



BGNE40V65HD

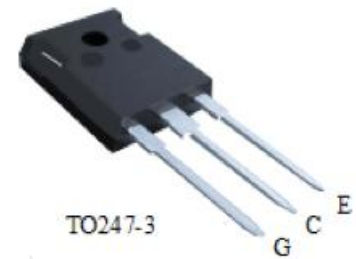
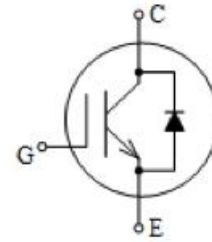
IGBT in advanced TrenchFS Technology with soft and fast recovery anti-parallel diode

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
- Low gate charge
低栅极电荷



Applications

应用

- Solar Inverter
光伏逆变器

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
BGNE40V65HD	650	40	1.65	175	40V65HD	TO-247-3L



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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}	650	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	A
Pulsed collector current, t_p limited by T_{jmax} 集电极脉冲电流, 脉宽时间受 T_{jmax} 限制	I_{Cpuls}	80	A
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	A
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	A
Diode pulsed current 二极管脉冲电流	I_{Fpuls}	160	A
Gate-emitter voltage 栅极-发射极电压	V_{GE}	± 20	V
Total power dissipation, $T_c = 25^\circ\text{C}$ 总耗散功率, $T_c = 25^\circ\text{C}$	P_{tot}	405	W
Maximum junction temperature 最高结温	T_{jmax}	175	$^\circ\text{C}$
Operating junction temperature 工作结温	T_{jop}	$-40 \dots +175$	$^\circ\text{C}$
Storage temperature 储存温度	T_{stg}	$-55 \dots +150$	$^\circ\text{C}$
Soldering temperature, 1.6mm from case for 5s 焊接温度	T_{st}	260	$^\circ\text{C}$

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	$R_{th(j-c)}$	0.37	$^\circ\text{C/W}$
Diode Thermal resistance junction to case 二极管结-管壳热阻	$R_{th(j-c)}$	0.65	$^\circ\text{C/W}$
Thermal resistance junction to ambient 结-环境热阻	$R_{th(j-a)}$	40	$^\circ\text{C/W}$



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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	$V_{(BR)CES}$	$V_{GE}=0V, I_C=100\mu A$		650	-	-	V
Collector-emitter saturation voltage 集电极-发射极饱和电压	V_{CEsat}	$V_{GE}=15V,$ $I_C=40A$	$T_J=25^{\circ}C$	-	1.65	2.25	V
			$T_J=150^{\circ}C$	-	2.15	-	V
Diode forward voltage 二极管正向电压	V_F	$V_{GE}=0V,$ $I_F=40A$	$T_J=25^{\circ}C$	-	1.9	2.5	V
			$T_J=150^{\circ}C$	-	1.5	-	V
Gate-emitter threshold voltage 栅极-发射极阈值电压	$V_{GE(th)}$	$I_C=1mA, V_{CE}=V_{GE}$		3.5	4.5	5.5	V
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}	$V_{CE}=0V, V_{GE}=\pm 20V$		-200	-	200	nA

Dynamic Characteristic

动态特性

Input capacitance 输入电容	C_{ies}	$V_{CE}=25V,$ $V_{GE}=0V,$ $f=1MHz$	-	2191	-	pF
Output capacitance 输出电容	C_{oes}		-	131	-	pF
Reverse transfer capacitance 反向传输电容	C_{res}		-	20	-	pF



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

$T_j=25^\circ\text{C}$ 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)}	V _{CE} =400V, I _C =40A, V _{GE} =-7.5/15V, R _G =8Ω, T _j =25℃, Energy losses include “tail” and diode reverse recovery.	-	39	-	ns
Rise time 上升时间	t _r		-	77	-	ns
Turn-off delay time 关断延迟时间	t _{d(off)}		-	100	-	ns
Fall time 下降时间	t _f		-	44	-	ns
Turn-on energy 开通损耗	E _{on}		-	1.14	-	mJ
Turn-off energy 关断损耗	E _{off}		-	0.76	-	mJ
Total switching energy 总开关损耗	E _{ts}		-	1.9	-	mJ

Anti-Parallel Diode Characteristic

反并联二极管特性

Reverse recovery time 反向恢复时间	t_{rr}	$V_R=400V$, $I_F=40A$, $di_F/dt=500A/\mu s$, $T_j=25^\circ\text{C}$	-	120	-	ns
Reverse recovery charge 反向恢复电荷	Q_{rr}		-	0.7	-	μC
Peak reverse recovery current 反向恢复峰值电流	I_{rrm}		-	12	-	A
Reverse recovered energy 反向恢复损耗	E_{rec}		-	0.23	-	mJ



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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)}	V _{CE} =400V, I _C =40A, V _{GE} =-7.5/15V, R _G =8Ω, T _j =150℃, Energy losses include “tail” and diode reverse recovery.	-	32	-	ns
Rise time 上升时间	t _r		-	79	-	ns
Turn-off delay time 关断延迟时间	t _{d(off)}		-	121	-	ns
Fall time 下降时间	t _f		-	61	-	ns
Turn-on energy 开通损耗	E _{on}		-	1.67	-	mJ
Turn-off energy 关断损耗	E _{off}		-	0.93	-	mJ
Total switching energy 总开关损耗	E _{ts}		-	2.6	-	mJ

Anti-Parallel Diode Characteristic

反并联二极管特性

Reverse recovery time 反向恢复时间	t_{rr}	$V_R=400\text{V},$ $I_F=60\text{A},$ $di_F/dt=500\text{A}/\mu\text{s}$ $T_j=150^{\circ}\text{C}$	-	193	-	ns
Reverse recovery charge 反向恢复电荷	Q_{rr}		-	2.4	-	μC
Peak reverse recovery current 反向恢复峰值电流	I_{rrm}		-	22	-	A
Reverse recovered energy 反向恢复损耗	E_{rec}		-	0.69	-	mJ



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Typical Characteristics Diagrams

特性曲线

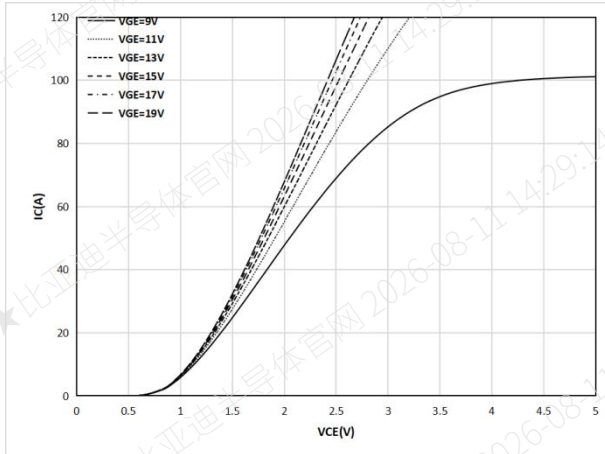


Figure 1. Typical output characteristic ($T_j=25^{\circ}\text{C}$)

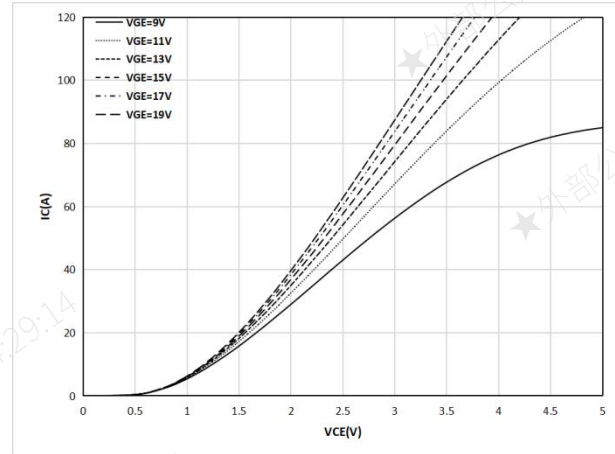


Figure 2. Typical output characteristic ($T_j=150^{\circ}\text{C}$)

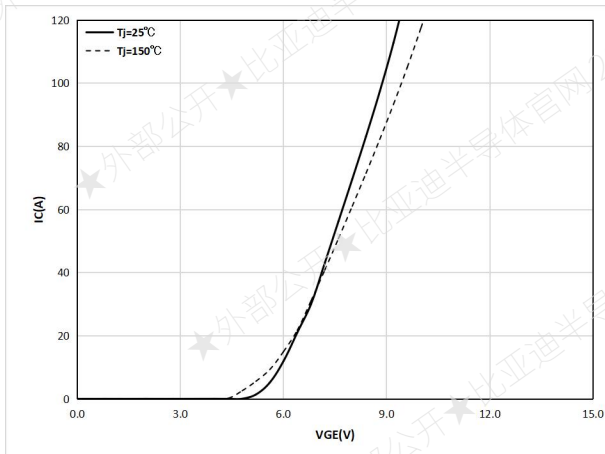


Figure 3. Typical transfer characteristic ($V_{CE}=20\text{V}$)

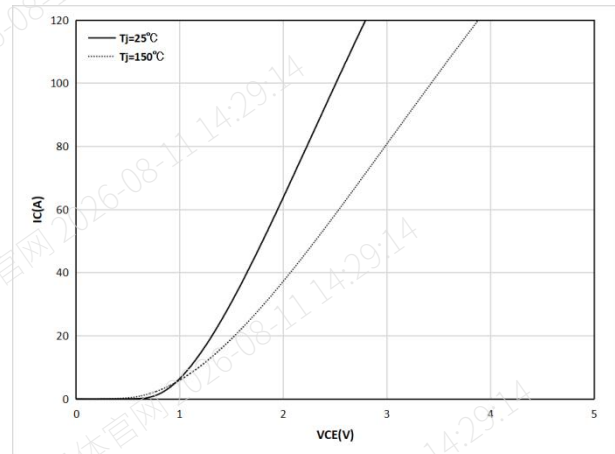
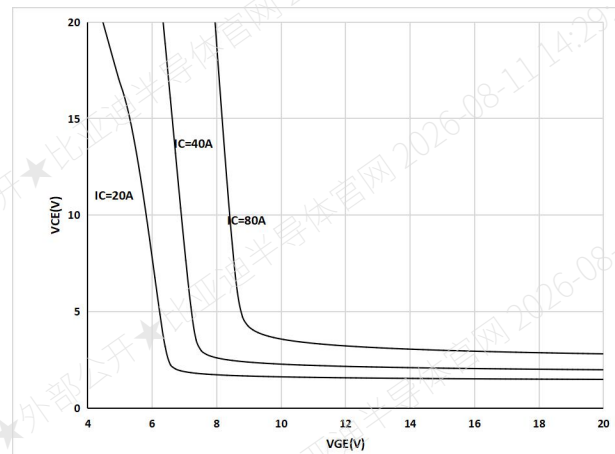
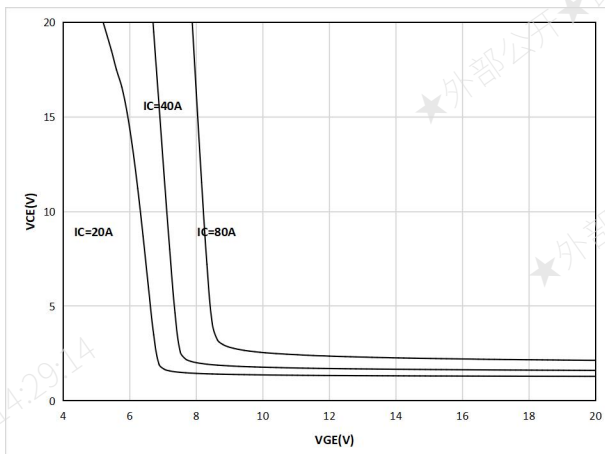


Figure 4. Typical collector current as a function of collector-emitter saturation voltage ($V_{GE}=15\text{V}$)





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Figure 5. Typical collector-emitter saturation voltage as a function of gate-emitter voltage ($T_j=25^\circ\text{C}$)

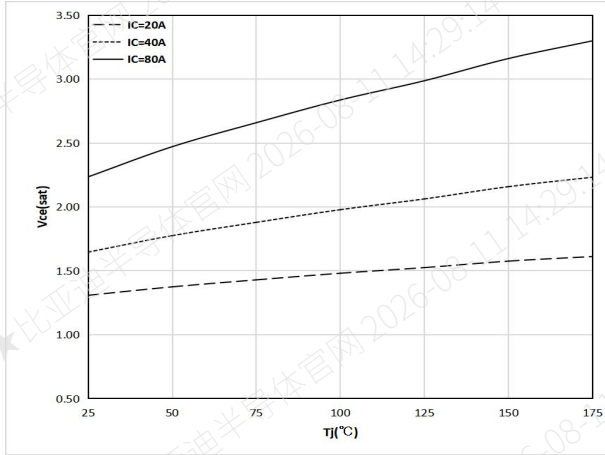


Figure 6. Typical collector-emitter saturation voltage as a function of gate-emitter voltage ($T_j=150^\circ\text{C}$)

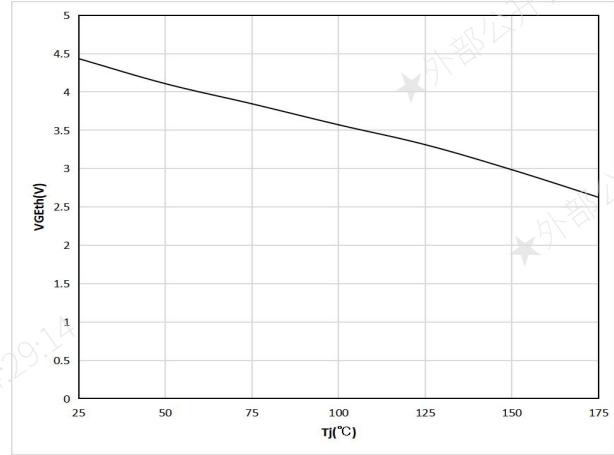


Figure 7. Typical collector-emitter saturation voltage as a function of junction temperature ($V_{GE}=15\text{V}$)

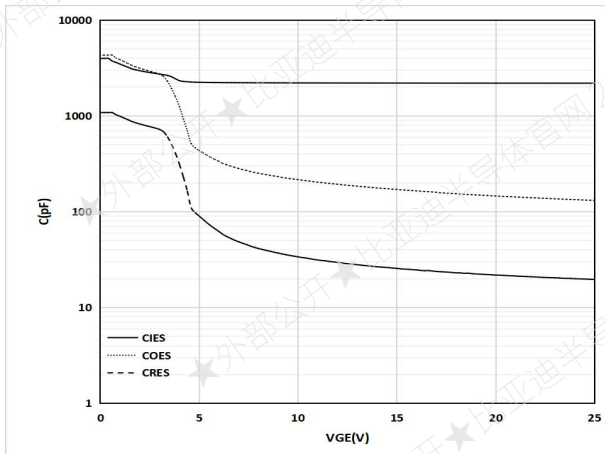


Figure 8. Gate-emitter threshold voltage as a function of junction temperature ($I_C=1\text{mA}$)

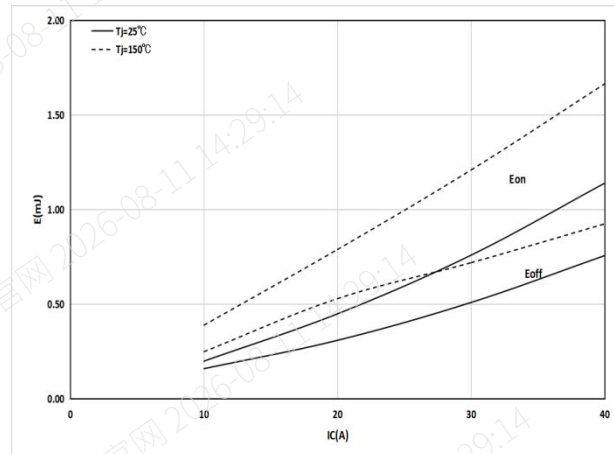


Figure 9. Typical capacitance as a function of collector-emitter voltage ($f=1\text{MHz}$, $V_{GE}=0\text{V}$)

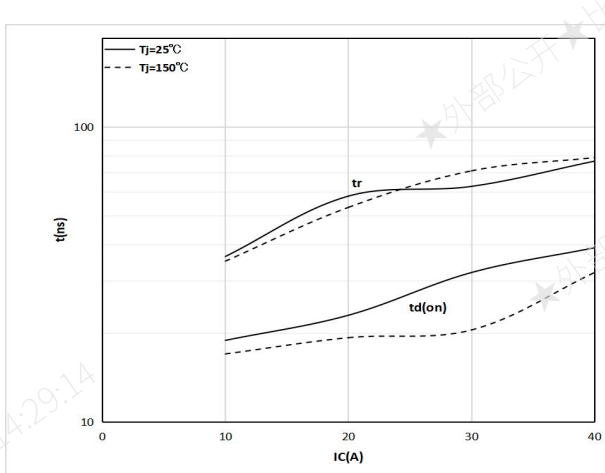
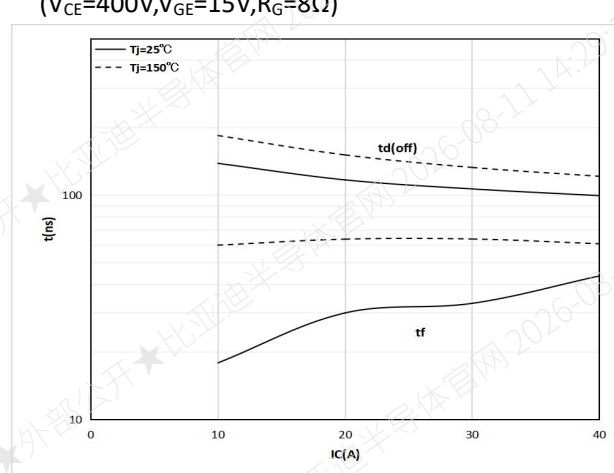


Figure 10. Typical switching energy losses as a function of collector current ($V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_G=8\Omega$)





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Figure 11. Typical turn-on characteristic as a function of collector current

($V_{CE}=400V, V_{GE}=15V, R_G=8\Omega$)

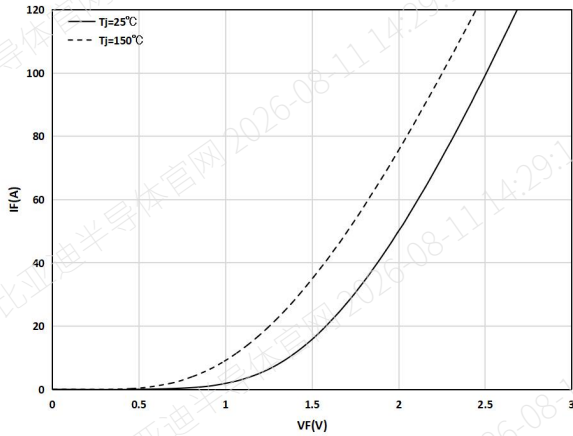


Figure 13. Typical diode forward current as a function of forward voltage

Figure 12. Typical turn-off characteristic as a function of collector current

($V_{CE}=400V, V_{GE}=15V, R_G=8\Omega$)

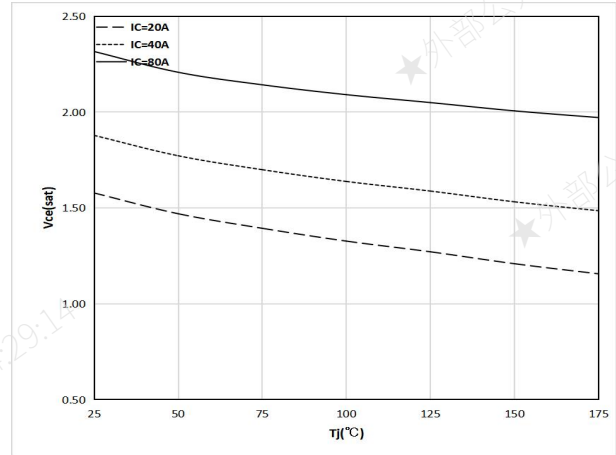


Figure 14. Typical diode forward voltage as a function of junction temperature



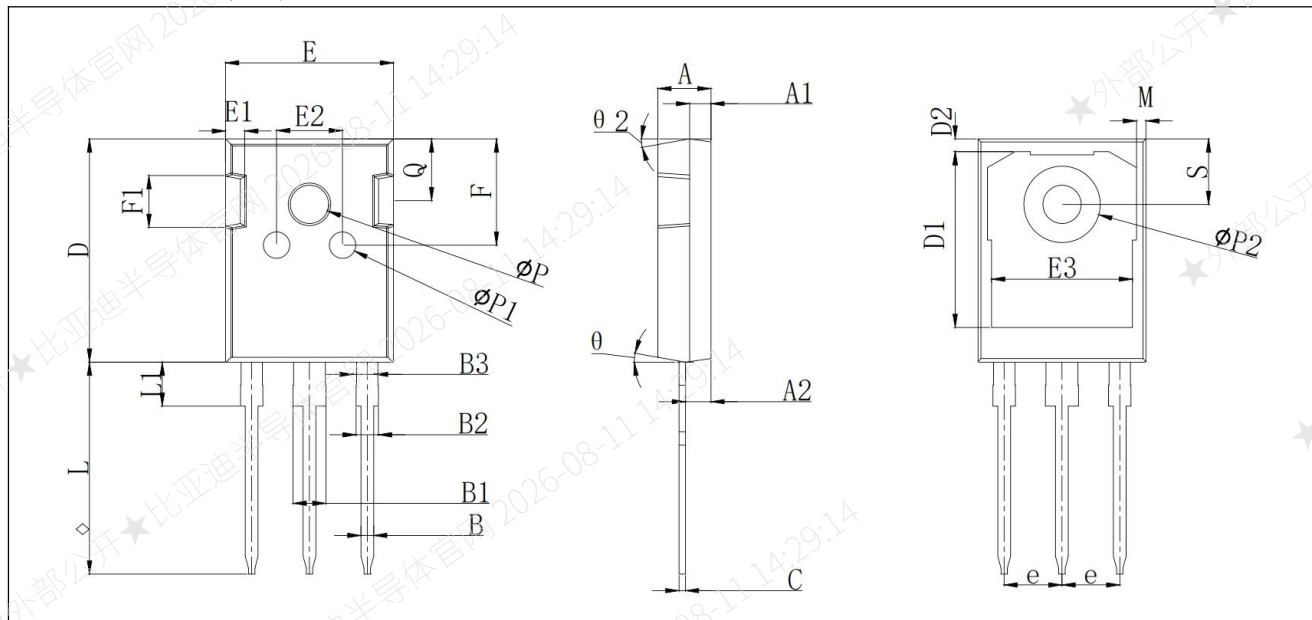
比亚迪
半导体

★外部公开★

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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	φP	3.50	3.70
C	0.50	0.70	φP1	2.40	3.10
D	20.30	21.10	φP2	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	θ	1°	11°
E1	1.20	2.60	θ 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 包装	pcs/tube 个/料管	tube/inner box 料管/内盒	inner box/carton 内盒/箱	pcs/carton 个/箱
Tube	30	12	6	2160



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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。

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