QMQ50N120B

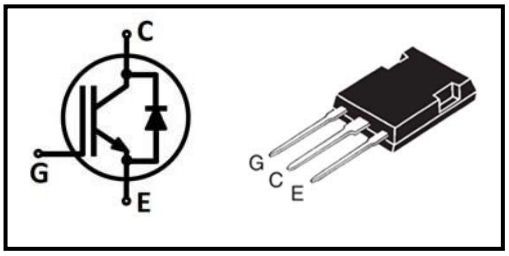
1200V-50A Trench and Field Stop IGBT

特征/Features

- 饱和压降为正温度系数，易于并联使用
  Easy parallel switching capability due to positive temperature coefficient in V_{CEsat}
- 内置快速恢复二极管
  Built- in fast recovery diode
- 高可靠性及热稳定性，良好的参数一致性
  High reliability and thermal stability, good parameter consistency

应用领域/Applications

- 太阳能逆变器/Solar Inverter
- 不间断电源/UPS
- 焊接/Welding



型号/Type	打标/Marking	封装/Package
QMQ50N120B	QM50N120B	TO-247-3L Plus

最大额定值/Maximum Rated Values

Item	Symbol	Value	Unit
集电极-发射极电压 Collector- emitter voltage	V_{CE}	1200	V
集电极电流 DC collector current, limited by T_{vjmax} T_C=25℃ T_C=130℃	I_C	 100 50	A
集电极脉冲电流 Pulsed collector current, t_p limitedby Tjmax1)	I_{Cpuls}	200	
关闭安全操作区域 Turn off safe operating area V_{CE}≤1200V, T_{vj}≤175℃, tp=1μs		200	
二极管正向电流 Diode forward current, limited by T_{jmax} T_C=25℃ T_C=100℃	I_F	 100 50	
二极管脉冲电流 Diode pulsed current, t_p limited by T_{jmax}1)	I_{Fpuls}	200	
栅极-发射极电压 Gate-emitter voltage	V_{GE}	±20	V
瞬态栅极-发射极电压 Transient Gate-emitter voltage（t_p≤10us,D<0.01)		±30	
耗散功率 Power dissipation T_C=25℃ T_C=100℃	P_{tot}	600 160	W
工作结温 Operating junction temperature	T_j	-40~175	℃
储存温度 Storage temperature	T_{stg}	-55~150	
焊接温度 Soldering temperature,wave soldering 1.6mm (0.063in.) from case for 10s		260	

1) Defined by design. Not subject to production test.

电学特性/Electrical Characteristics

静态特性/Static Characteristics (at Tj=25℃ unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
集电极－发射极击穿电压 Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=0.25mA	1200	-	-	V
集电极－发射极饱和电压 Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=50A T_j=25℃	-	1.8	2.3	
		T_j=150℃	-	2.35	-	
		T_j=175℃	-	2.50	-	
二极管正向压降 Diode forward voltage	V_F	V_{GE}=0V，I_F=50A T_j= 25 ℃	-	2.0	-	
		T_j=150℃	-	1.8	-	
		T_j=175℃	-	1.7	-	
阈值电压 G-E threshold voltage	$V_{GE(th)}$	I_C=1.7mA, V_{CE}=V_{GE}	5.2	5.8	6.4	
集电极-发射极漏电流 C-E leakage current	I_{CES}	V_{CE}=1200V, V_{GE}=0V T_j=25℃	-	-	0.01	mA
		T_j=175℃	-	-	4.0	
栅极-发射极漏电流 G-E leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	100	nA

动态特性/Dynamic Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
输入电容 Input capacitance	C_{iss}	V_{CE}=25V, V_{GE}=0V, f=1MHz	-	6050	-	pF
输出电容 Output capacitance	C_{oss}		-	145	-	
反馈电容 Reverse transfer capacitance	C_{rss}		-	135	-	
栅电荷 Gate charge	Q_G	V_{CC}=960V, I_C=50A, V_{GE}=15V	-	516	-	nC

热学特性/Thermal Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
结－外壳热阻 IGBT thermal resistance, junction-case	R_{thJC}	-	-	-	0.25	K/W
二极管结－外壳热阻 Diode thermal resistance, junction-case	R_{thJCD}	-	-	-	0.48	
结-环境热阻 Thermal Resistance, junction-ambient	R_{thJA}	-	-	-	40	

IGBT开关特性(感性负载)/IGBT Switching Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
开通延迟时间 Turn-on delay time	$t_{d(on)}$	T_j=25℃, V_{CC}=600V, I_C=50A, V_{GE}=0/15V, R_G=10Ω, Inductive load	-	96	-	ns
上升时间 Rise time	t_r		-	121	-	
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	575	-	
下降时间 Fall time	t_f		-	39	-	
开通损耗 Turn-on energy	E_{on}		-	5.50	-	mJ
关断损耗 Turn-off energy	E_{off}		-	3.21	-	
开关损耗 Total switching energy	E_{ts}		-	8.71	-	
开通延迟时间 Turn-on delay time	$t_{d(on)}$	T_j=175℃, V_{CC}=600V, I_C=50A, V_{GE}=0/15V, R_G=10Ω, Inductive load	-	90	-	ns
上升时间 Rise time	t_r		-	135	-	
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	655	-	
下降时间 Fall time	t_f		-	82	-	
开通损耗 Turn-on energy	E_{on}		-	5.90	-	mJ
关断损耗 Turn-off energy	E_{off}		-	4.23	-	
开关损耗 Total switching energy	E_{ts}		-	10.13	-	

二极管开关特性/Diode Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
反向恢复时间 Diode reverse recovery time	t_{rr}	T_j=25℃, V_R=600V, I_F=50A, di_F/dt=400A/μs	-	233	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	2.76	-	μC
反向恢复峰值电流 Diode peak reverse recovery current	I_{rrm}		-	18.8	-	A
反向恢复时间 Diode reverse recovery time	t_{rr}	T_j=175℃, V_R=600V, I_F=50A, di_F/dt=400A/μs	-	465	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	9.82	-	μC
反向恢复峰值电流 Diode peak reverse recovery current	I_{rrm}		-	44.0	-	A

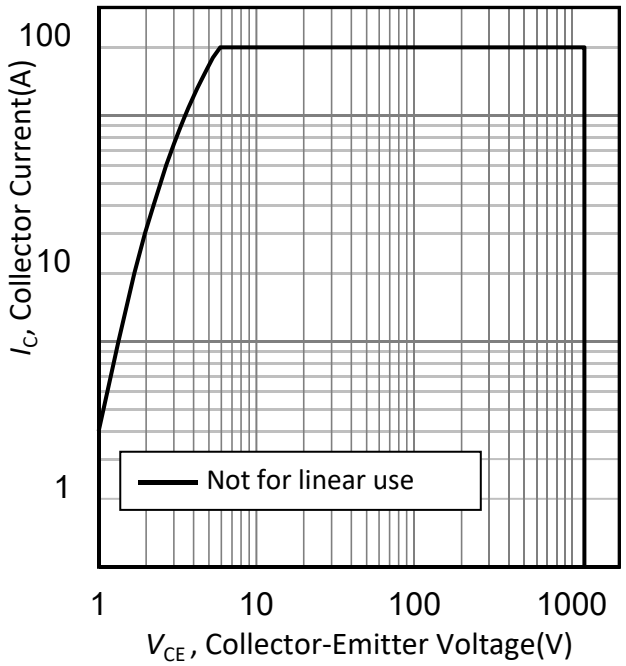


Figure 1. 正向偏置安全工作区/**Forward bias safe operating area** (D=0, T_C=25 ℃, T_{vj}≤175℃,V_{GE}=15V)

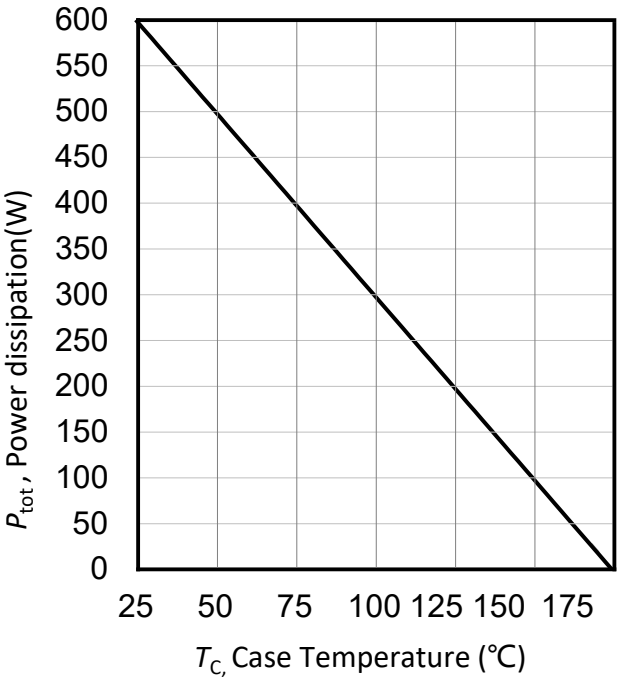


Figure 2. 功耗与外壳温度的关系/**Power dissipation as a function of case temperature (T_{vj}≤175℃)**

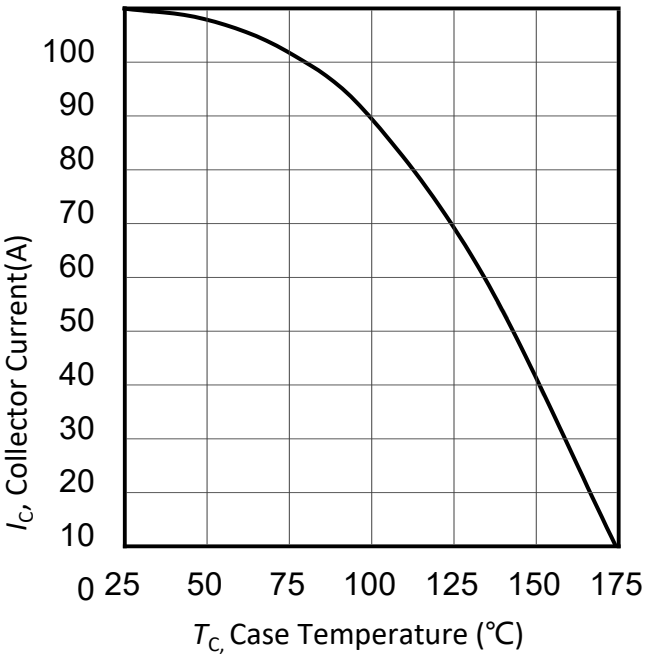


Figure 3. 集电极电流与外壳温度的关系 /**Collector current as a function of case temperature**
(T_{vj}≤175℃ ,V_{GE}≥15V)

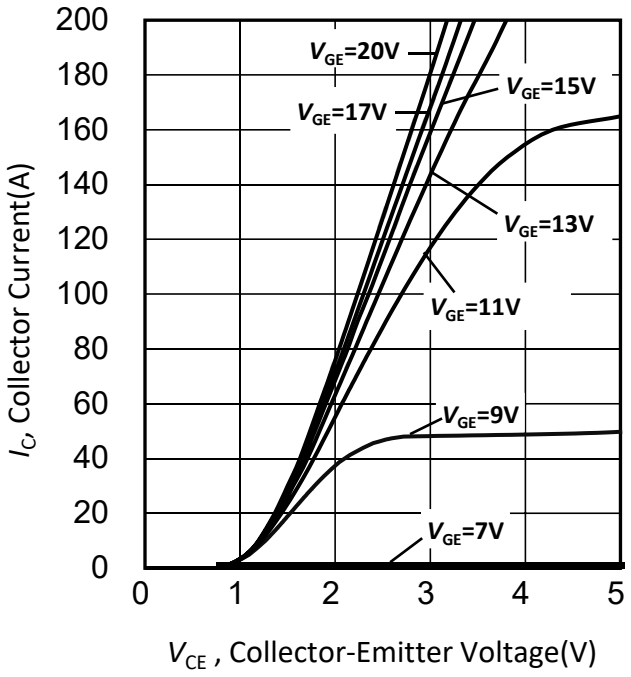


Figure 4. 典型输出特性/**Typical output characteristic** (T_{vj}=25℃)

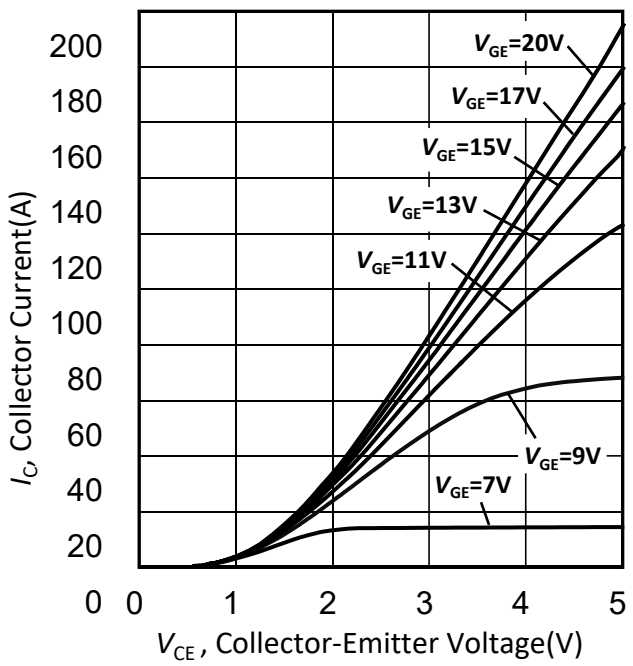


Figure 5. 典型输出特性/Typical output characteristic
(T_{vj}=175℃)

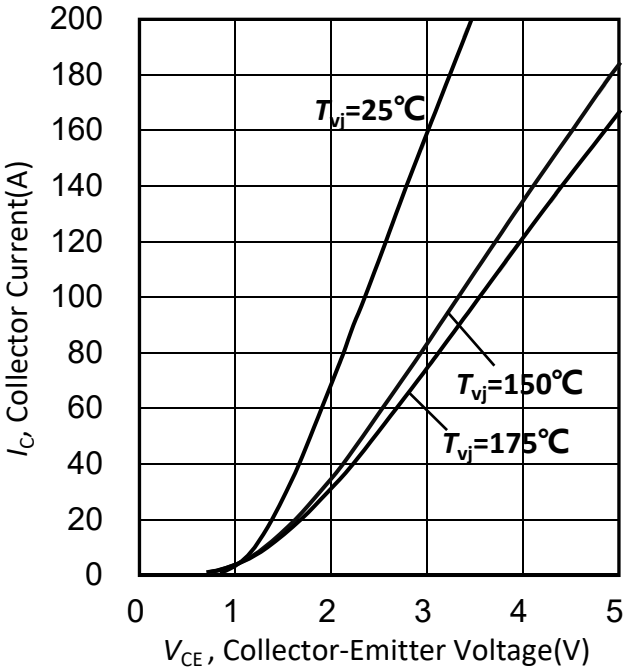


Figure 6. 集电极-发射极饱和电压特性/Collector-emitter saturation voltage characteristic
(V_{GE}=15V)

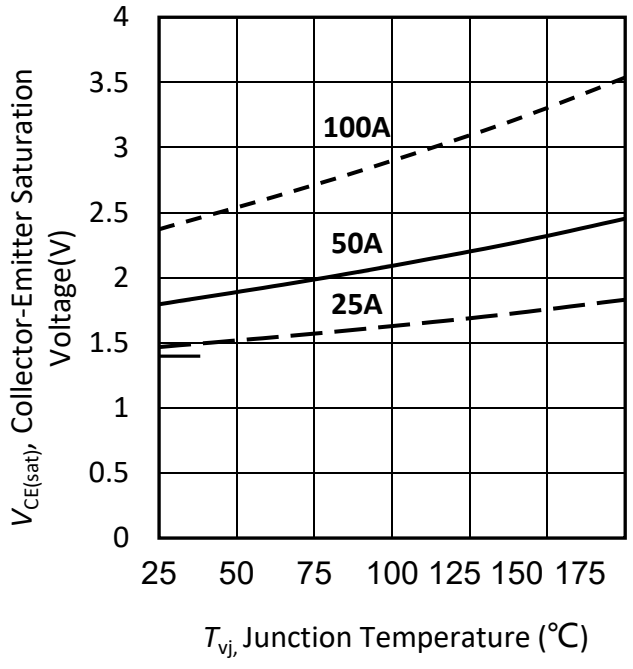


Figure 7. 典型集电极-发射极饱和电压与结温的关系/Typical collector-emitter saturation voltage as a function of junction temperature (V_{GE}=15V)

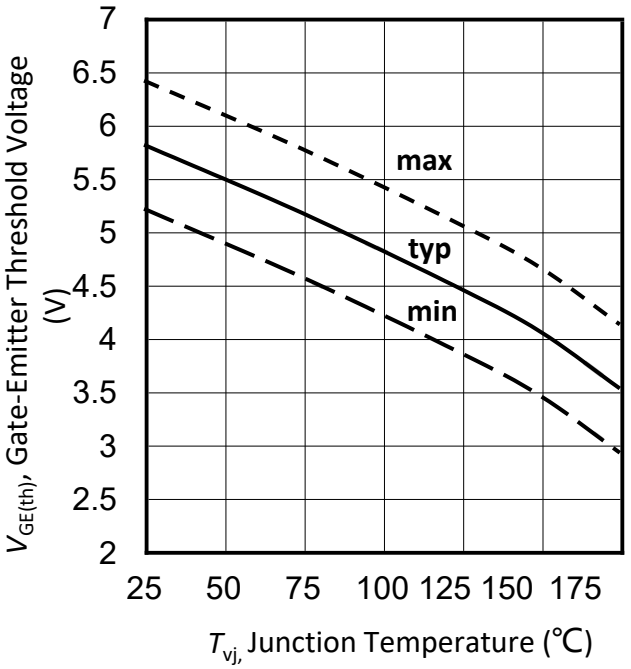


Figure 8. 栅极-发射极阈值电压与结温的关系/Gate-emitter threshold voltage as a function of junction temperature
(I_C=1.7mA)

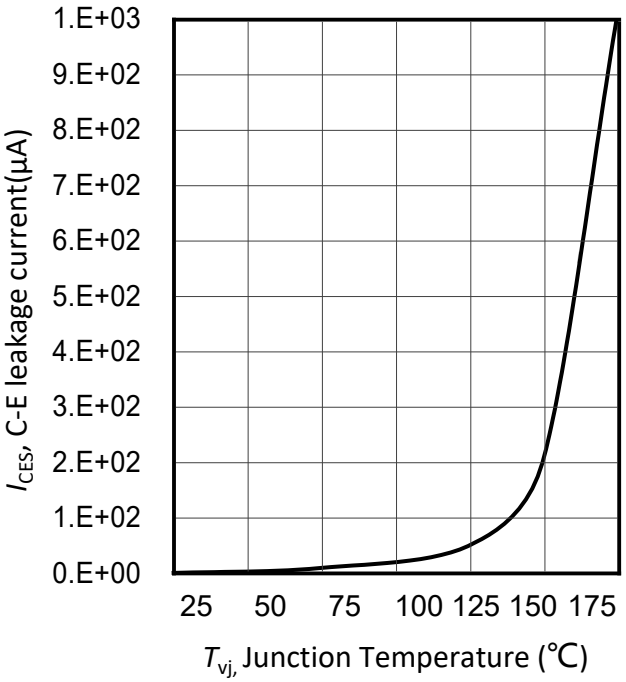


Figure 9. 典型 I_{CES} 漏电流作为结温的函数 **/Typical I_{CES} leakage current as a function of junction temperature**
(V_{CE}=1200V, V_{GE}=0V)

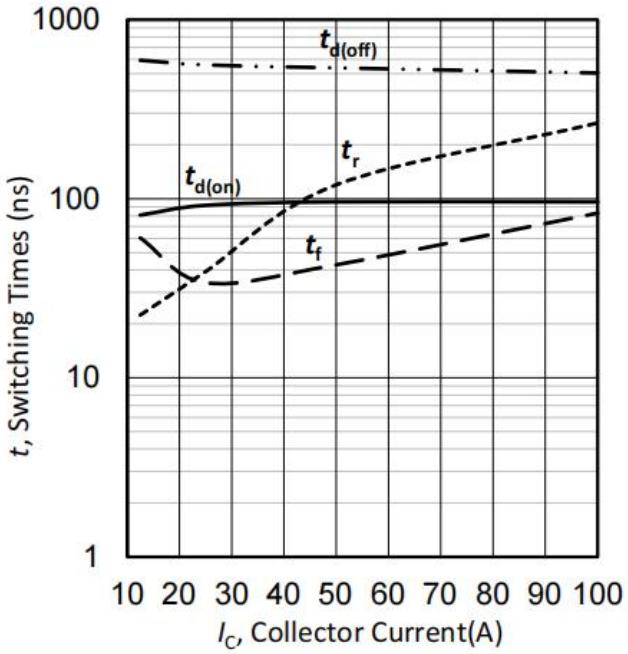


Figure 10. 典型开关时间与集电极电流的关系**/Typical switching times as a function of collector current**
(inductive load, T_{vj}=25℃, V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω)

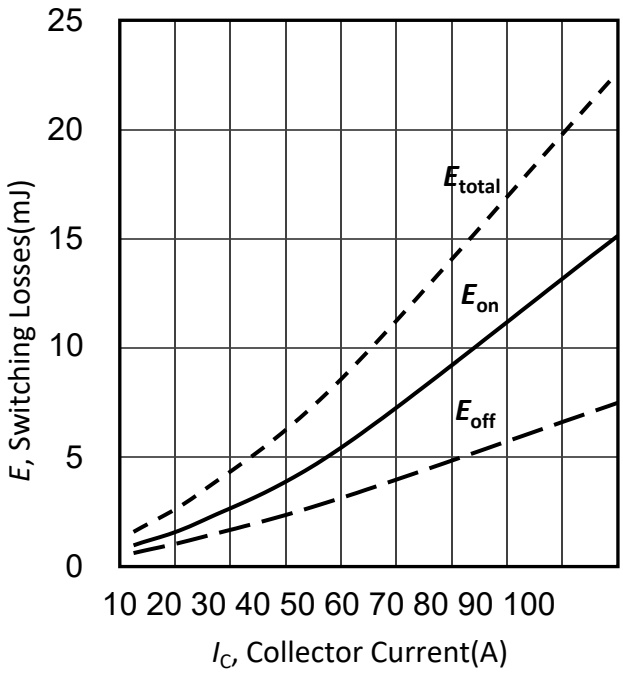


Figure 11. 典型开关能量损耗与集电极电流的关系**/Typical switching energy losses as a function of collector current**
(inductive load, T_{vj}=25℃, V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω)

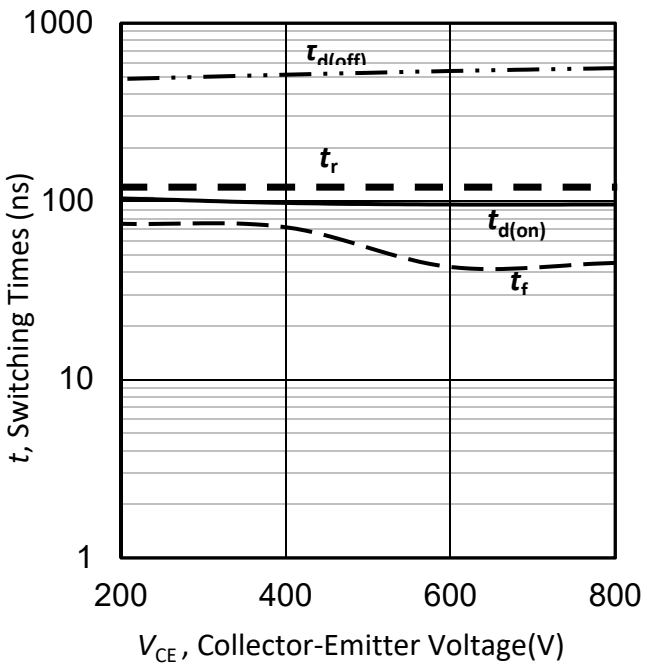


Figure 12. 典型开关时间与集电极发射极电压的关系**/Typical switching times as a function of collector emitter voltage**
(inductive load, T_{vj}=25℃, I_C=50A, V_{GE}=0/15V, R_G=10Ω)

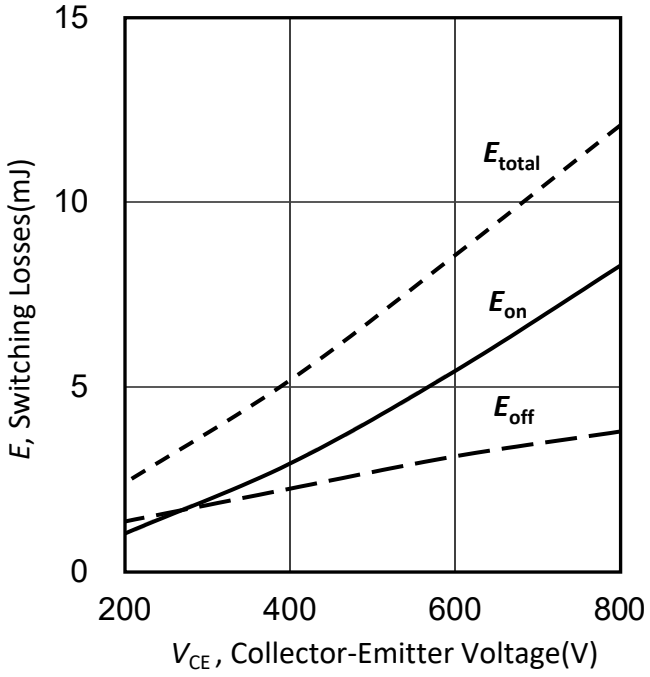


Figure 13. 典型开关能量损耗与集电极发射极电压的关系/**Typical switching energy losses as a function of collector emitter voltage** (inductive load, T_{vj}=25℃, I_C=50A, V_{GE}=0/15V, R_G=10Ω)

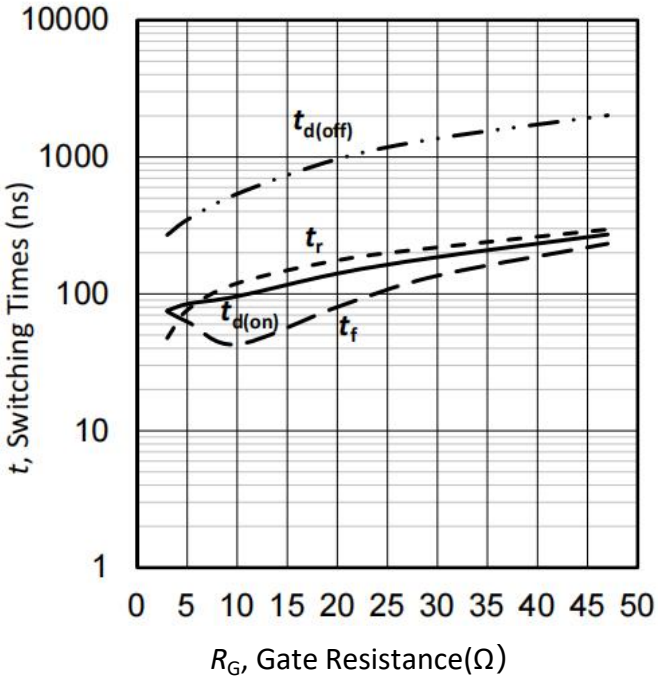


Figure 14. 典型开关时间与栅极电阻器的关系/**Typical switching times as a function of gate resistor**(inductive load, T_{vj}=25℃, V_{CE}=600V, V_{GE}=0/15V, I_C=50A)

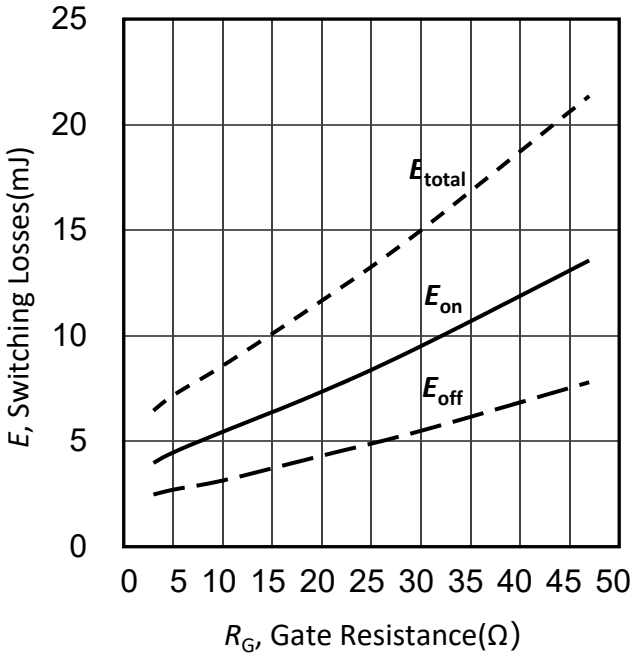


Figure 15. 典型开关能量损耗与栅极电阻器的关系/**Typical switching energy losses as a function of gate resistor**(inductive load, T_{vj}=25℃,V_{CE}=600V, V_{GE}=0/15V, I_C=50A)

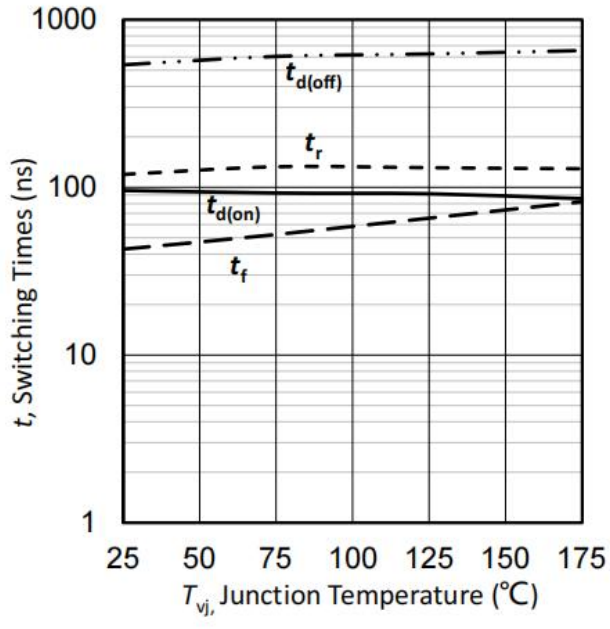


Figure 16. 典型开关时间与结温的关系/**Typical switching times as a function of junction temperature** (inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=50A, , R_G=10Ω)

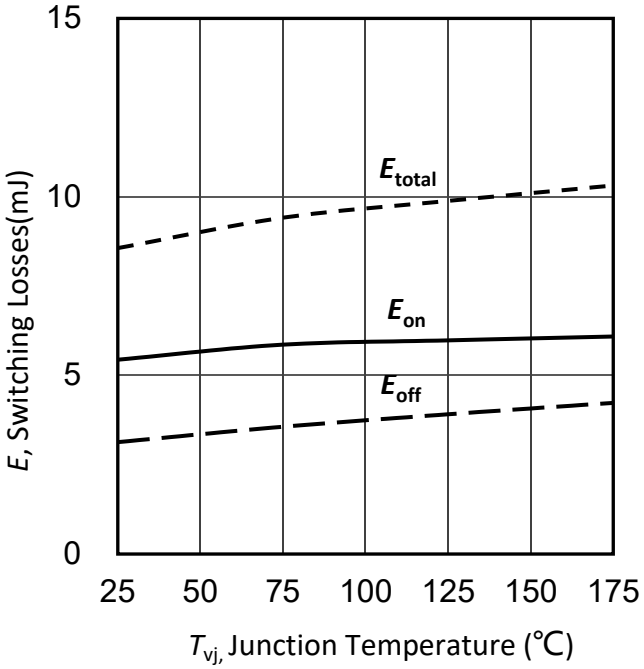


Figure 17. 典型开关能量损耗与结温的关系 **/Typical switching energy losses as a function of junction temperature**
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=50A, , R_G=10Ω)

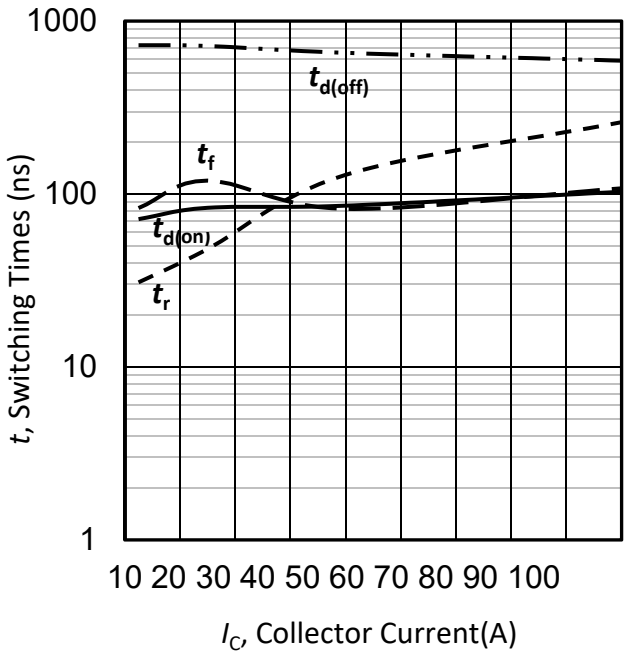


Figure 18. 典型开关时间与集电极电流的关系**/Typical switching times as a function of collector current**
(inductive load, T_{vj}=175℃, V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω)

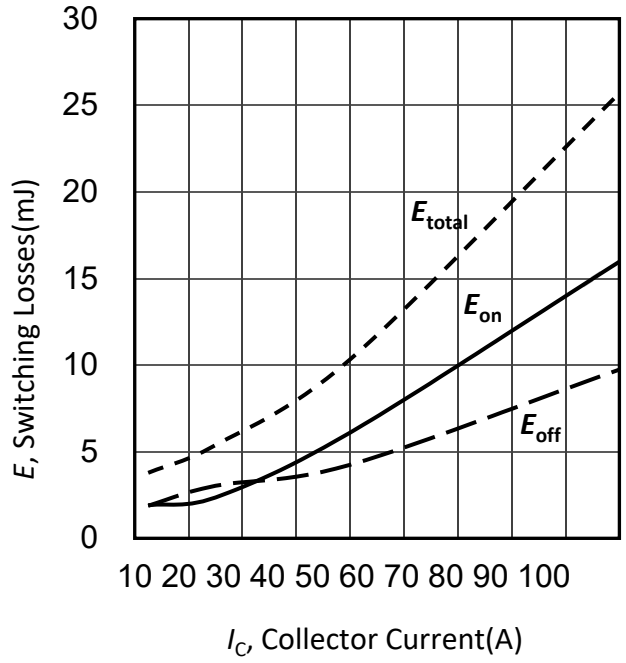


Figure 19. 典型开关能量损耗与集电极电流的关系 **Typical switching energy losses as a function of collector current**
(inductive load, T_{vj}=175℃, V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω)

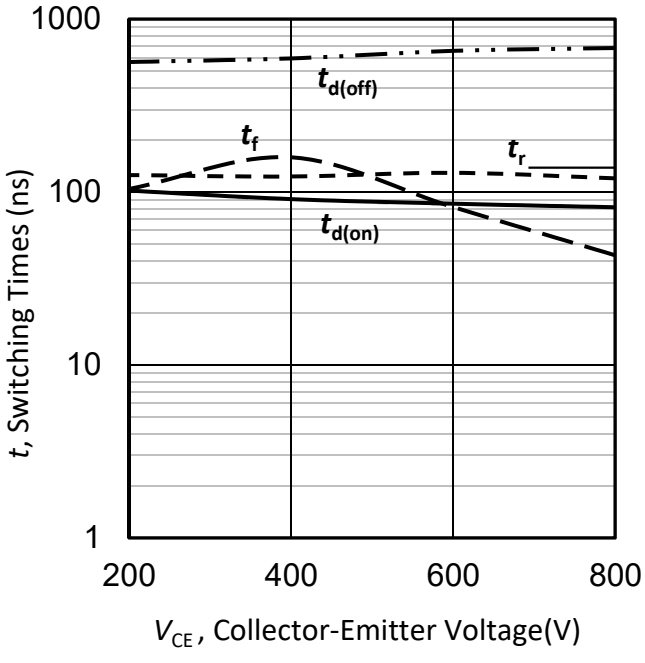


Figure 20. 典型开关时间与集电极发射极电压的关系**/Typical switching times as a function of collector emitter voltage**
(inductive load, T_{vj}=175℃, I_C=50A, V_{GE}=0/15V, R_G=10Ω)

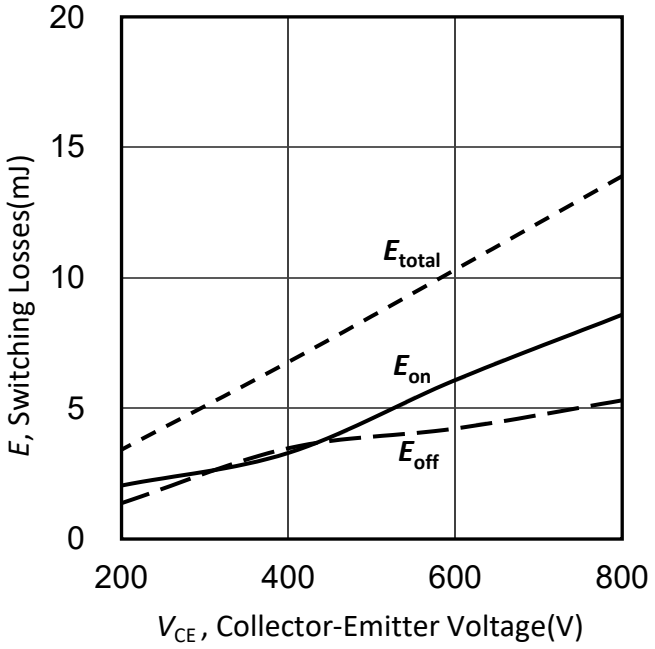


Figure 21. 典型开关能量损耗与集电极发射极电压的关系/**Typical switching energy losses as a function of collector emitter voltage**
(inductive load, T_{vj}=175℃, I_C=50A, V_{GE}=0/15V, R_G=10Ω)

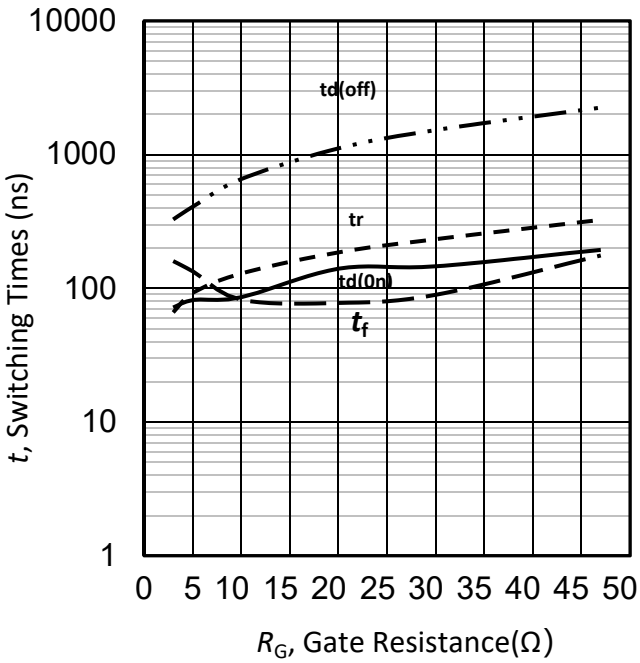


Figure 22. 典型开关时间与栅极电阻器的关系/**Typical switching times as a function of gate resistor**
(inductive load, T_{vj}=175℃, V_{CE}=600V, V_{GE}=0/15V, I_C=50A)

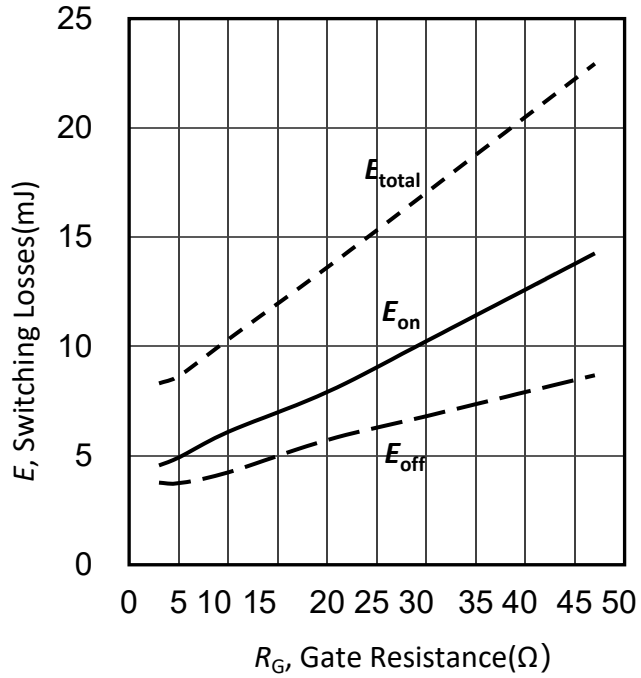


Figure 23. 典型开关能量损耗与栅极电阻器的关系/**Typical switching energy losses as a function of gate resistor**
(inductive load, T_{vj}=175℃, V_{CE}=600V, V_{GE}=0/15V, I_C=50A)

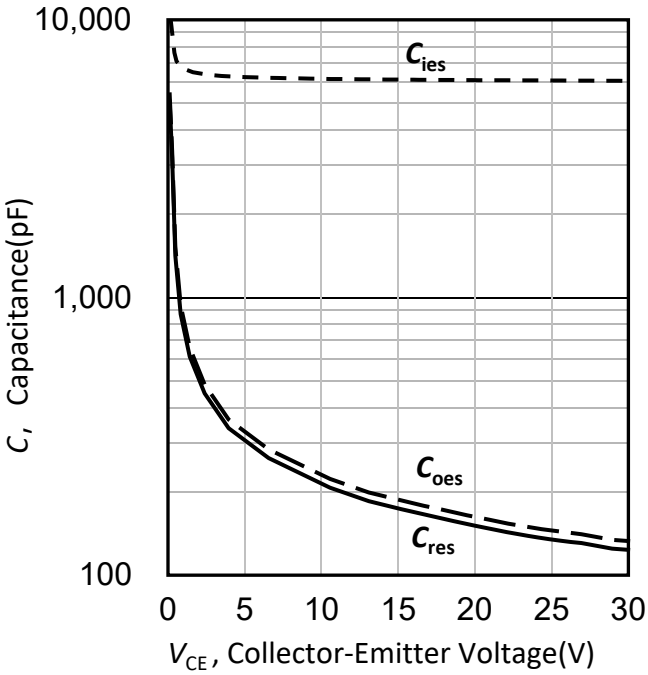


Figure 24. 典型电容与集电极-发射极电压的关系/**Typical capacitance as a function of collector-emitter voltage**

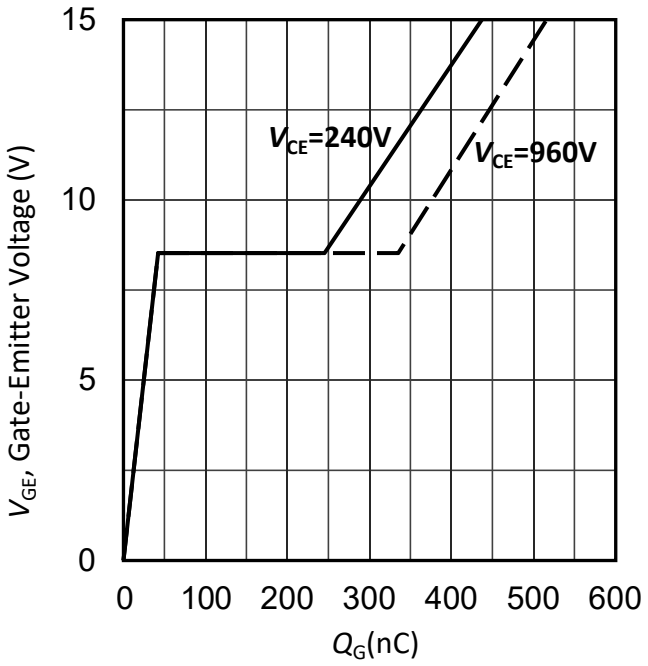


Figure 25. 典型栅极电荷/Typical gate charge (I_C=50A)

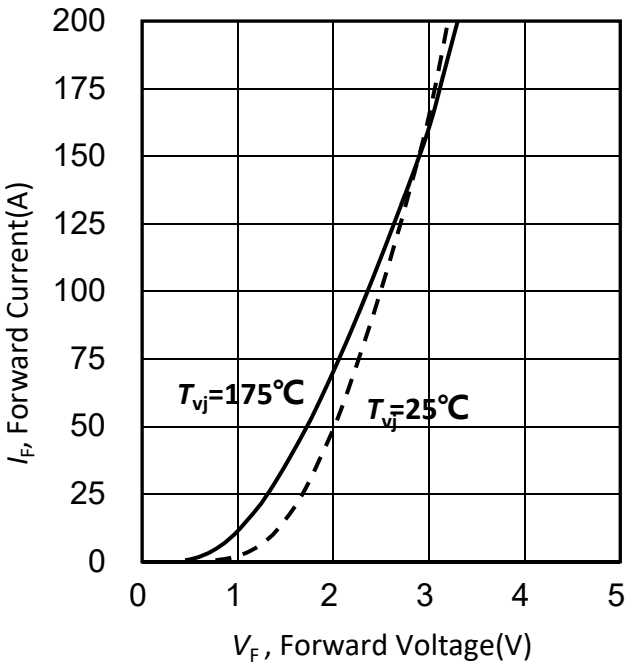


Figure 26. 典型二极管正向电流与正向电压的函数关系/Typical diode forward current as a function of forward voltage

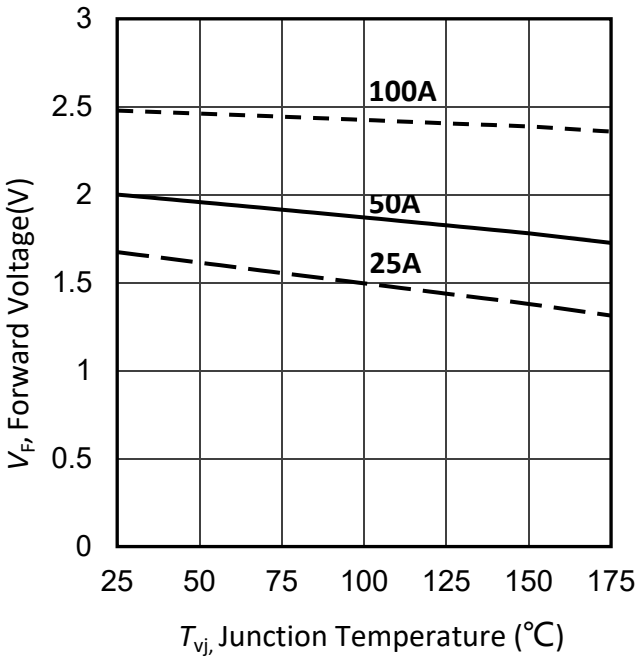


Figure 27. 典型二极管正向电压与结温的关系/Typical diode forward voltage as a function of junction temperature

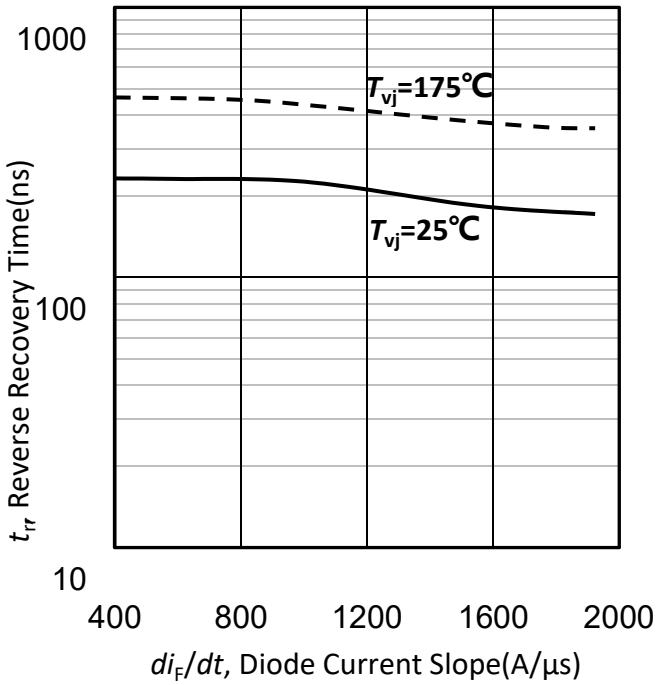


Figure 28. 典型反向恢复时间与二极管电流斜率的关系/Typical reverse recovery time as a function of diode current slope (V_R=600V)

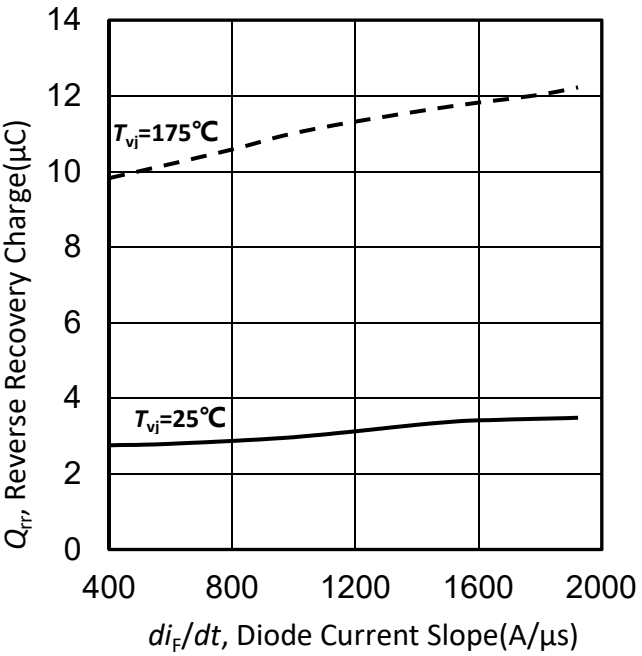


Figure 29. 典型反向恢复电荷与二极管电流斜率的关系/**Typical reverse recovery charge as a function of diode current slope** (V_R=600V)

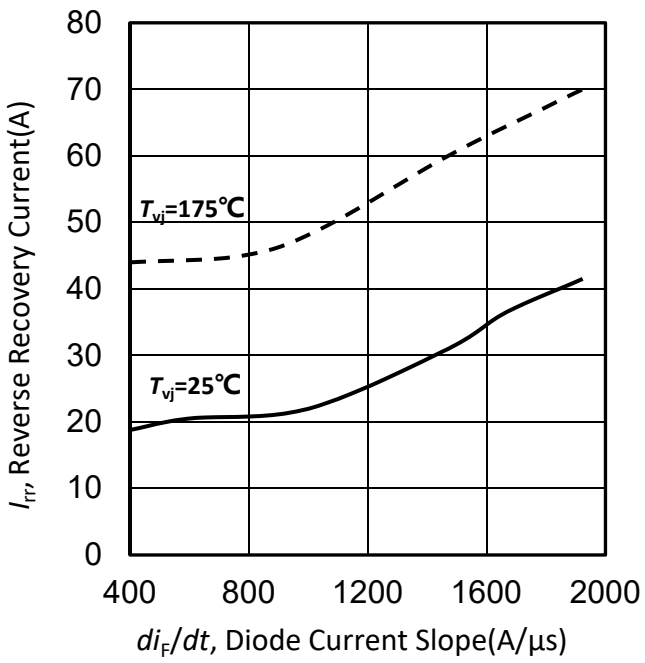


Figure 30. 典型反向恢复电流与二极管电流斜率的关系/**Typical reverse recovery current as a function of diode current slope** (V_R=600V)

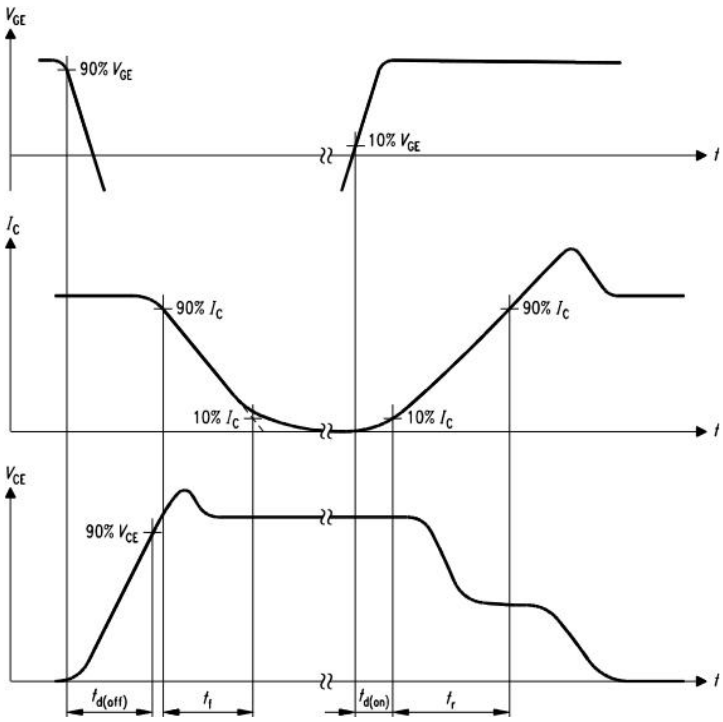


Figure A. 开关时间的定义/
Definition of switching times

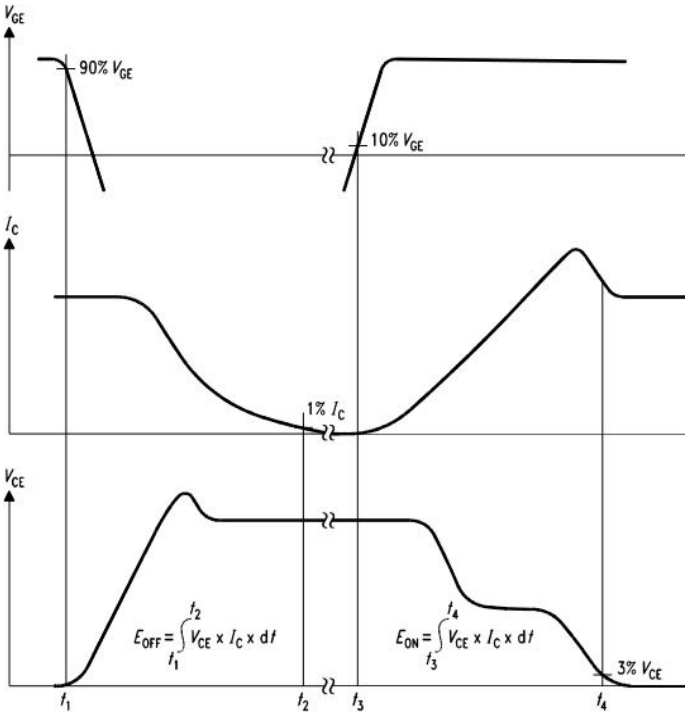


Figure B. 开关损耗的定义/
Definition of switching losses

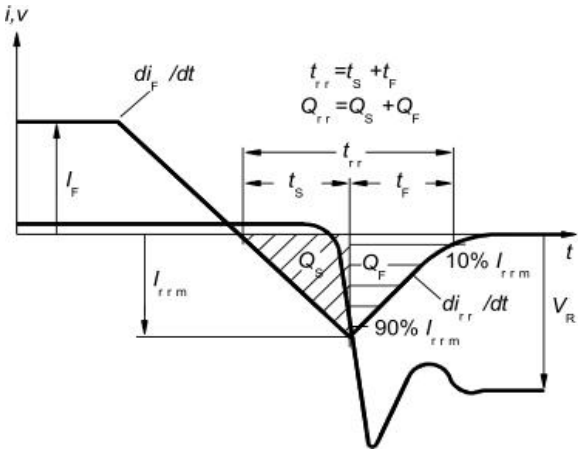


Figure C. 二极管开关特性的定义
/Definition of diodes switching characteristics

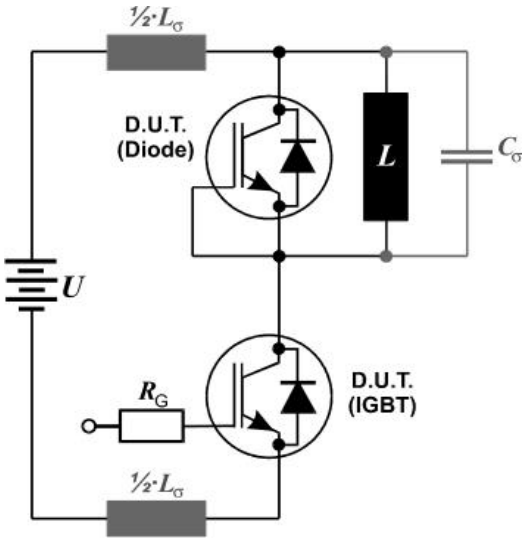
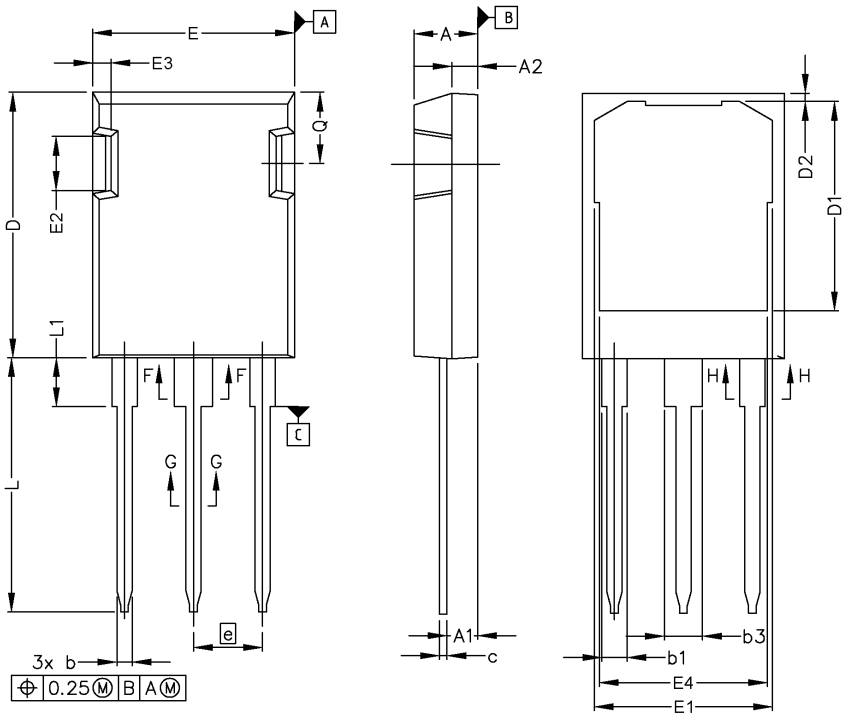


Figure D. 开关测试电路/Switching test circuit

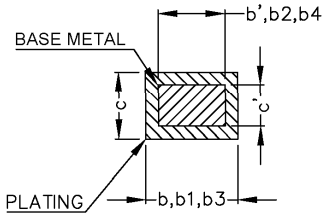
TO-247-3L Plus



SYMBOL	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	1.91	2.41
b2	1.91	2.16
b3	2.87	3.38
b4	2.87	3.13
c'	0.55	0.65
c	0.55	0.68
D	20.80	21.10
D1	16.25	17.65
D2	0.50	0.80
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	5.44 BSC	
N	3	
L	19.81	20.32
L1	3.70	4.00
Q	5.49	6.00

NOTE ;
1. ALL METAL SURFACES: TIN PLATED,EXCEPT AREA OF CUT
2. DIMENSIONING & TOLERANCEING CONFIRM TO ASME Y14.5M-1994.
3. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
4. THIS DRAWING WILL MEET ALL DIMENSIONS REQUIREMENT OF JEDEC outlines TO-247 AD.

1 - GATE
2 - DRAIN (COLLECTOR)
3 - SOURCE (EMITTER)
4 - DRAIN (COLLECTOR)



SECTION "F-F", "G-G" AND "H-H"
SCALE: NONE

修订历史/Revision History：

修订 /Revision	主题（自上次修订以来的主要变化） /Subjects (major changes since last revision)	日期 /Date
1.0	Initial Version	2023-01
2.0	Update the English and Chinese versions	2023-04

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