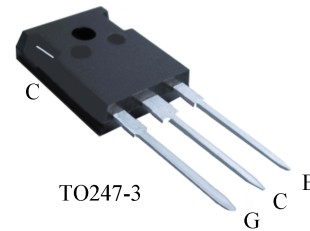
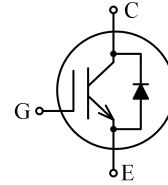


IGBT in advanced TrenchFS Technology with soft and fast recovery anti-parallel diode
具有先进 TrenchFS 技术的 IGBT 且反并联软快恢复二极管

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-5 μ s
具备5 μ s短路承受能力



Applications:

应用

- 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
BGN20T65SD	650	20	1.6	175	20T65SD	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, $T_j \geq 25^\circ\text{C}$ 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	40	A
Collector current, $T_c = 100^\circ\text{C}$ 集电极电流, $T_c = 100^\circ\text{C}$	I_C	20	
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	$I_{C\text{puls}}$	80	
Diode forward current, $T_c = 25^\circ\text{C}$ 二极管正向电流, $T_c = 25^\circ\text{C}$	I_F	40	
Diode forward current, $T_c = 100^\circ\text{C}$ 二极管正向电流, $T_c = 100^\circ\text{C}$	I_F	20	
Diode pulsed current 二极管脉冲电流	$I_{F\text{puls}}$	80	
Gate-emitter voltage 栅极-发射极电压	V_{GE}	± 20	V
Short Circuit withstand time $V_{GE} = 15\text{V}, V_{CC} \leq 400\text{V}, T_j \leq 150^\circ\text{C}$ 短路耐受时间	t_{sc}	5	us
Total power dissipation, $T_c = 25^\circ\text{C}$ 总耗散功率, $T_c = 25^\circ\text{C}$	P_{tot}	192	W
Operating junction temperature 最高结温	$T_{j\max}$	175	°C
Operating junction temperature 工作结温	$T_{j\text{op}}$	-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	M_d	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	$R_{th(j-c)}$	0.78	$^{\circ}C/W$
Diode Thermal resistance junction to case 二极管结-管壳热阻	$R_{th(j-c)}$	2.07	$^{\circ}C/W$
Thermal resistance junction to ambient 结-环境热阻	$R_{th(j-a)}$	40	$^{\circ}C/W$

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

$T_j=25^{\circ}C$ 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}	$V_{GE}=15V,$ $I_C=20A$	$T_j=25^{\circ}C$	-	1.6		2.0
			$T_j=150^{\circ}C$	-	1.8		-
Diode forward voltage 二极管正向电压	VF	$V_{GE}=0V,$ $I_F=20A$	$T_j=25^{\circ}C$	-	1.7		2.4
			$T_j=150^{\circ}C$	-	1.4		-
Gate-emitter threshold voltage 栅极-发射极阈值电压	$V_{GE(th)}$	$I_C=300\mu A,$ $V_{CE}=V_{GE}$	5.0	5.8	7.0		
Collector-emitter cut-off current 集电极-发射极截止电流	I_{CES}	$V_{CE}=650V,$ $V_{GE}=0V$	-	-	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}	$V_{CE}=25V,$ $V_{GE}=0V,$ $f=1MHz$	-	1500	-	pF
Output capacitance 输出电容	C_{oes}		-	128	-	
Reverse transfer capacitance 反向传输电容	C_{res}		-	28.7	-	



Gate charge 门极电量	Q_G	$V_{CC}=400V, I_C=30A,$ $V_{GE}=15V$	-	43.9	-	nC
Short circuit current 短路电流	$I_{C(sc)}$	$V_{CC}=400V, V_{GE}=15V,$ $tpsc \leq 5\mu s, T_j=150^\circ C$	-	80	-	A

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	$t_{d(on)}$	$T_j=25^\circ C,$ $V_{CC}=400V,$ $I_C=20A,$ $V_{GE}=-7.5/15V,$ $R_G=10\Omega,$ Energy losses include "tail" and diode reverse recovery.	-	40.5	-	ns
Rise time 上升时间	t_r		-	48	-	
Turn-off delay time 关断延迟时间	$t_{d(off)}$		-	70	-	
Fall time 下降时间	t_f		-	141	-	
Turn-on energy 开通损耗	E_{on}		-	0.55	-	mJ
Turn-off energy 关断损耗	E_{off}		-	0.26	-	
Total switching energy 总开关损耗	E_{ts}		-	0.81	-	

Anti-Parallel Diode Characteristic

反并联二极管特性

Reverse recovery time 反向恢复时间	t_{rr}	$T_j=25^\circ C,$ $V_R=400V,$ $I_F=20A,$ $diF/dt=390A/\mu s$	-	117	-	ns
Recovered charge 恢复电荷	Q_r		-	345	-	nC
Peak reverse recovery current 反向恢复峰值电流	I_{RM}		-	5.3	-	A



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	$t_{d(on)}$	$T_j=150^\circ\text{C}$, $V_{CC}=400\text{V}$, $I_C=20\text{A}$, $V_{GE}=-7.5/15\text{V}$, $R_G=10\Omega$, Energy losses include "tail" and diode reverse recovery.	-	39.5	-	ns
Rise time 上升时间	t_r		-	47	-	
Turn-off delay time 关断延迟时间	$t_{d(off)}$		-	80	-	
Fall time 下降时间	t_f		-	166	-	
Turn-on energy 开通损耗	E_{on}		-	0.71	-	mJ
Turn-off energy 关断损耗	E_{off}		-	0.42	-	
Total switching energy 总开关损耗	E_{ts}	-	1.13	-		
Anti-Parallel Diode Characteristic						
反并联二极管特性						
Reverse recovery time 反向恢复时间	t_{rr}	$T_j=150^\circ\text{C}$, $V_R=400\text{V}$, $I_F=20\text{A}$, $diF/dt=400\text{A}/\mu\text{s}$	-	152	-	ns
Recovered charge 恢复电荷	Q_r		-	980	-	nC
Peak reverse recovery current 反向恢复峰值电流	I_{RM}		-	8.7	-	A

ELECTRICAL CHARACTERISTICS

特性曲线

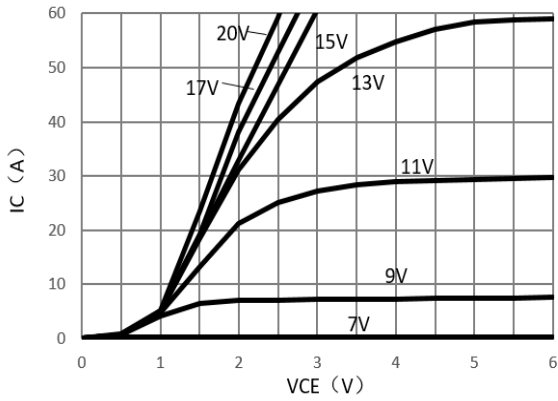


Figure 1. Typical output characteristic($T_j=25^{\circ}\text{C}$)

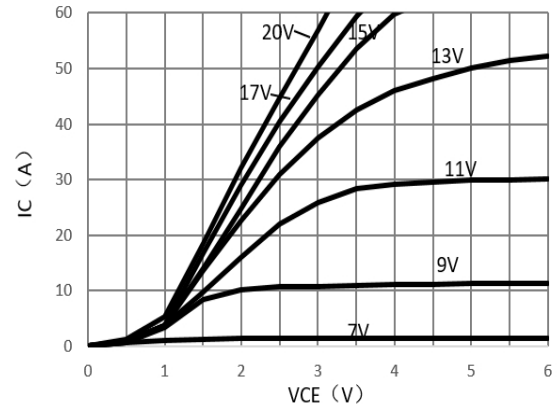


Figure 2. Typical output characteristic($T_j=150^{\circ}\text{C}$)

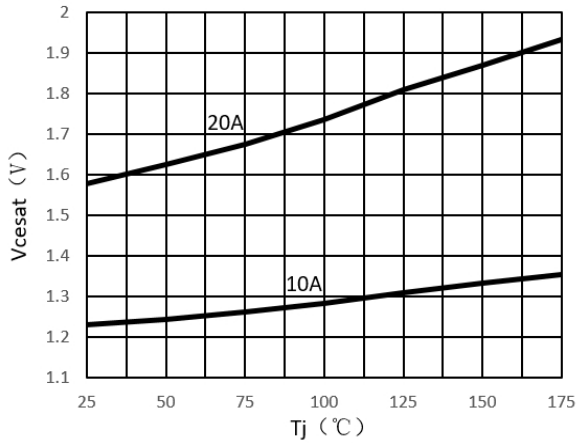


Figure 3. V_{cesat} vs. T_j

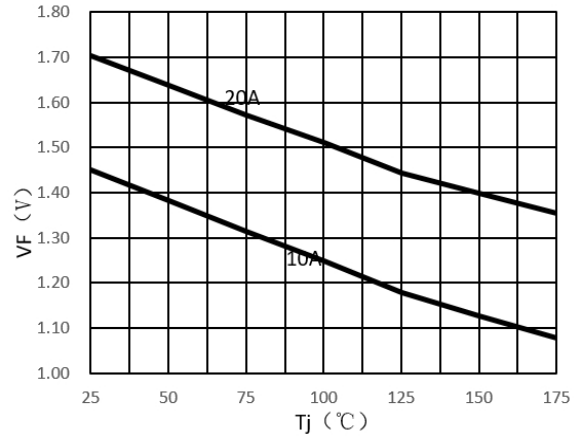


Figure 4. V_F vs. T_j

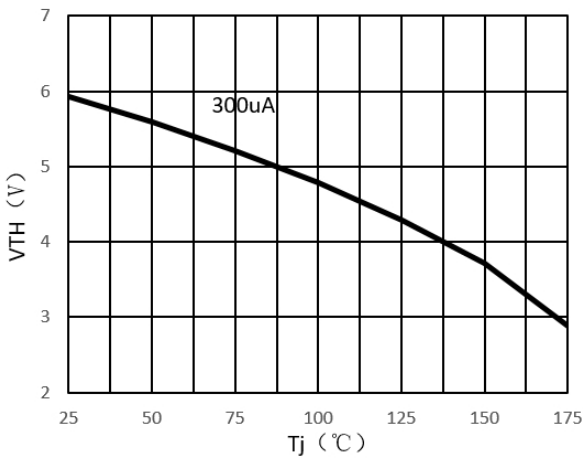


Figure 5. V_{TH} vs. T_j

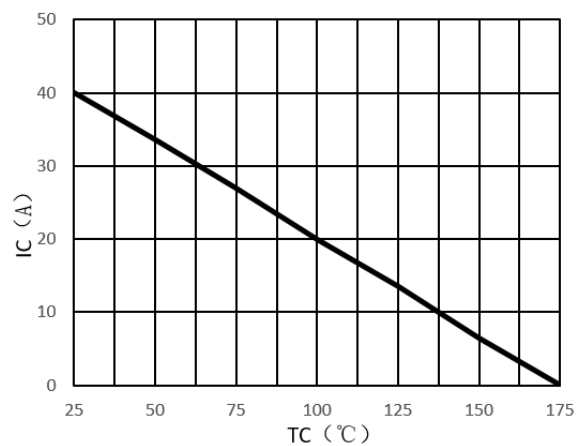


Figure 6. I_C VS T_c

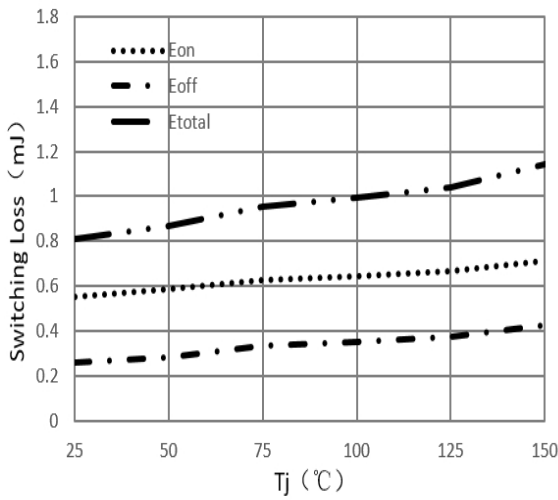


Figure 7. Switching energy losses vs T_j
($V_{CE}=400V, V_{GE}=15V, I_C=20A, R_G=10\Omega$)

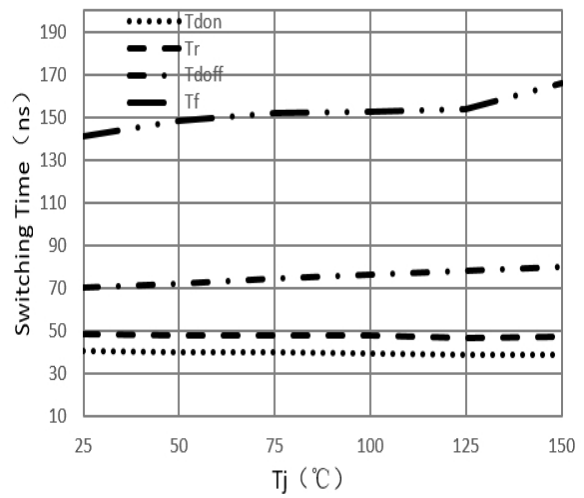


Figure 8. Switching times vs T_j
($T_j=25^\circ C, V_{GE}=15V, I_C=20A, R_G=10\Omega$)

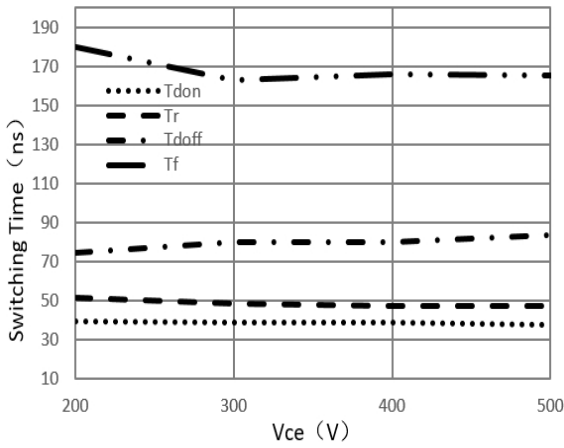


Figure 9. Switching times vs V_{CE}
($T_j=150^\circ C, V_{GE}=15V, I_C=20A, R_G=10\Omega$)

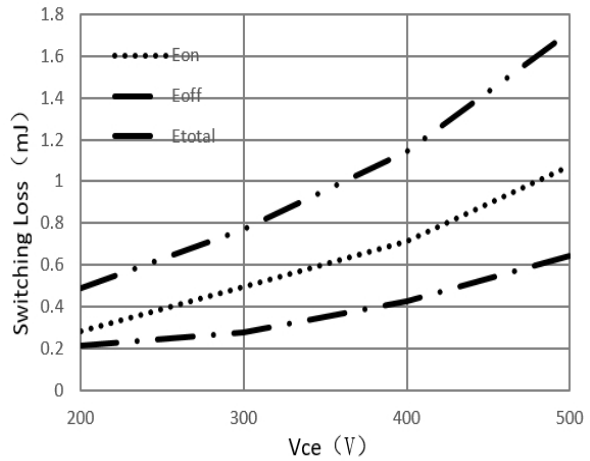


Figure 10. Switching energy losses vs V_{CE}
($T_j=150^\circ C, V_{CE}=400V, V_{GE}=15V, I_C=20A$)

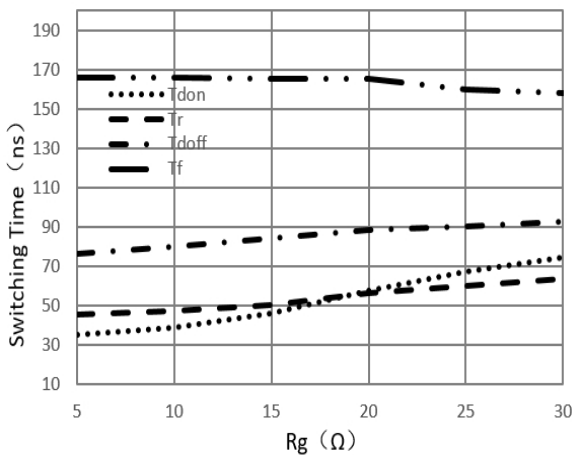


Figure 11. Switching times vs R_g
($T_j=150^\circ C, V_{CE}=400V, V_{GE}=15V, I_C=20A$)

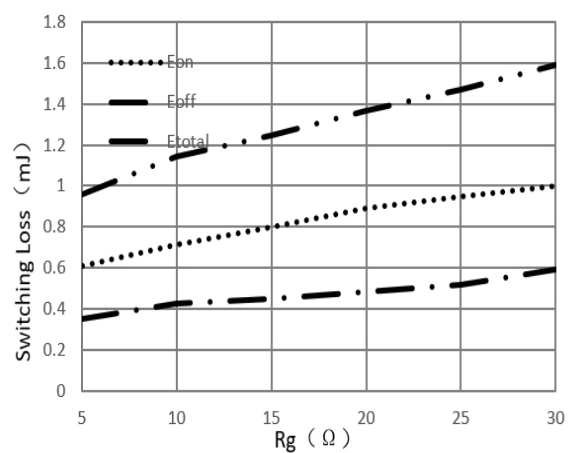
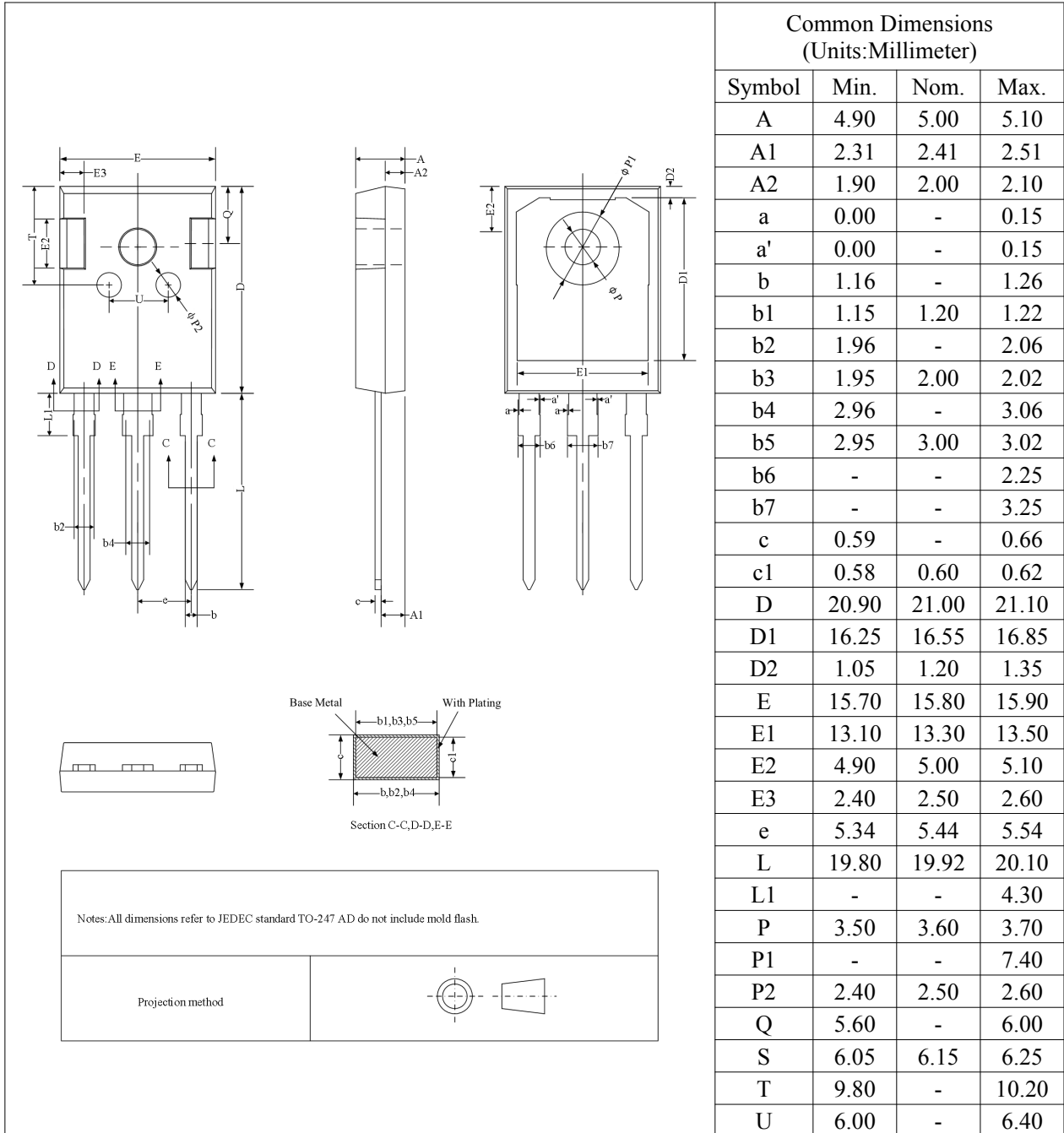


Figure 12. Switching energy losses vs R_g
($T_j=150^\circ C, V_{CE}=400V, V_{GE}=15V, I_C=20A$)



TO247-3 Outline Dimensions:

TO247-3 外形尺寸



Packing

包装

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



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