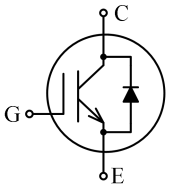
BGN40Q120SD

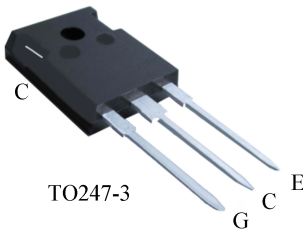
本产品符合 AEC-Q101 标准要求

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-10μs
  具备10μs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}[℃] 最高结温	Marking 标记	Package 封装
BGN40Q120SD	1200	40	2.2	175	40Q120SD	TO247-3

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}	1200	V
Collector current,T_C=25℃ 集电极电流，Tc=25℃	I_C	80	A
Collector current,T_C=100℃ 集电极电流，Tc=100℃	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℃ 二极管正向电流，Tc=25℃	I_F	80	
Diode forward current,T_C=100℃ 二极管正向电流，Tc=100℃	I_F	40	
Diode pulsed current 二极管脉冲电流	I_{Fpuls}	160	
Gate-emitter voltage 栅极-发射极电压	V_{GE}	±20	V
Short Circuit withstand time V_{GE}=15V,V_{CC}≤800V,T_j≤150℃ 短路耐受时间	t_{sc}	10	us
Total power dissipation, T_C=25℃ 总耗散功率，Tc=25℃	P_{tot}	428	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}	260	
Mounting Torque M3 锁装力矩	Md	0.6	Nm

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	℃/W
Diode Thermal resistance junction to case 二极管结-管壳热阻	$R_{th(j-c)}$	0.58	℃/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 Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位
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=1mA		1200	-	-	V
Collector-emitter saturation voltage 集电极-发射极饱和电压	Vcesat	V_{GE}=15V, I_C=40A	T_j=25℃	-	2.2	2.5	
			T_j=150℃	-	2.4	-	
Diode forward voltage 二极管正向电压	VF	V_{GE}=0V, I_F=40A	T_j=25℃	-	2.45	2.85	
			T_j=150℃	-	2.4	-	
Gate-emitter threshold voltage 栅极-发射极阈值电压	$V_{GE(th)}$	I_C=1.6mA, V_{CE}=V_{GE}		5.0	5.8	7.0	
Collector-emitter cut-off current 集电极-发射极截止电流	I_{CES}	V_{CE}=1200V, 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		-	3825	-	pF
Output capacitance 输出电容	C_{oes}			-	205	-	
Reverse transfer capacitance 反向传输电容	C_{res}			-	110	-	

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℃	-	200	-	A
Reverse bias safe operating area 反偏安全工作区	RBSOA	V_{CC}=800V,V_{GE}=20V, T_j≤150℃	80	-	-	

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}=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℃, V_R=600V, I_F=40A, diF/dt=380A/μs	-	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

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}=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℃, V_R=600V, I_F=40A, diF/dt=345A/μs	-	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

ELECTRICAL CHARACTERISTICS
特性曲线

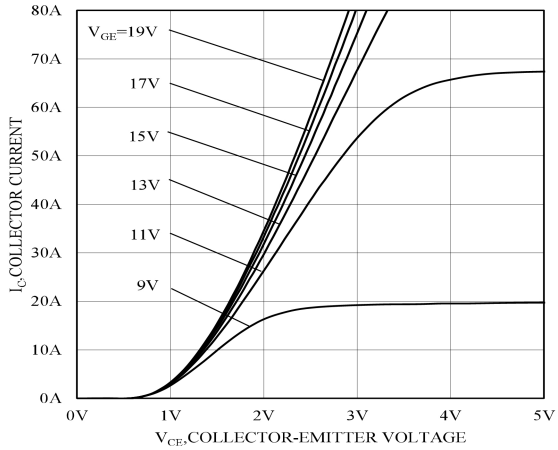


Figure 1. Typical output characteristic(T_j=25℃)

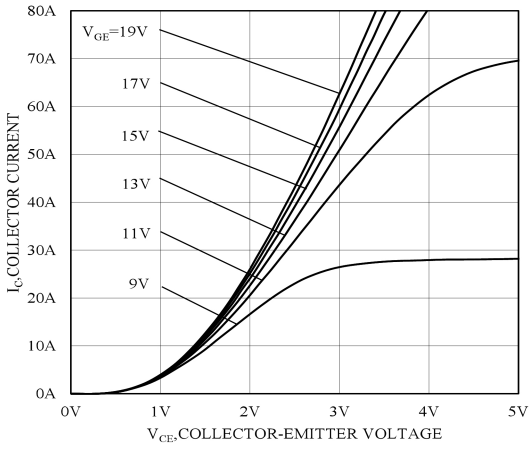


Figure 2. Typical output characteristic(T_j=150℃)

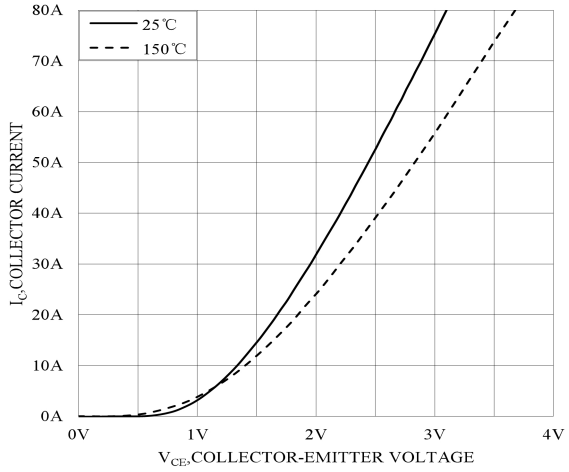


Figure 3. Typical on-state Characteristic(V_{GE}=15V)

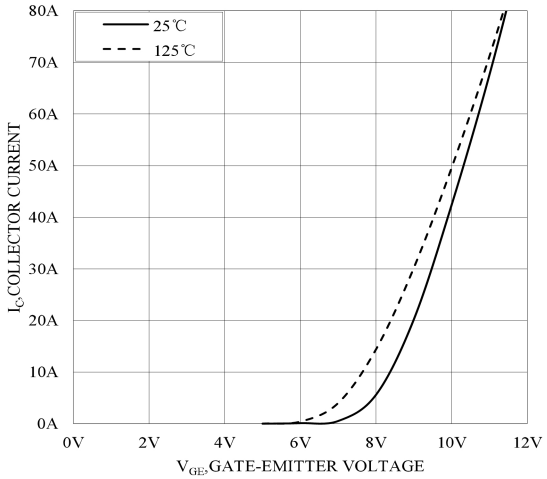


Figure 4. Typical transfer voltage(V_{CE}=20V)

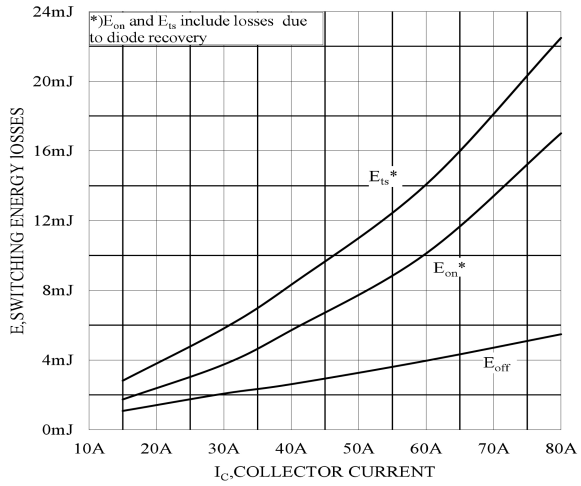


Figure 5. Switching energy losses as I_C
(T_j=150℃,V_{CC}=600V,V_{GE}=-7.5/15V,R_G=10Ω)

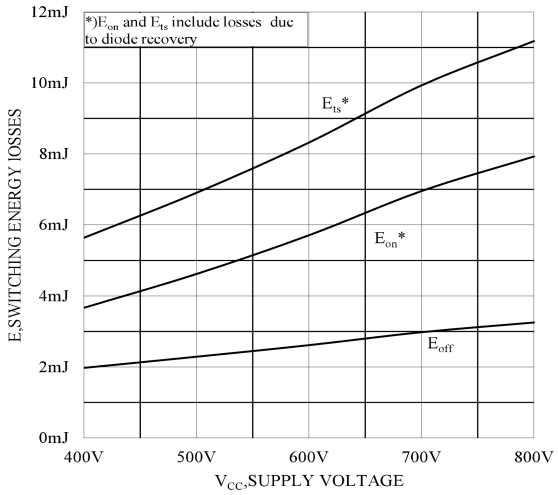


Figure 6. Switching energy losses as V_{CC}
(T_j=150℃,V_{GE}=-7.5/15V,I_C=40A,R_G=10Ω)

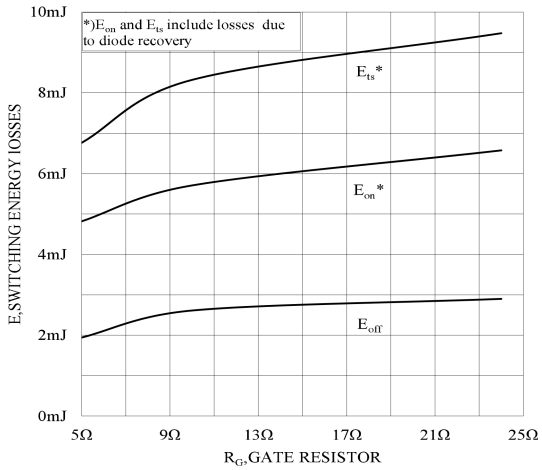


Figure 7. Switching energy losses as R_G (T_j=150℃,V_{CC}=600V,V_{GE}=-7.5/15V,I_C=40A)

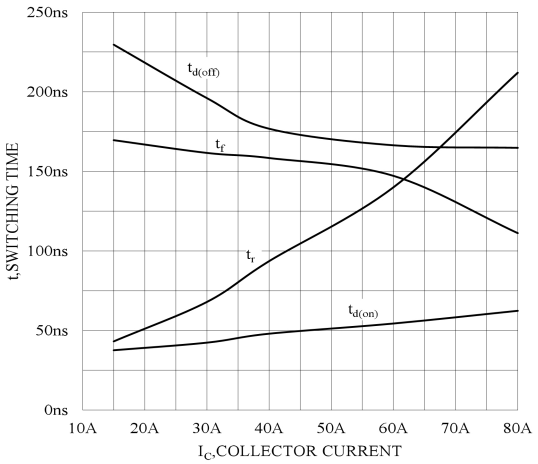


Figure 8. Switching times as I_C (T_j=150℃,V_{CC}=600V,V_{GE}=-7.5/15V,R_G=10Ω)

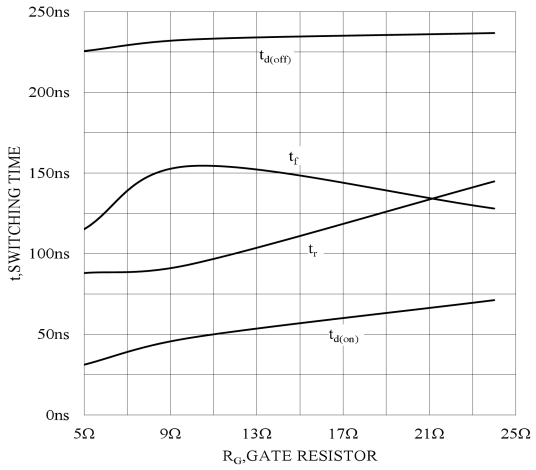


Figure 9. Switching times as R_G (Tj=150℃, V_{CC}=600V,V_{GE}=-7.5/15V,I_C=40A)

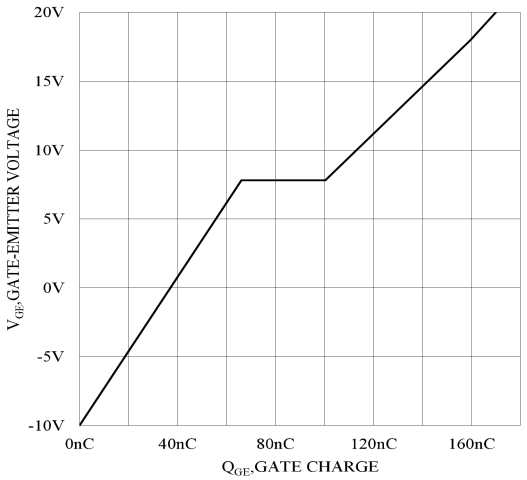


Figure 10. Typical gate charge (V_{CC}=600V, I_C=40A)

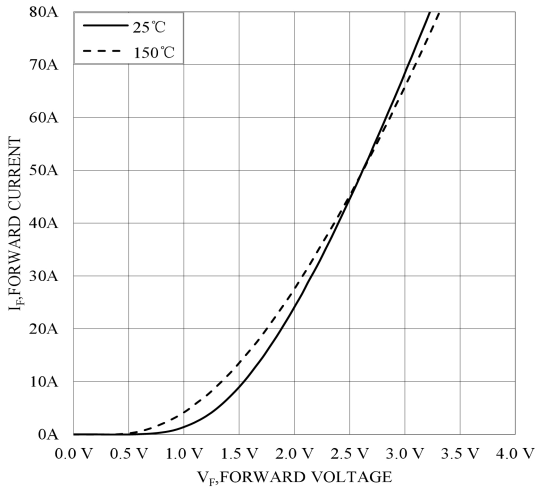


Figure 11. Diode forward current as V_F

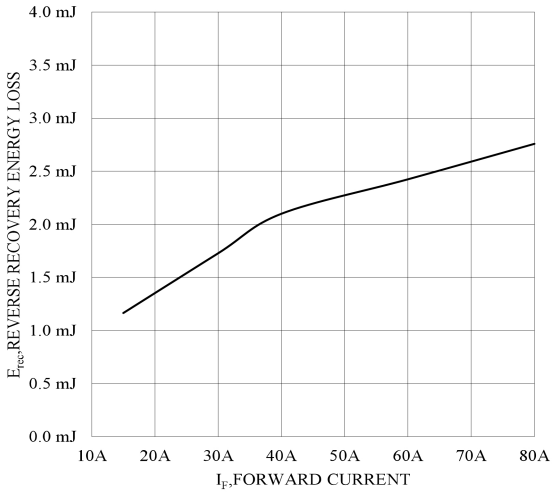


Figure 12. Diode reverse recovery loss as I_F (T_j=150℃, V_R=600V,R_G=10Ω)

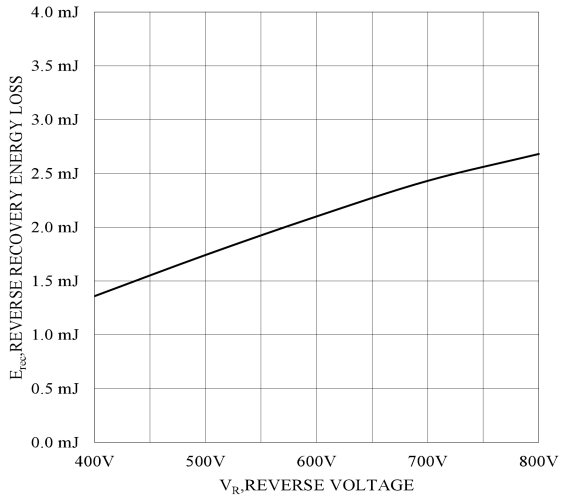


Figure 13. Diode reverse recovery loss as R_G
(T_j=150℃,I_F=40A,R_G=10Ω)

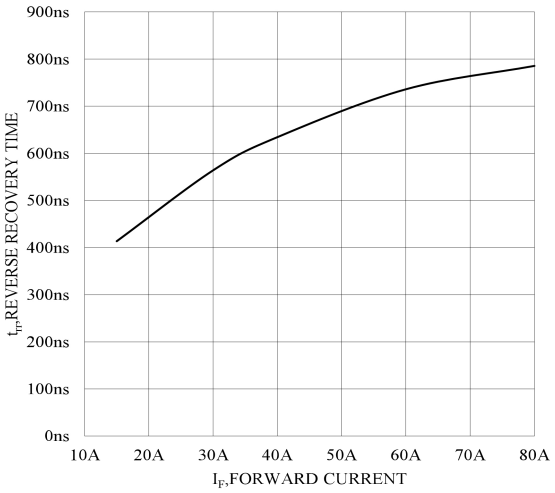


Figure 14. Diode reverse recovery time as I_F
(T_j=150℃,V_R=600V,R_G=10Ω)

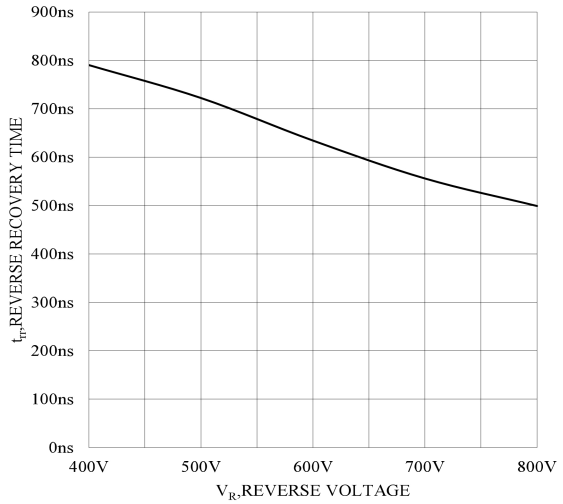
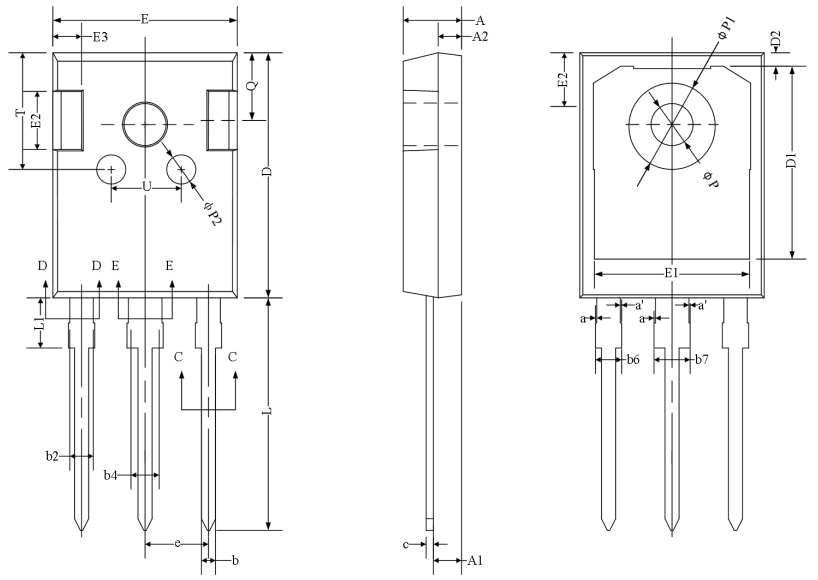
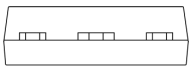
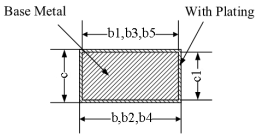


Figure 15. Diode reverse recovery time as V_R
(T_j=150℃,I_F=40A,R_G=10Ω)

TO247-3 Outline Dimensions:
TO247-3 外形尺寸



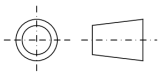




Section C-C,D-D,E-E

Notes:All dimensions refer to JEDEC standard TO-247 AD do not include mold flash.

Projection method



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	1.20	1.35
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.34	5.44	5.54
L	19.80	19.92	20.10
L1	-	-	4.30
P	3.50	3.60	3.70
P1	-	-	7.40
P2	2.40	2.50	2.60
Q	5.60	-	6.00
S	6.05	6.15	6.25
T	9.80	-	10.20
U	6.00	-	6.40

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.

- The products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of products listed in this document shall be made at the customer’s own risk.