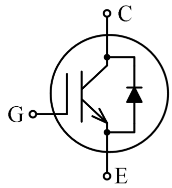
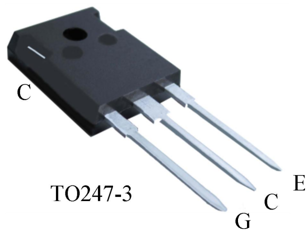
IGBT in advanced TrenchFS Technology with soft and fast recovery anti-parallel diode
具有先进 TrenchFS 技术的 IGBT 且反并联软快恢复二极管

Features:
特性





- 650V TrenchFS technology
  650V 沟槽栅场终止技术
- Low switching losses
  低开关损耗
- 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

- UPS
  不间断电源
- PFC
  功率因数校正
- Welding
  焊机
- Industrial Power Supply
  工业电源

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
BGN40T65HD	650	40	1.85	175	40T65HD	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, $T_j \geq 25℃$ 集电极-发射极电压,$T_j \geq 25℃$	V_{CE}	650	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} \leq$400V,$T_j \leq$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}	312.5	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	$R_{th(j-c)}$	0.48	℃/W
Diode Thermal resistance junction to case 二极管结-管壳热阻	$R_{th(j-c)}$	0.54	℃/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=100uA		650	-	-	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℃	-	1.85	2.2	V
			T_j=150℃	-	2.1	-	V
Diode forward voltage 二极管正向电压	VF	V_{GE}=0V, I_F=40A	T_j=25℃	-	1.9	2.4	V
			T_j=150℃	-	1.6	-	V
Gate-emitter threshold voltage 栅极-发射极阈值电压	$V_{GE(th)}$	I_C=1mA, V_{CE}=V_{GE}		5.0	5.8	7.0	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}=±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		-	5200	-	pF
Output capacitance 输出电容	C_{oes}			-	230	-	pF
Reverse transfer capacitance 反向传输电容	C_{res}			-	160	-	pF

Gate charge 门极电量	Q_G	V_{CC}=400V,I_C=40A, V_{GE}=15V	-	238	-	nC
Short circuit current 短路电流	$I_{C(sc)}$	V_{CC}=400V,V_{GE}=15V, tpsc≤5us,T_j=150℃	-	230	-	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 Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位
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=40A, V_{GE}=-7.5/15V, R_G=10Ω, Energy losses include “tail” and diode reverse recovery.	-	100	-	ns
Rise time 上升时间	t_r		-	90	-	ns
Turn-off delay time 关断延迟时间	$t_{d(off)}$		-	115	-	ns
Fall time 下降时间	t_f		-	25	-	ns
Turn-on energy 开通损耗	E_{on}		-	0.58	-	mJ
Turn-off energy 关断损耗	E_{off}		-	0.38	-	mJ
Total switching energy 总开关损耗	E_{ts}		-	0.96	-	mJ
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=40A, diF/dt=1000A/μs	-	55	-	ns
Recovered charge 恢复电荷	Q_r		-	1.8	-	μC
Peak reverse recovery current 反向恢复峰值电流	I_{RM}		-	7	-	A
Reverse recovered energy 反向恢复损耗	E_{rec}		-	0.07	-	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 Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位
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=40A, V_{GE}=-7.5/15V, R_G=10Ω, Energy losses include “tail” and diode reverse recovery.	-	100	-	ns
Rise time 上升时间	t_r		-	80	-	
Turn-off delay time 关断延迟时间	$t_{d(off)}$		-	135	-	
Fall time 下降时间	t_f		-	65	-	
Turn-on energy 开通损耗	E_{on}		-	0.83	-	mJ
Turn-off energy 关断损耗	E_{off}		-	0.48	-	
Total switching energy 总开关损耗	E_{ts}		-	1.31	-	
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=40A, diF/dt=1000A/µs	-	130	-	ns
Recovered charge 恢复电荷	Q_r		-	2.1	-	µC
Peak reverse recovery current 反向恢复峰值电流	I_{RM}		-	12	-	A
Reverse recovered energy 反向恢复损耗	E_{rec}		-	0.11	-	mJ

ELECTRICAL CHARACTERISTICS
特性曲线

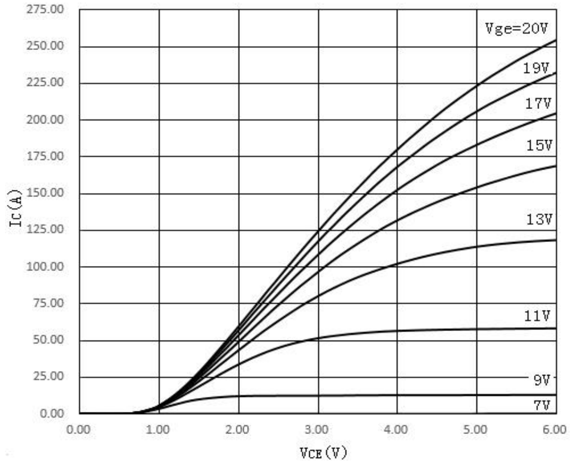


Figure 1. Typical output characteristic(T_j=25℃)

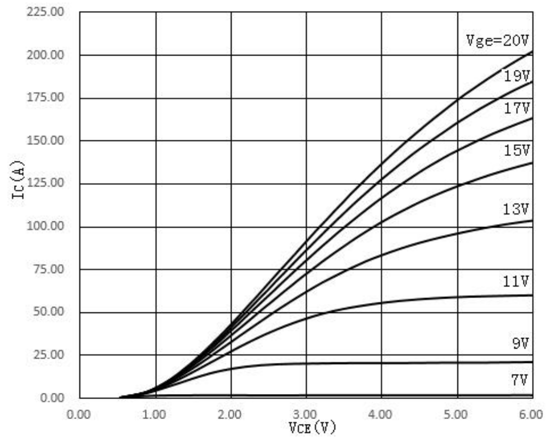


Figure 2. Typical output characteristic(T_j=150℃)

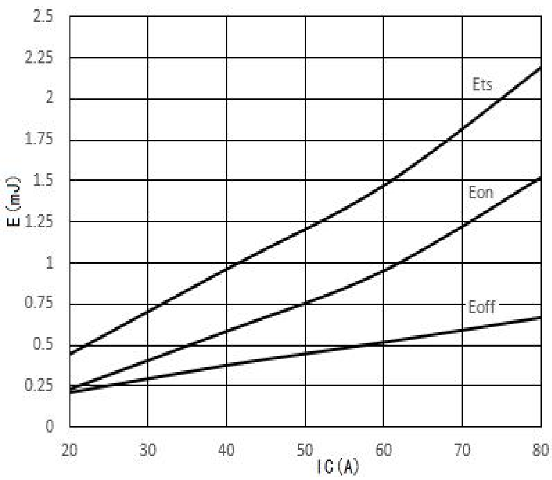


Figure 3. Switching energy vs I_C
(T_j=25℃,V_{GE}=15V,V_{CE}=400V,R_g=10Ω)

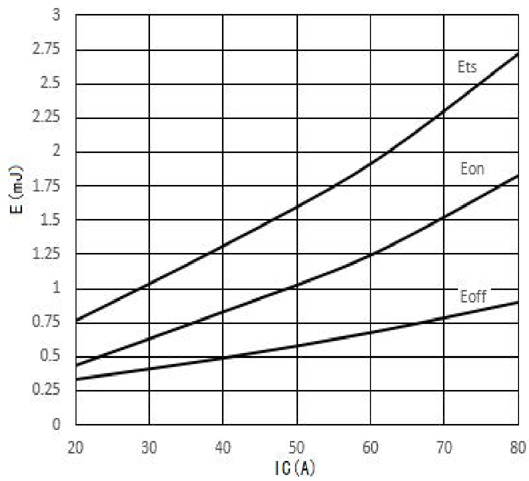


Figure 4. Switching energy vs I_C
(T_j=150℃,V_{GE}=15V,V_{CE}=400V,R_g=10Ω)

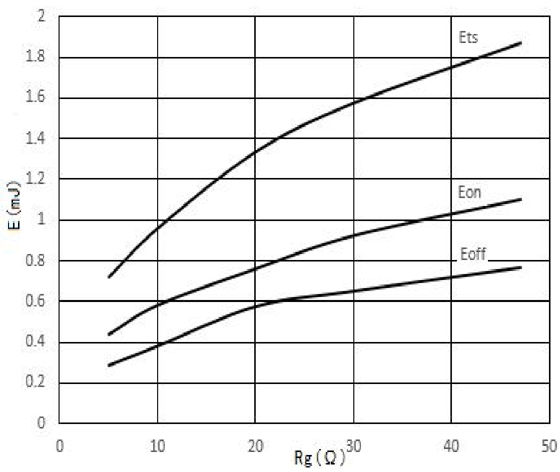


Figure 5. Switching energy losses vs R_g
(T_j=25℃,VCE=400V,VGE=15V,Ic=40A)

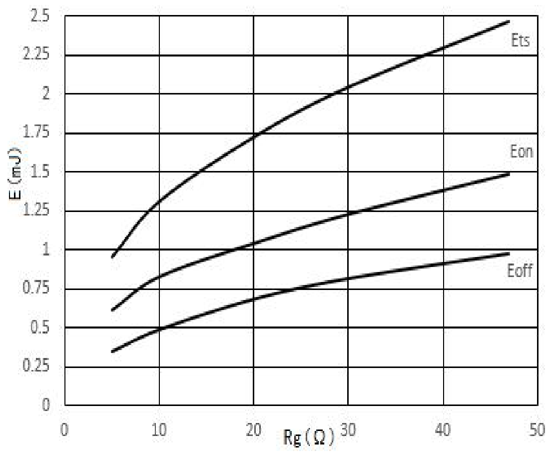


Figure 6. Switching energy losses vs R_g
(T_j=150℃, V_{CE}=400V,V_{GE}=15V,I_C=40A)

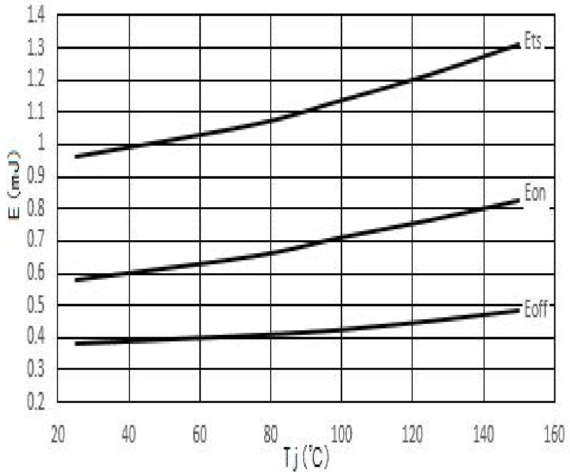


Figure 7. Switching energy losses vs T_j
(V_{CE}=400V,V_{GE}=15V,I_C=40A,R_G=10Ω)

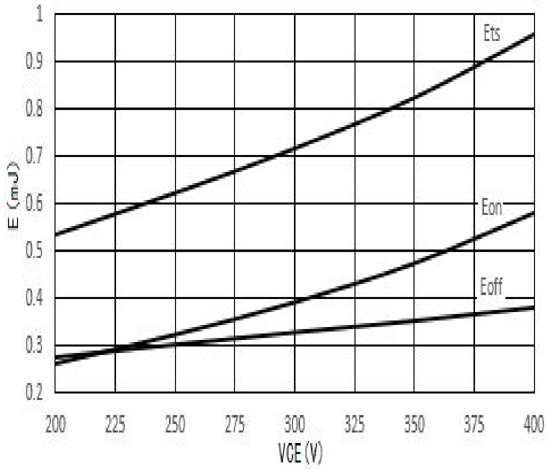


Figure 8. Switching energy losses vs V_{CE}
(T_j=25℃,V_{GE}=15V,I_C=40A,R_g=10Ω)

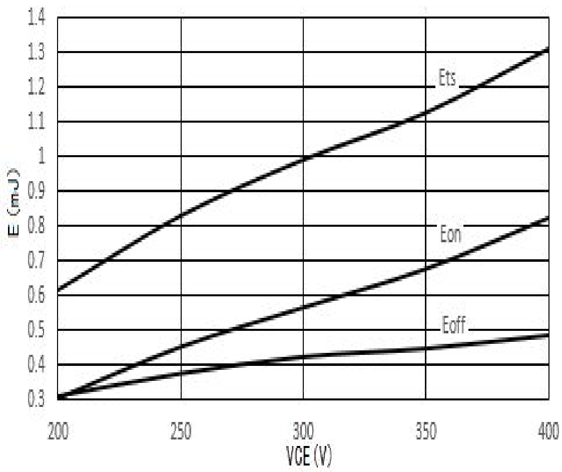


Figure 9. Switching energy losses vs V_{CE}
(T_j=150℃, V_{GE}=15V,I_C=40A,R_g=10Ω)

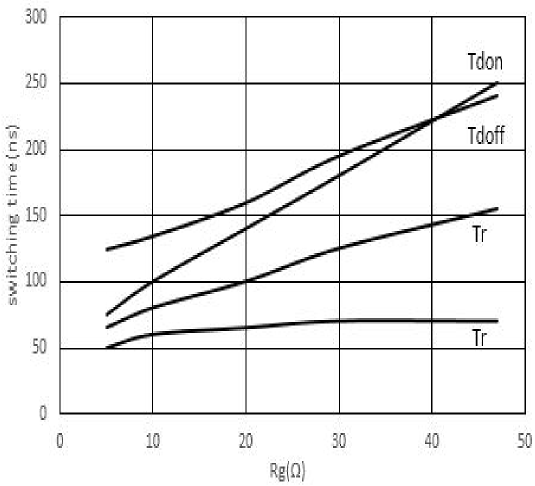


Figure 10. Switching times vs R_g
(T_j=150℃,V_{CE}=400V,V_{GE}=15V,I_C=40A)

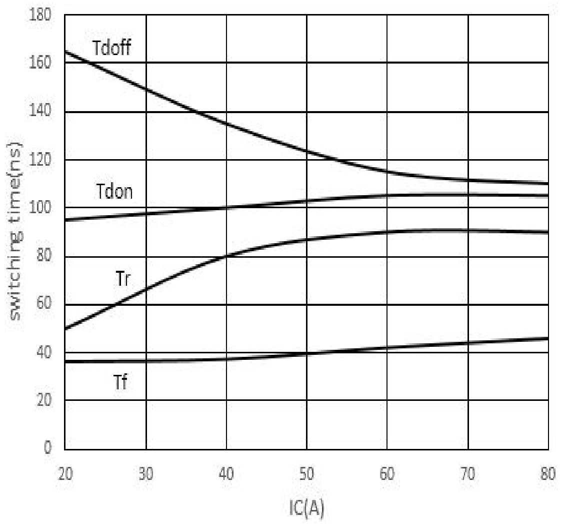
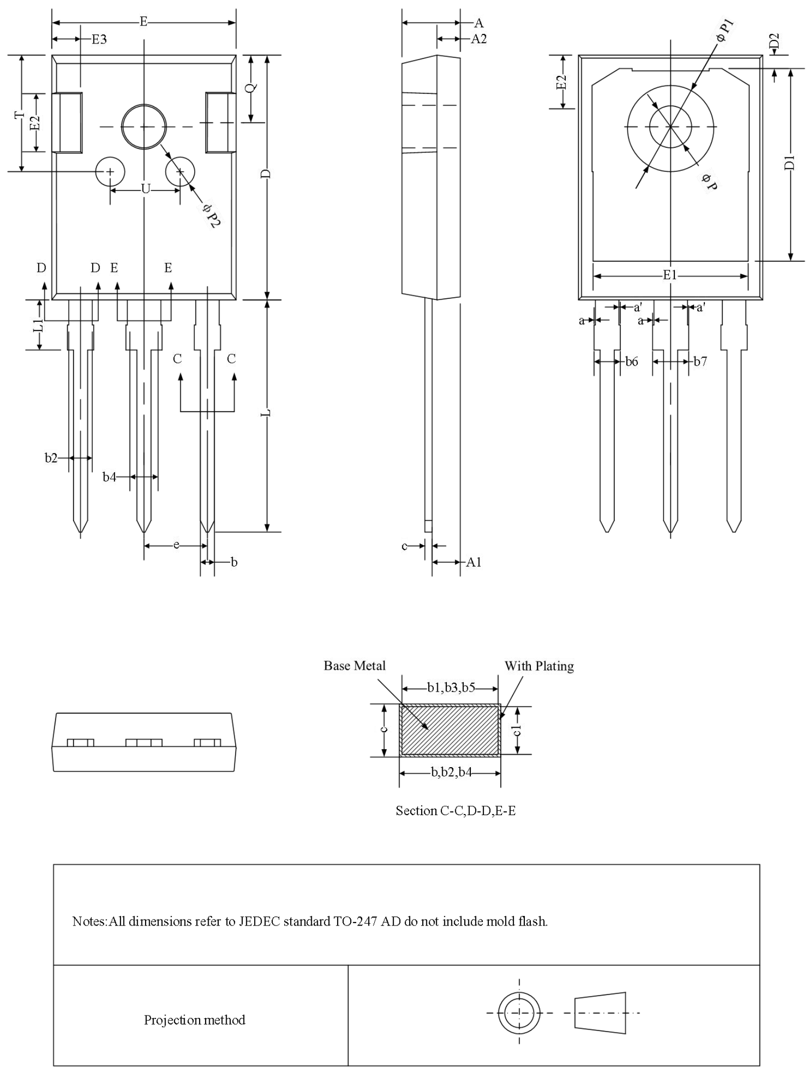


Figure 11. Switching times vs I_C
(T_j=150℃,V_{CE}=400V,V_{GE}=15V,R_g=10Ω)

TO247-3 Outline Dimensions:

TO247-3 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	1.20	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

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