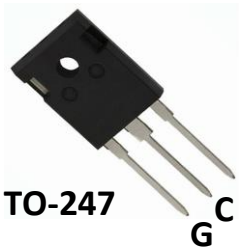
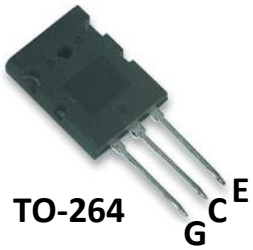
KWBW40N120S1E2
KWBL40N120S1E2

1200V 40A 沟槽栅场截止型IGBT

特征

饱和压降为正温度系数，易于并联使用
内置快恢复二极管
高可靠性及热稳定性，良好的参数一致性





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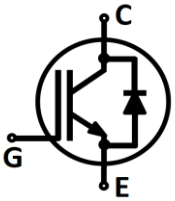
应用领域

逆变焊机



机械特性

无铅，符合RoHS要求

最大额定值[1]

参数	符号	额定值	单位
集电极-发射极电压	V_{CE}	1200	V
集电极电流 T_C=25°C T_C=100°C	I_C	 60[2] 40	A
集电极脉冲电流	I_{Cpuls}	120*[3]	
RBSOA电流 VCE<1200V,Tj<150°C	I_{Cpeak}	120*	
二极管正向电流 T_C=25°C T_C=100°C	I_F	 30[2] 30[2]	
二极管脉冲电流	I_{Fpuls}	80*	
栅极-发射极电压	V_{GE}	±20	V
短路承受时间[4] V_{GE}=15V, V_{CC}=600V, T_j=25°C	t_{SC}	3	μs
耗散功率(TO-264/TO-247) T_C=25°C T_C=100°C	P_{tot}	 250/297 100/119	W
工作结温	T_j	-55~150	°C
储存温度	T_{stg}	-55~150	

[1]测试标准参考JESD-022

[2]受限于邦定线

[3]加*表示估计值，下同

[4]允许短路次数:<1000;短路时间间隔:>1s

热学特性

参数	符号	封装形式	最小值	典型值	最大值	单位
IGBT结壳热阻	R_{thJC}	TO-247	-	-	0.42	K/W
二极管结壳热阻	R_{thJCD}	TO-247	-	-	1.2	
IGBT结壳热阻	R_{thJC}	TO-264	-	-	0.5	
二极管结壳热阻	R_{thJCD}	TO-264	-	-	1.5	
结-环境热阻	R_{thJA}	TO-247/TO-264	-	-	30	

电学特性（未特殊说明时，T_j=25℃）

参数	符号	测试条件	最小值	典型值	最大值	单位
静态特性						
击穿电压	$V_{(BR)CES}$	V_{GE}=0V,I_C=0.5mA	1200	-	-	V
IGBT导通压降	$V_{CE(sat)}$	V_{GE}=15V,I_C=40A T_j=25℃ T_j=150℃	 - -	 2.2 2.7	 2.4 -	
二极管正向压降	V_F	V_{GE}=0V,I_F=40A T_j=25℃ T_j=150℃	 - -	 2.7 2.4	 - -	
阈值电压	$V_{GE(th)}$	I_C=1.5mA,V_{CE}=V_{GE}	5	5.8	6.5	
集电极-发射极漏电流	I_{CES}	V_{CE}=1200V,V_{GE}=0V T_j=25℃ T_j=150℃	 - -	 - -	 0.4 4	mA
栅极-发射极漏电流	I_{GES}	V_{CE}=0V,V_{GE}=20V	-	-	200	nA
跨导	g_{FS}	V_{CE}=20V,I_C=40A	-	18	-	S
动态特性						
输入电容	C_{iss}	V_{CE}=25V V_{GE}=0V f=1MHz	-	8450	-	pF
输出电容	C_{oss}		-	160	-	
反馈电容	C_{rss}		-	120	-	
栅电荷	Q_G	V_{CC}=750V,I_C=40A, V_{GE}=15V	-	-	-	nC

参数	符号	测试条件	最小值	典型值	最大值	单位
IGBT开关特性（感性负载）						
开通延迟时间	$t_{d(on)}$	T_j=25℃	-	80	-	ns
上升时间	t_r	V_{CC}=600V,I_C=40A	-	84	-	
关断延迟时间	$t_{d(off)}$	V_{GE}=15/0V	-	345	-	
下降时间	t_f	R_G=12Ω	-	65	-	
开通损耗	E_{on}	L_{load}=500μH	-	2.6	-	mJ
关断损耗	E_{off}		-	1.7	-	
开关损耗	E_{ts}		-	4.3	-	
开通延迟时间	$t_{d(on)}$	T_j=150℃	-	70	-	ns
上升时间	t_r	V_{CC}=600V,I_C=40A	-	77	-	
关断延迟时间	$t_{d(off)}$	V_{GE}=15/0V	-	410	-	
下降时间	t_f	R_G=12Ω	-	167	-	
开通损耗	E_{on}	L_{load}=500μH	-	2.5	-	mJ
关断损耗	E_{off}		-	2.9	-	
开关损耗	E_{ts}		-	5.4	-	
二极管开关特性						
反向恢复时间	t_{rr}	T_j=25℃	-	100	-	ns
反向恢复电荷	Q_{rr}	V_R=600V,I_F=40A	-	0.65	-	μC
反向恢复峰值电流	I_{rrm}	di_F/dt=440A/μs	-	11.5	-	A
反向恢复时间	t_{rr}	T_j=150℃	-	tbd	-	ns
反向恢复电荷	Q_{rr}	V_R=600V,I_F=40A	-	tbd	-	μC
反向恢复峰值电流	I_{rrm}	di_F/dt=440A/μs	-	tbd	-	A

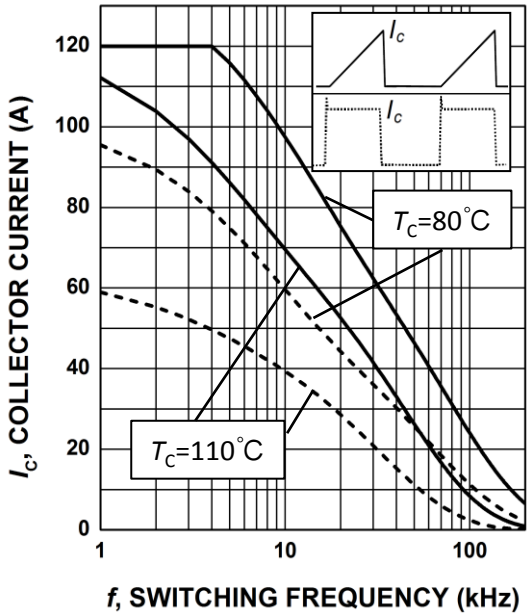


Figure 1. Collector current as a function of switching frequency (TO-247)
(T_j≤150°C, D = 0.5, V_{CE} = 600V,
V_{GE} = 0/+15V, R_G = 12Ω)

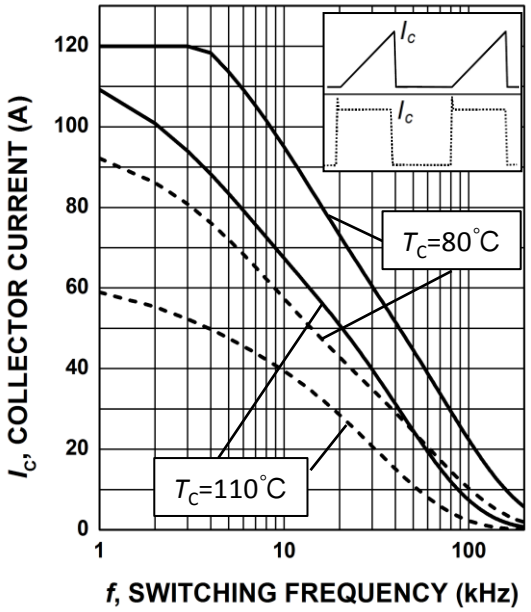


Figure 2. Collector current as a function of switching frequency (TO-264)
(T_j≤150°C, D = 0.5, V_{CE} = 600V,
V_{GE} = 0/+15V, R_G = 12Ω)

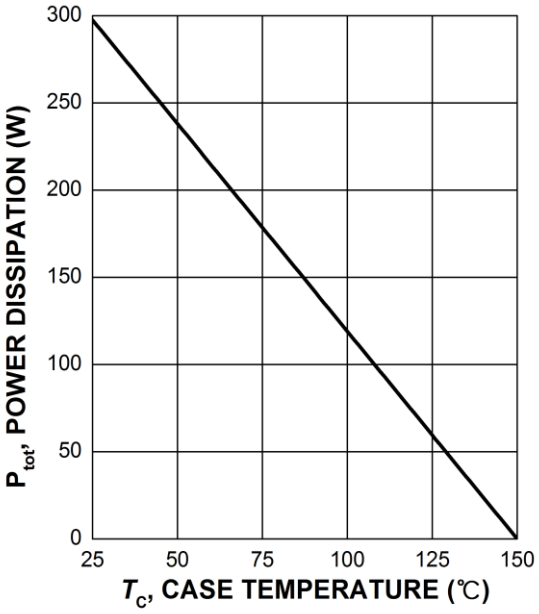


Figure 3. Maximum power dissipation as a function of case temperature (TO-247)
(T_j ≤ 150°C)

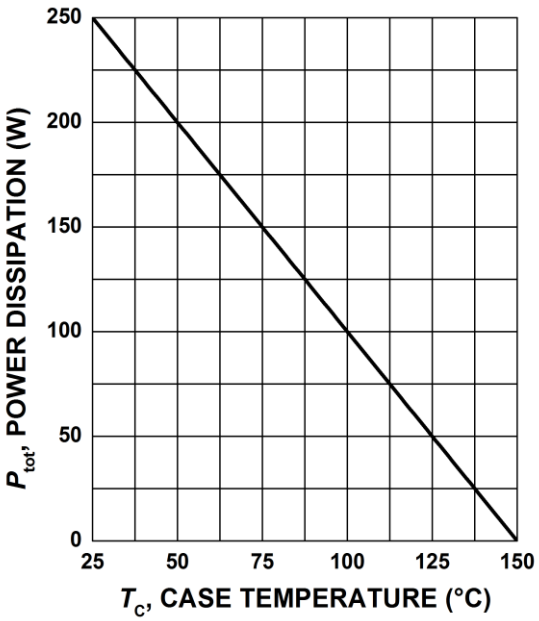


Figure 4. Maximum power dissipation as a function of case temperature (TO-264)
(T_j ≤ 150°C)

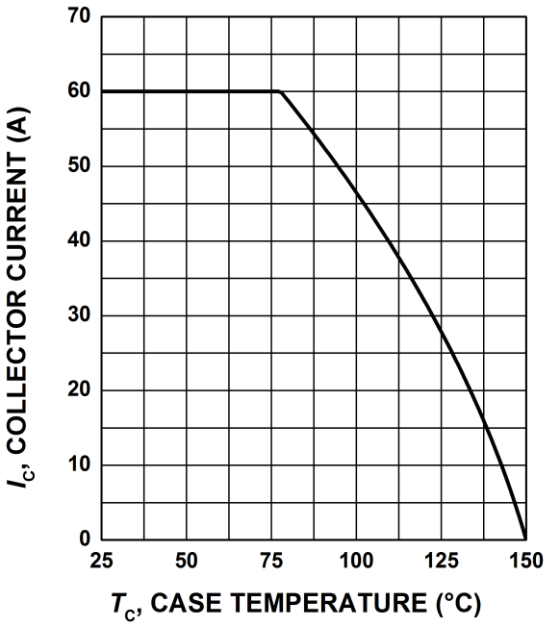


Figure 5. Maximum collector current as a function of case temperature (TO-247)
(V_{GE} ≥ 15V, T_j ≤ 150°C)

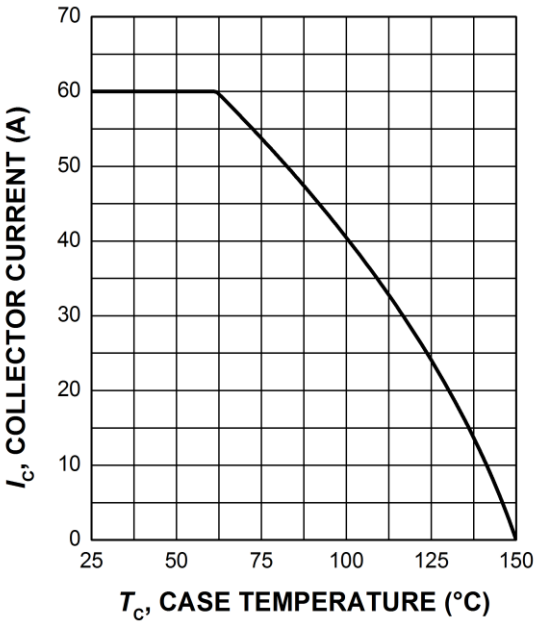


Figure 6. Maximum collector current as a function of case temperature (TO-264)
(V_{GE} ≥ 15V, T_j ≤ 150°C)

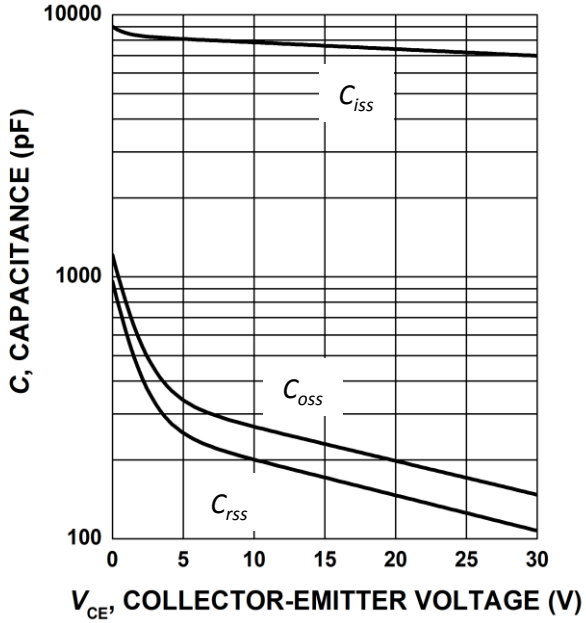


Figure 7. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f = 1 MHz)

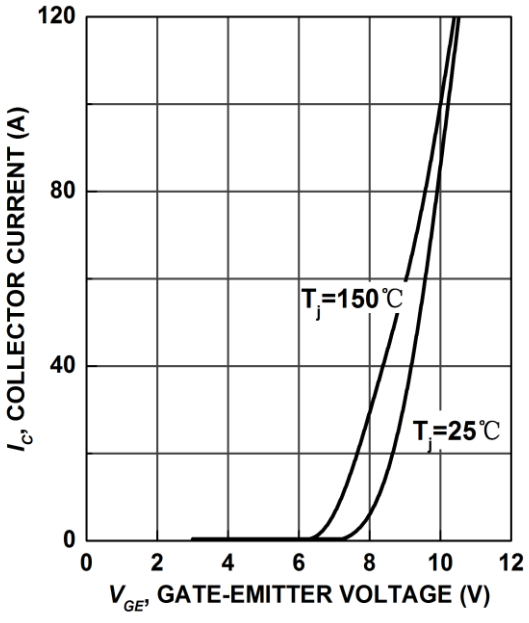


Figure 8. Typical transfer characteristic
(V_{CE}=15V)

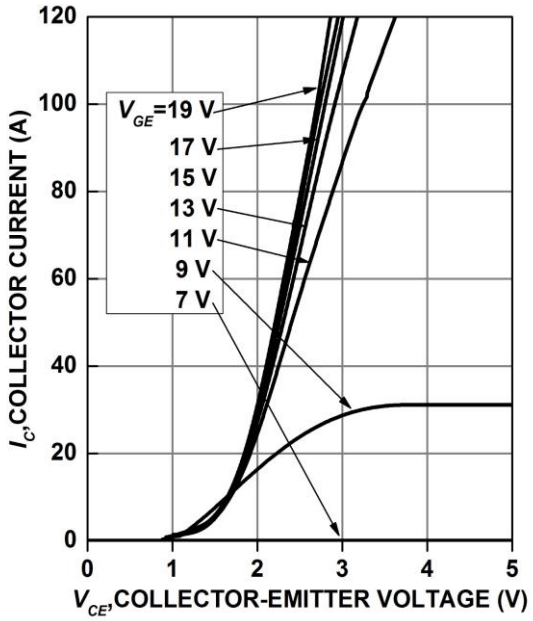


Figure 9. Typical output characteristic
(T_j = 25°C)

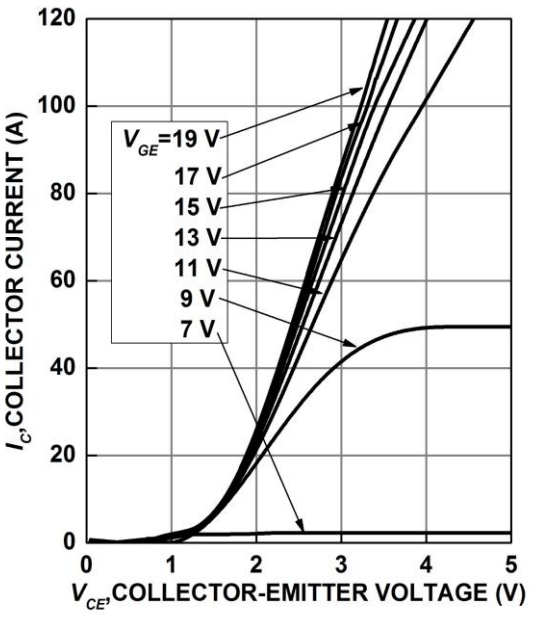


Figure 10. Typical output characteristic
(T_j = 150°C)

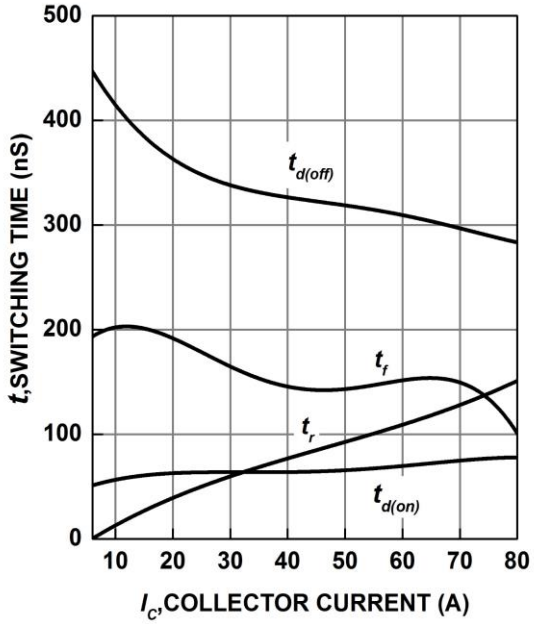


Figure 11. Typical switching times as a function of collector current
(inductive load, T_j=150°C, V_{CE}=600V, V_{GE}=0/15V, R_G=12Ω,
Dynamic test circuit in Figure D)

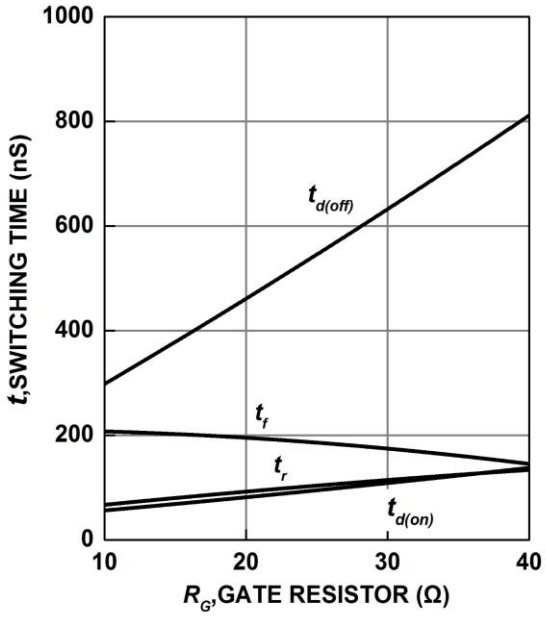


Figure 12. Typical switching times as a function of gate resistor
(inductive load, T_j=150°C, V_{CE}=600V, V_{GE}=0/15V, I_C=40A, Dynamic test circuit in Figure D)

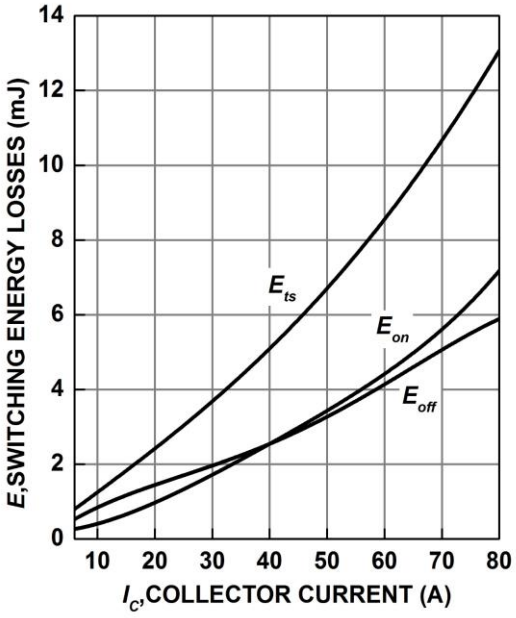


Figure 13. Typical switching energy losses as a function of collector current
(inductive load, T_j=150°C, V_{CE}=600V,
V_{GE}=0/15V, R_G=12Ω,
Dynamic test circuit in Figure D)

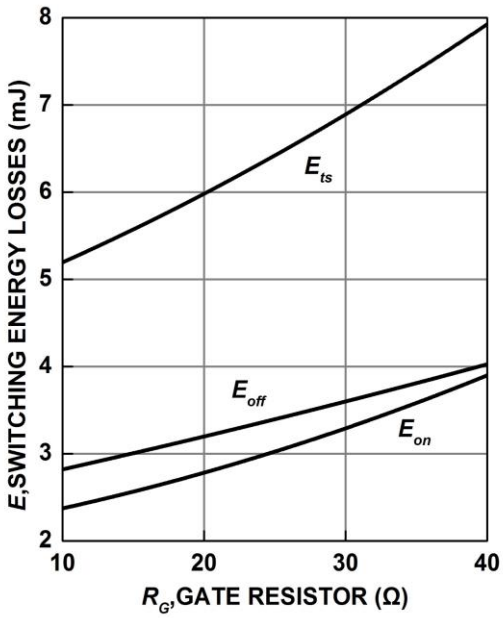


Figure 14. Typical switching energy losses as a function of gate resistor
(inductive load, T_j=150°C, V_{CE}=600V,
V_{GE}=0/15V, I_C=40A,
Dynamic test circuit in Figure D)

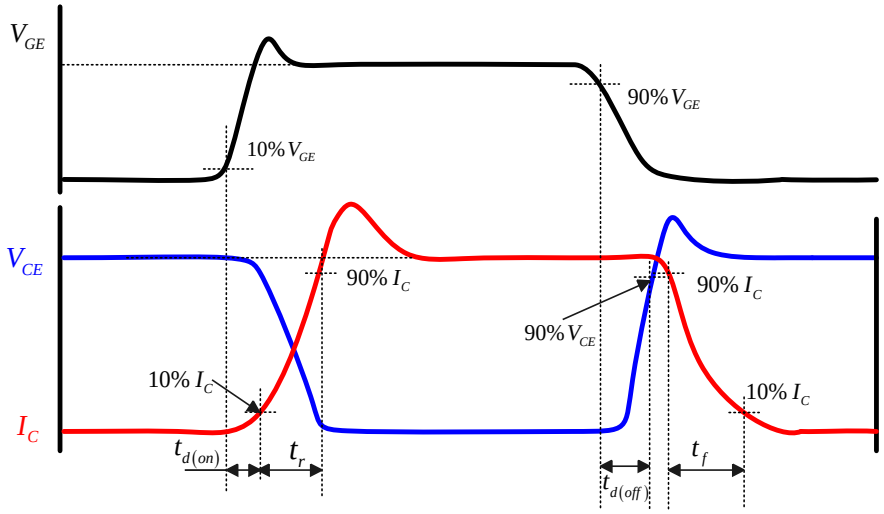


Figure A. Definition of switching times

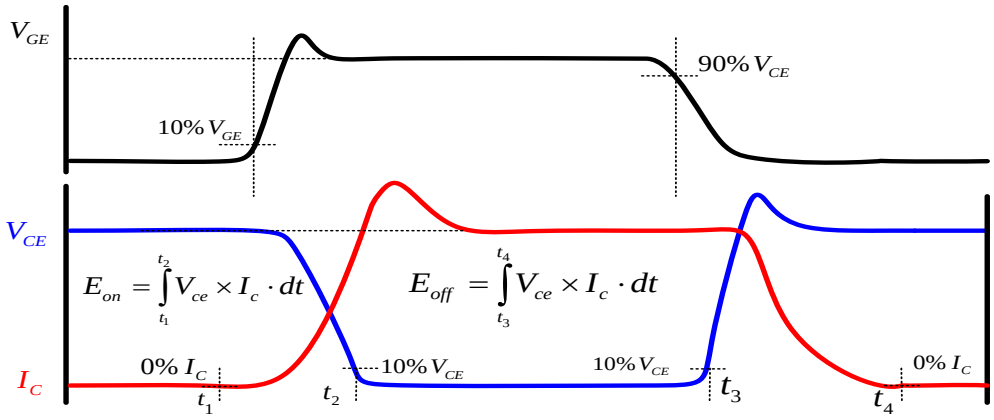


Figure B. Definition of switching losses

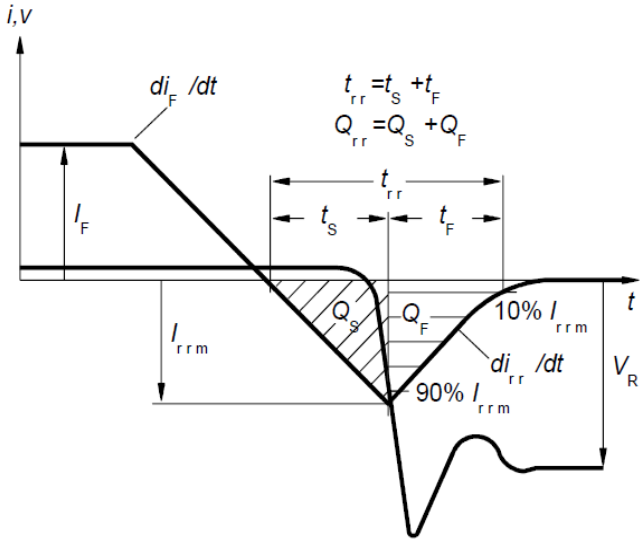


Figure C. Definition of diodes switching characteristics

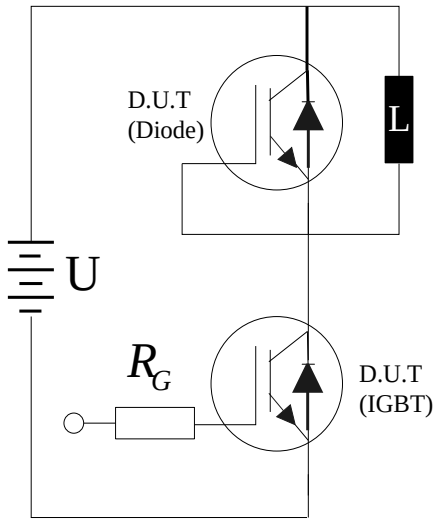
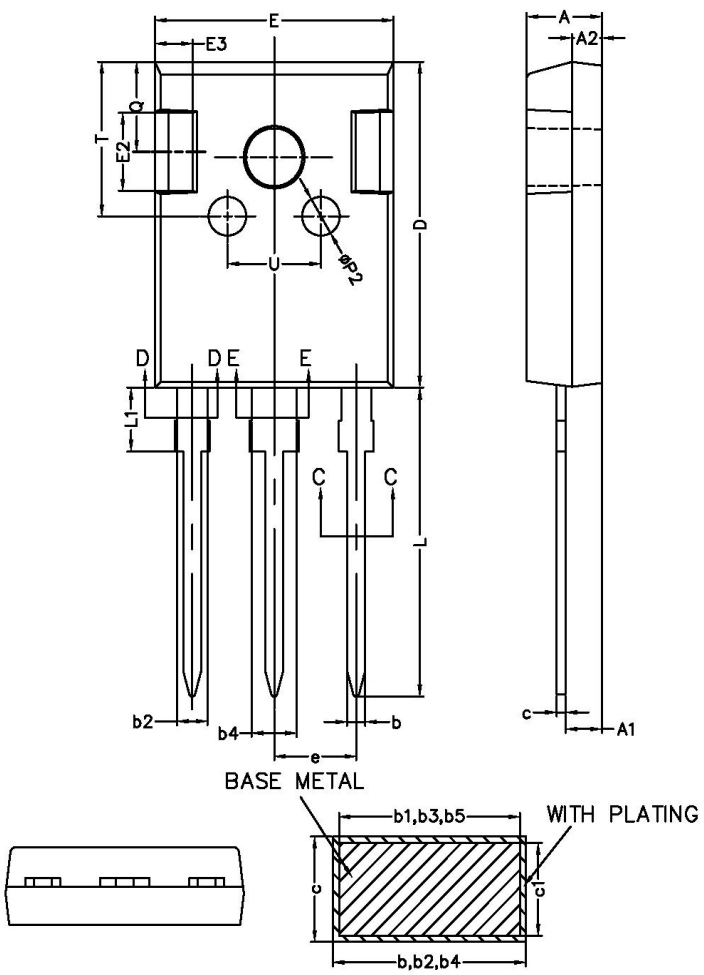


Figure D. Dynamic test circuit

TO-247

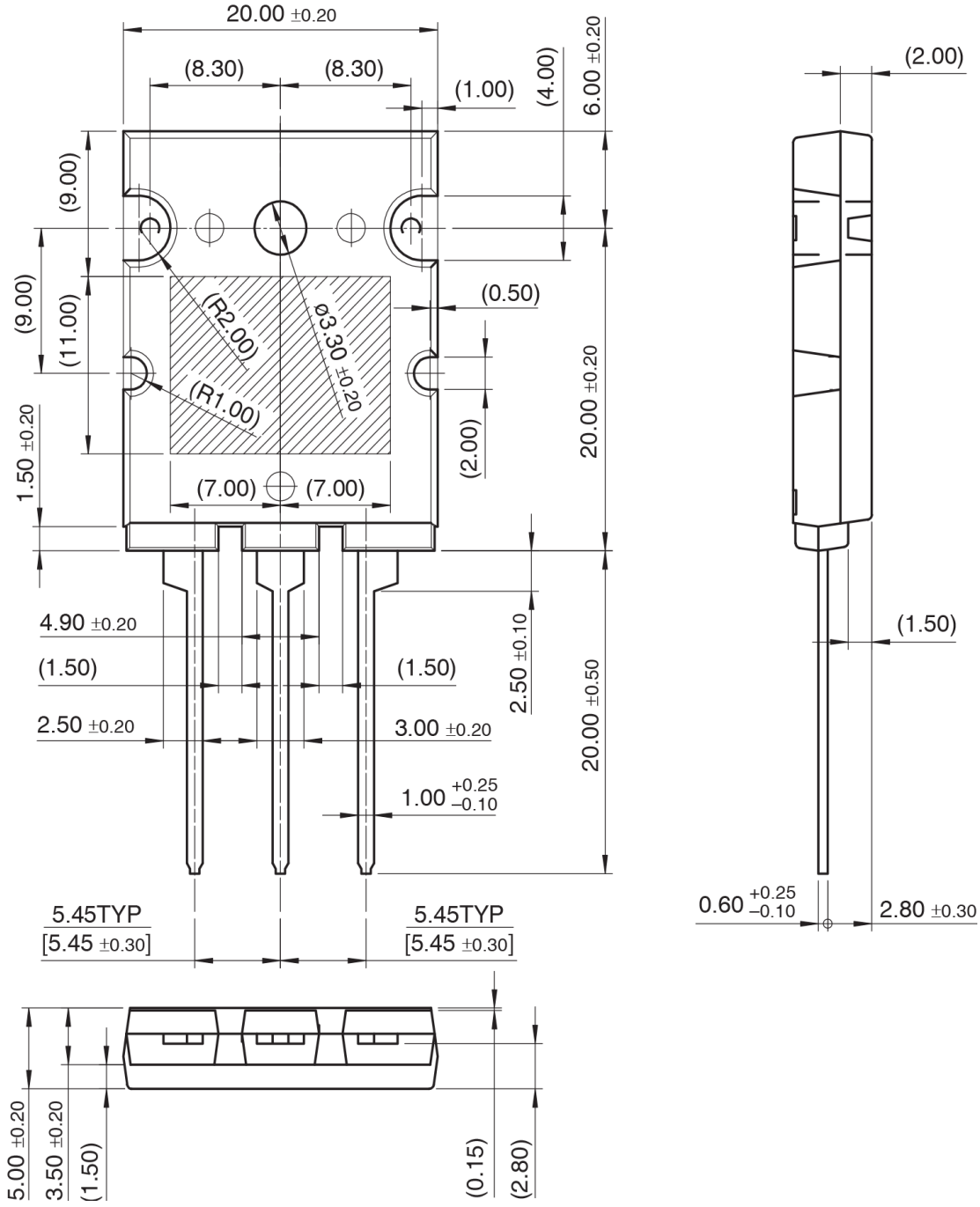


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

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
⚠2 a	0	–	0.15
⚠2 a'	0	–	0.15
b	1.16	–	1.26
b1	1.15	1.2	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
⚠2 b6	–	–	2.25
⚠2 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
⚠2 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
⚠2 S	6.05	6.15	6.25
T	9.80	–	10.20
U	6.00	–	6.40

NOTES:
1.ALL DIMENSIONS REFER TO JEDEC STANDARD TO-247 AD DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
2.EJECTION MARK DEPTH $0.10^{+0.15}_{-0.05}$.

TO-264



Dimensions in Millimeters

NOTES:

1.ALL DIMENSIONS REFER TO JEDEC STANDARD TO-264.
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.