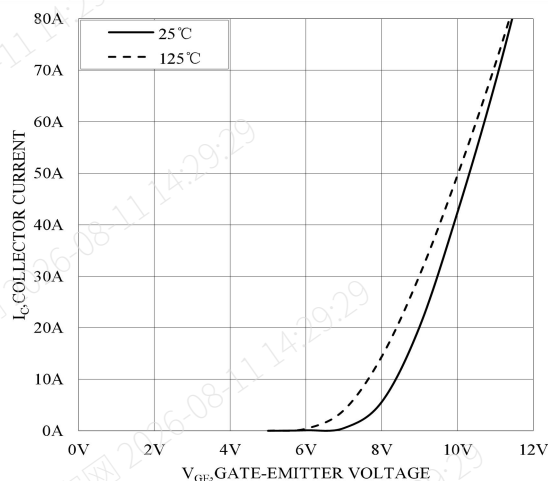


Figure 4. Typical transfer voltage($V_{CE}=20\text{V}$)

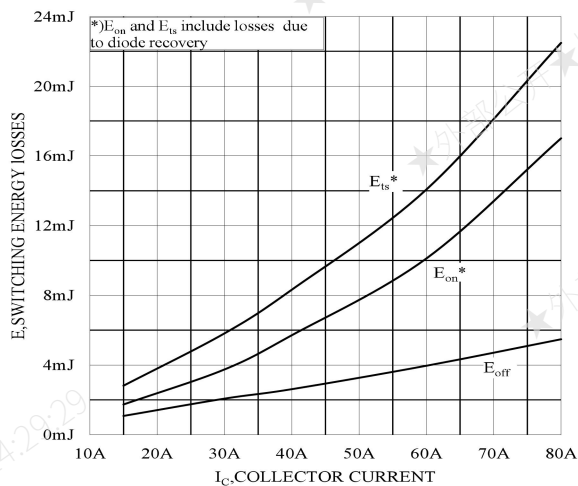


Figure 5. Switching energy losses as I_C
($T_j=150^{\circ}\text{C}$, $V_{CC}=600\text{V}$, $V_{GE}=7.5/15\text{V}$, $R_G=10\Omega$)

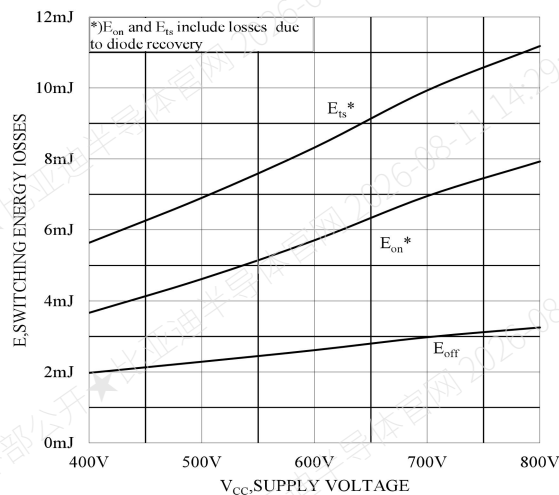


Figure 6. Switching energy losses as V_{CC}
($T_j=150^{\circ}\text{C}$, $V_{GE}=7.5/15\text{V}$, $I_C=40\text{A}$, $R_G=10\Omega$)



BGNE40Q120SD

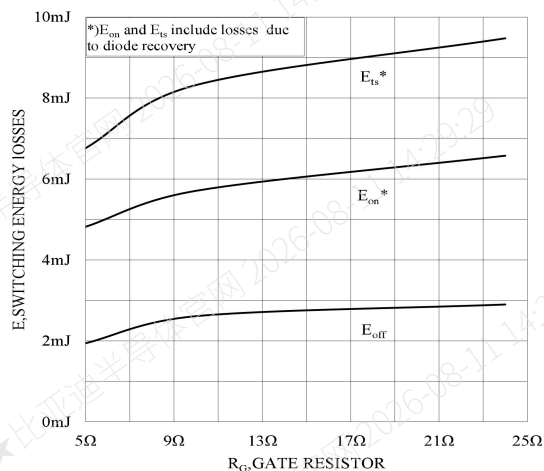


Figure 7. Switching energy losses as R_G
($T_j=150^\circ\text{C}$, $V_{CC}=600\text{V}$, $V_{GE}=-7.5/15\text{V}$, $I_C=40\text{A}$)

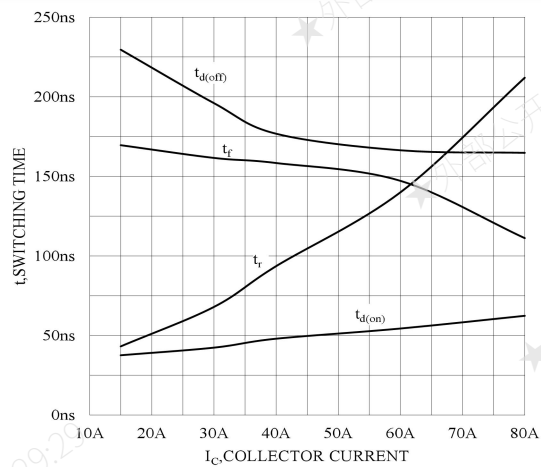


Figure 8. Switching times as I_C
($T_j=150^\circ\text{C}$, $V_{CC}=600\text{V}$, $V_{GE}=-7.5/15\text{V}$, $R_G=10\Omega$)

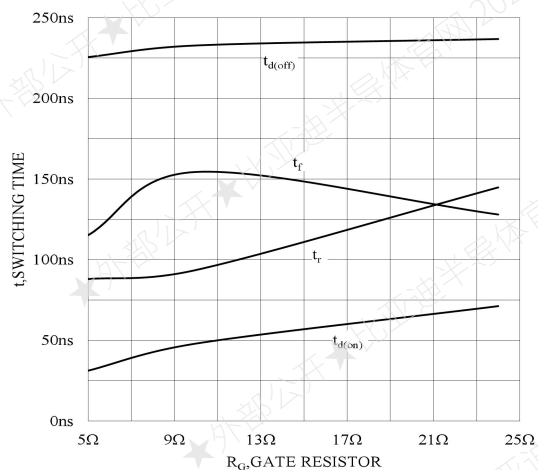


Figure 9. Switching times as R_G
($T_j=150^\circ\text{C}$, $V_{CC}=600\text{V}$, $V_{GE}=-7.5/15\text{V}$, $I_C=40\text{A}$)

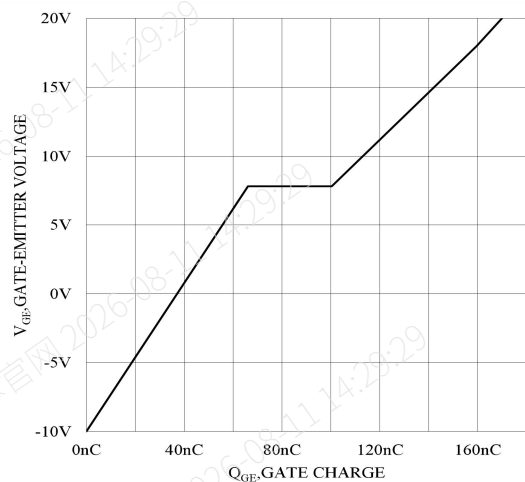


Figure 10. Typical gate charge
($V_{CC}=600\text{V}$, $I_C=40\text{A}$)

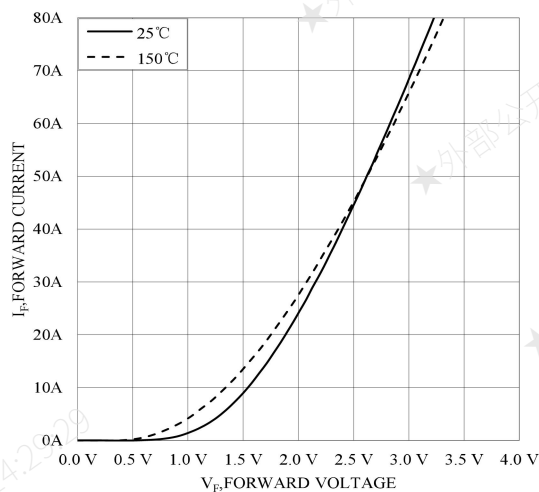


Figure 11. Diode forward current as V_F

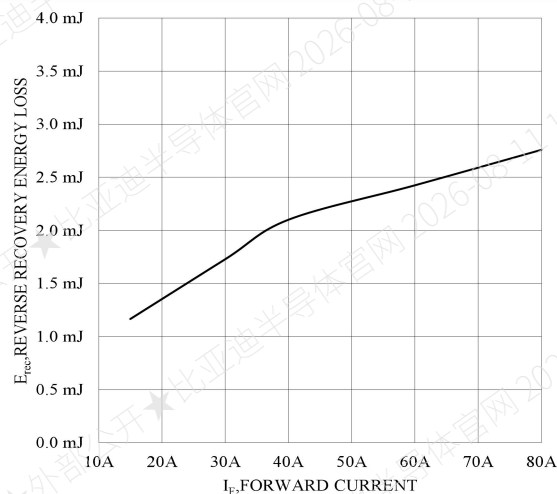


Figure 12. Diode reverse recovery loss as I_F
($T_j=150^\circ\text{C}$, $V_R=600\text{V}$, $R_G=10\Omega$)



BGNE40Q120SD

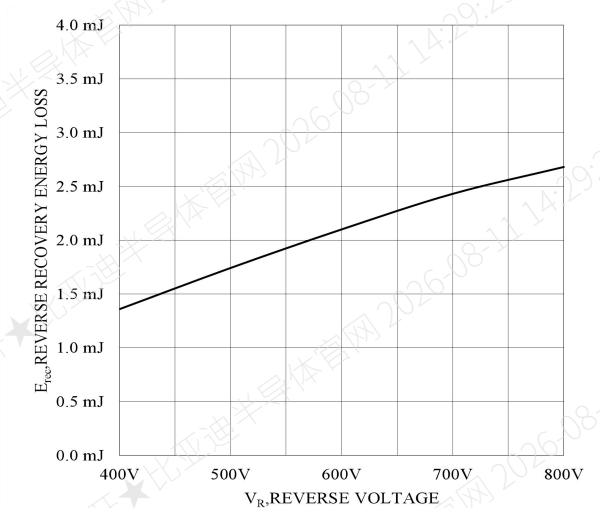


Figure 13. Diode reverse recovery loss as R_G
($T_j=150^{\circ}\text{C}$, $I_F=40\text{A}$, $R_G=10\Omega$)

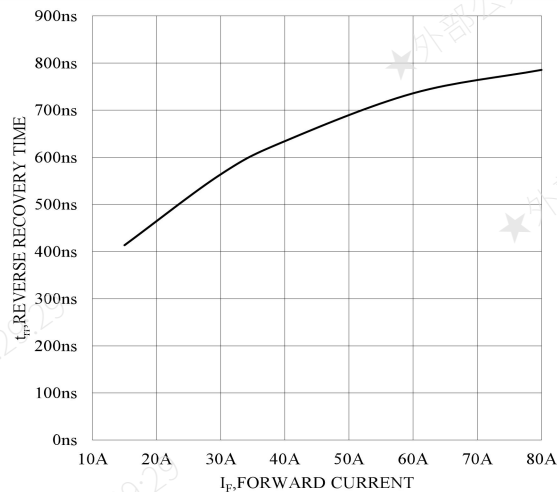


Figure 14. Diode reverse recovery time as I_F
($T_j=150^{\circ}\text{C}$, $V_R=600\text{V}$, $R_G=10\Omega$)

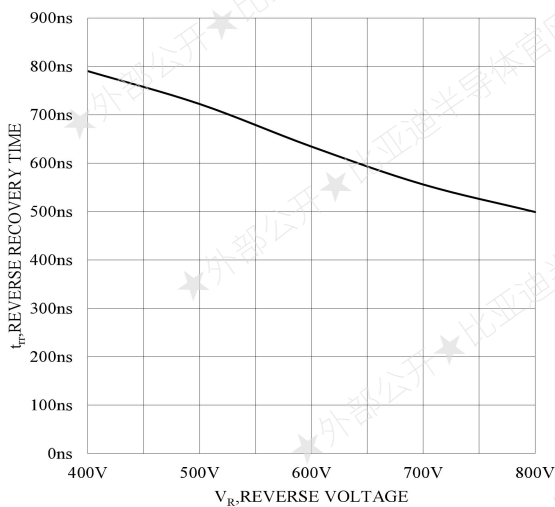


Figure 15. Diode reverse recovery time as V_R
($T_j=150^{\circ}\text{C}$, $I_F=40\text{A}$, $R_G=10\Omega$)



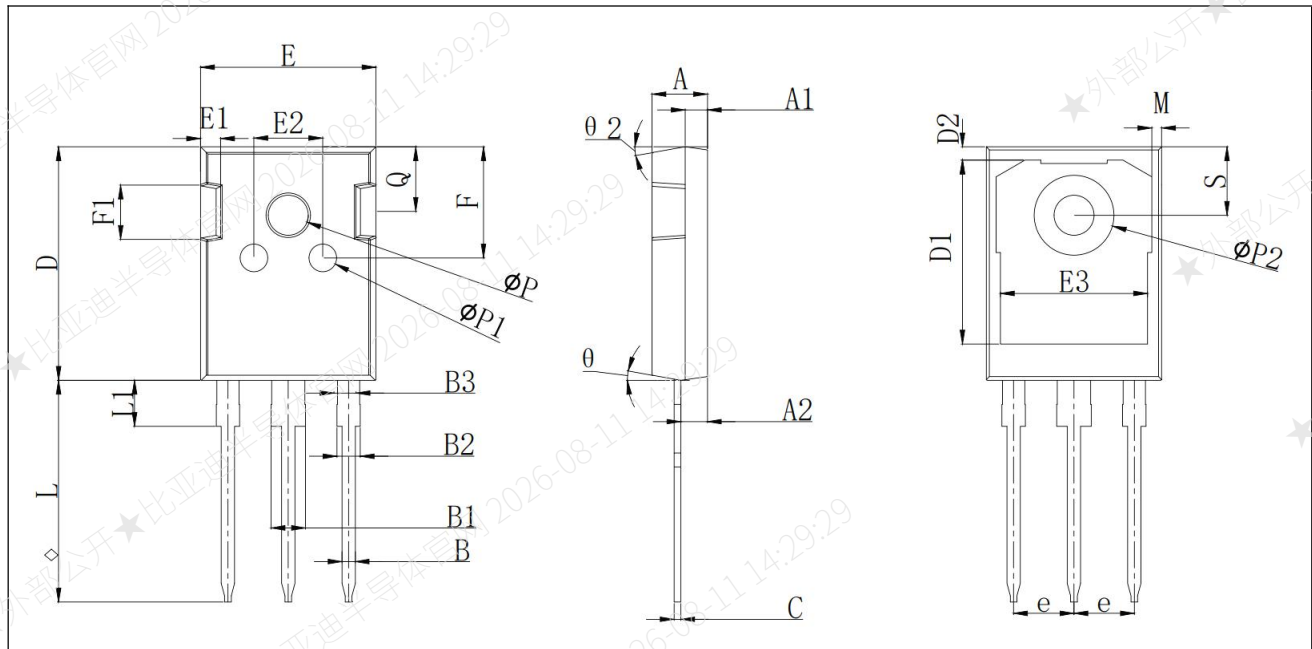
比亚迪
半导体

★外部公开★

BGNE40Q120SD

TO-247-3L Outline Dimensions:

TO-247-3L 外形尺寸



Common Dimensions
(Units:Millimeter)

Symbol	Min.	Max.	Symbol	Min.	Max.
A	4.85	5.15	E3	13.06	14.22
A1	1.90	2.10	F	8.76	10.20
A2	2.20	2.60	F1	4.00	5.30
B	1.00	1.40	e	5.39	5.49
B1	2.80	3.25	L	19.72	21.00
B2	1.80	2.20	L1	3.90	4.80
B3	1.80	2.10	phi P	3.50	3.70
C	0.50	0.70	phi P1	2.40	3.10
D	20.30	21.10	phi P2	7.10	7.30
D1	16.35	16.75	Q	5.40	5.98
D2	0.85	1.32	S	5.98	6.27
E	15.45	15.90	theta	1°	11°
E1	1.20	2.60	theta 2	9°	23°
E2	6.10	8.20			

Note: The mold may vary little from different packaging plants, please refer to the actual product.

备注：因各封装厂的模具存在细微差异，请以实物的尺寸为准。

Packing

包装

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



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- Warranty Period: Unless otherwise agreed in the COOPERATION AGREEMENT or other WRITTEN DOCUMENTS, the Warranty Period for products specified in this specification shall be one year from the date of purchase if the products are properly preserved.

Special instructions: Storage Temperature: $20\pm 5^{\circ}\text{C}$; Relative Humidity: 30%-60%; The product should be stored in a place away from direct light and vibration.

质保期: 除双方在合作协议或其他书面文件中另行约定外, 产品妥当保存的情况下自购买之日起, 本规格书所述产品质保期为一年。

特殊说明: 储存温度: $20\pm 5^{\circ}\text{C}$; 相对湿度: 30%-60%; 产品应放置于避光地方, 避免震动。

- Our Company is committed to enhancing product quality and stability. This specification serves solely to delineate technical product details.

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BGNE40Q120SD

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