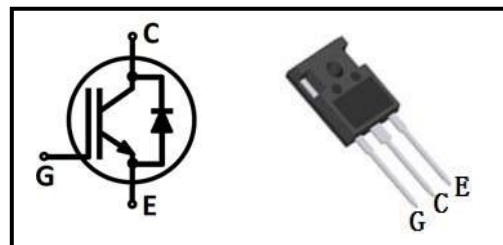


特征/Features

- 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}
- 低饱和压降，快速开关
Low V_{CEsat} , fast switching
- 高可靠性及热稳定性，良好的参数一致性
High ruggedness, good thermal stability very tight parameter distribution

应用领域/Applications

- 变频器/Frequency converter
- 不间断电源/UPS



型号/Type	打标/Marking	封装/Package
QMW25N120BF	QMW25N120BF	TO-247

最大额定值/Maximum Rated Values ¹

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_{jmax} $T_C=25^\circ C$ $T_C=100^\circ C$	I_C	50 25	A
集电极脉冲电流 Pulsed collector current, t_p limited by $T_{jmax}^{1)}$	I_{Cpuls}	100	
二极管正向电流 Diode forward current, limited by T_{jmax} $T_C=25^\circ C$ $T_C=100^\circ C$	I_F	50 25	
二极管脉冲电流 Diode pulsed current, t_p limited by $T_{jmax}^{1)}$	I_{Fpuls}	100	
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 ($t_p \leq 10\mu s, D < 0.01$)		± 30	
短路耐受时间 ² Short circuit withstand time $V_{GE}=15V, V_{CC}=600V, T_j \leq 175^\circ C$	t_{SC}	10	μs
耗散功率 Power dissipation $T_C=25^\circ C$ $T_C=100^\circ C$	P_{tot}	348 174	W
工作结温 Operating junction temperature	T_j	-40~175	°C
储存温度 Storage temperature	T_{stg}	-55~150	
焊接温度从外壳处进行1.6毫米(0.063英寸)波峰焊10秒 Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	
安装扭矩, M3螺钉 最大安装过程: 3 Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm

¹ Defined by design. Not subject to production test.

² Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0s$

电学特性/Electrical Characteristics

静态特性/Static Characteristics (at $T_j=25^\circ\text{C}$ 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	$V_{CE(sat)}$	$V_{GE}=15V$, $I_C=25A$ $T_j=25^\circ\text{C}$	-	1.9	2.4	
		$T_j=150^\circ\text{C}$	-	2.5	-	
		$T_j=175^\circ\text{C}$	-	2.6	-	
二极管正向压降 Diode forward voltage	V_F	$V_{GE}=0V$, $I_F=25A$ $T_j=25^\circ\text{C}$	-	2.2	-	
		$T_j=150^\circ\text{C}$	-	1.7	-	
		$T_j=175^\circ\text{C}$	-	1.6	-	
阈值电压 G-E threshold voltage	$V_{GE(th)}$	$I_C=1mA$, $V_{CE}=V_{GE}$	5.5	6.0	6.5	
集电极-发射极漏电流 C-E leakage current	I_{CES}	$V_{CE}=1200V$, $V_{GE}=0V$ $T_j=25^\circ\text{C}$	-	-	0.1	mA
		$T_j=175^\circ\text{C}$	-	-	4.0	
栅极-发射极漏电流 G-E leakage current	I_{GES}	$V_{CE}=0V$, $V_{GE}=20V$	-	-	200	nA
跨导 Transconductance	g_{FS}	$V_{CE}=20V$, $I_C=25A$	-	15	-	S

动态特性/Dynamic Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
输入电容 Input capacitance	C_{iss}	$V_{CE}=25V$, $V_{GE}=0V$, $f=1MHz$	-	1767	-	pF
输出电容 Output capacitance	C_{oss}		-	116	-	
反馈电容 Reverse transfer capacitance	C_{rss}		-	62	-	
栅电荷 Gate charge	Q_G	$V_{CC}=960V$, $I_C=25A$, $V_{GE}=15V$	-	171	-	nC
短路集电极电流 Short circuit collector current	$I_{C(SC)}$	$V_{GE}=15V$, $V_{CC}\leq 600V$, $t_{SC}\leq 10\mu s$, $T_j=175^\circ\text{C}$	-	90	-	A

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}	-	-	-	0.43	K/W
二极管结-外壳热阻 Diode thermal resistance, junction-case	R_{thJCD}	-	-	-	0.80	
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	$t_{d(on)}$	$T_j=25\text{ }^\circ\text{C}$, $V_{CC}=600\text{V}$, $I_C=25\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=16\Omega$, <i>Inductive load</i>	-	32	-	ns	
上升时间 Rise time	t_r		-	52	-		
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	266	-		
下降时间 Fall time	t_f		-	246	-	mJ	
开通损耗 Turn-on energy	E_{on}		-	1.6	-		
关断损耗 Turn-off energy	E_{off}		-	1.9	-		
开关损耗 Total switching energy	E_{ts}		-	3.5	-		
开通延迟时间 Turn-on delay time	$t_{d(on)}$		$T_j=175\text{ }^\circ\text{C}$, $V_{CC}=600\text{V}$, $I_C=25\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=16\Omega$, <i>Inductive load</i>	-	30	-	ns
上升时间 Rise time	t_r			-	50	-	
关断延迟时间 Turn-off delay time	$t_{d(off)}$	-		322	-		
下降时间 Fall time	t_f	-		378	-	mJ	
开通损耗 Turn-on energy	E_{on}	-		1.7	-		
关断损耗 Turn-off energy	E_{off}	-		2.5	-		
开关损耗 Total switching energy	E_{ts}	-		4.2	-		

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}	$T_j=25\text{ }^\circ\text{C}$, $V_R=600\text{V}$, $I_F=25\text{A}$, $di_F/dt=400\text{A}/\mu\text{s}$	-	256	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	1.35	-	μC
反向恢复峰值电流 Diode peak reverse recovery current	I_{rrm}		-	12.4	-	A
反向恢复时间 Diode reverse recovery time	t_{rr}	$T_j=175\text{ }^\circ\text{C}$, $V_R=600\text{V}$, $I_F=25\text{A}$, $di_F/dt=400\text{A}/\mu\text{s}$	-	350	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	4.28	-	μC
反向恢复峰值电流 Diode peak reverse recovery current	I_{rrm}		-	26.2	-	A

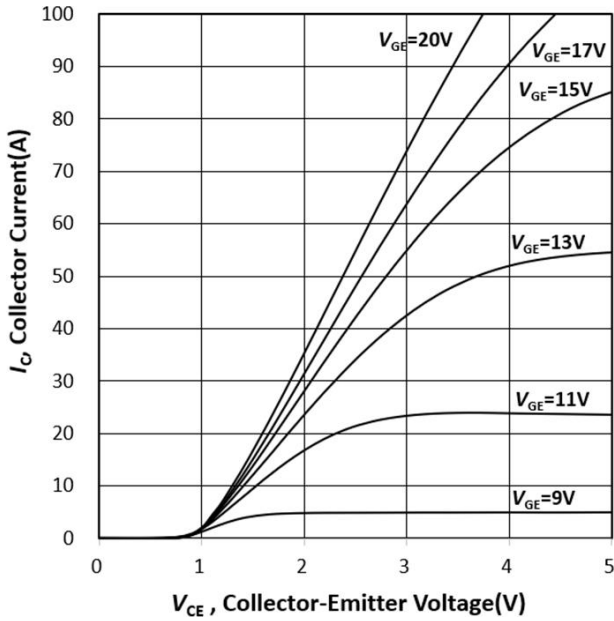


Figure 1. 典型输出特性/Typical output characteristic ($T_j = 25\text{ }^\circ\text{C}$)

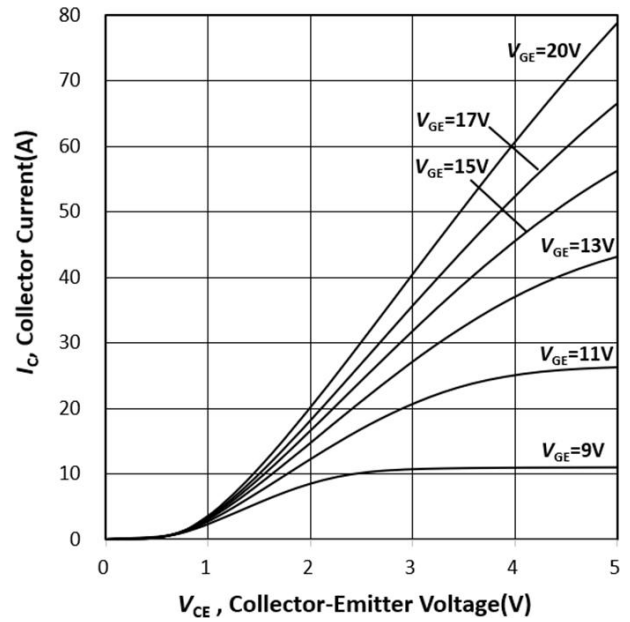


Figure 2. 典型输出特性/ Typical output characteristic ($T_j = 175\text{ }^\circ\text{C}$)

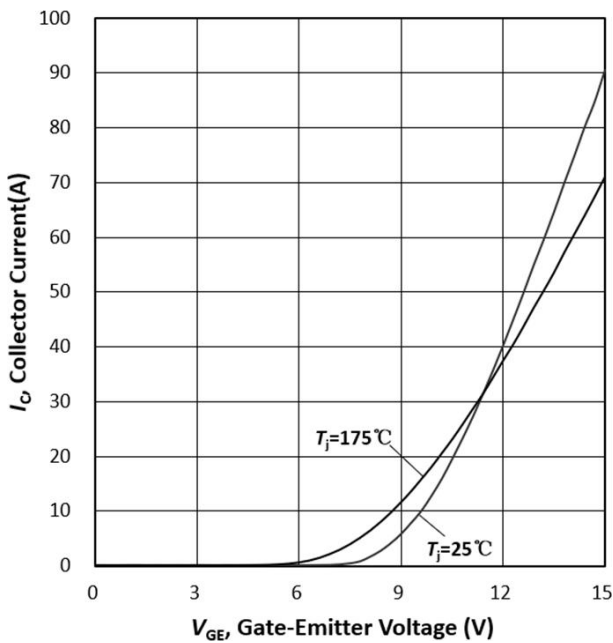


Figure 3. 典型传输特性/Typical transfer characteristic ($V_{CE} = 25\text{V}$)

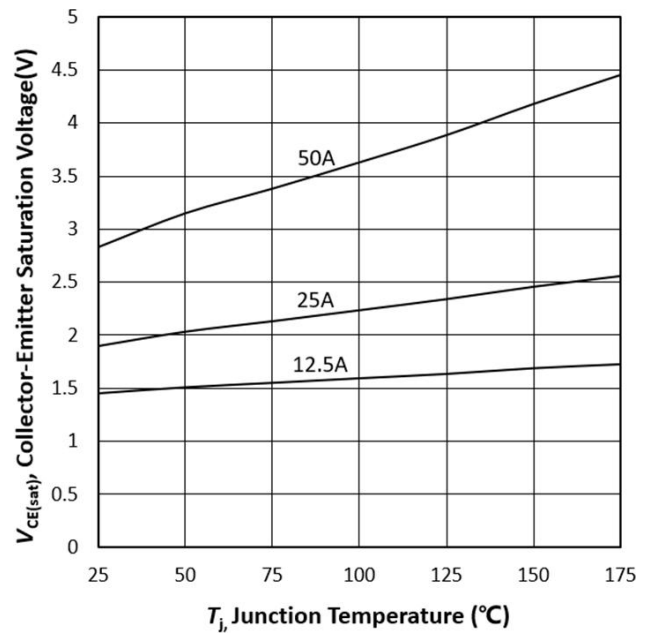


Figure 4. 典型集电极-发射极饱和电压与结温的关系/Typical collector - emitter saturation voltage as a function of junction temperature ($V_{GE} = 15\text{V}$)

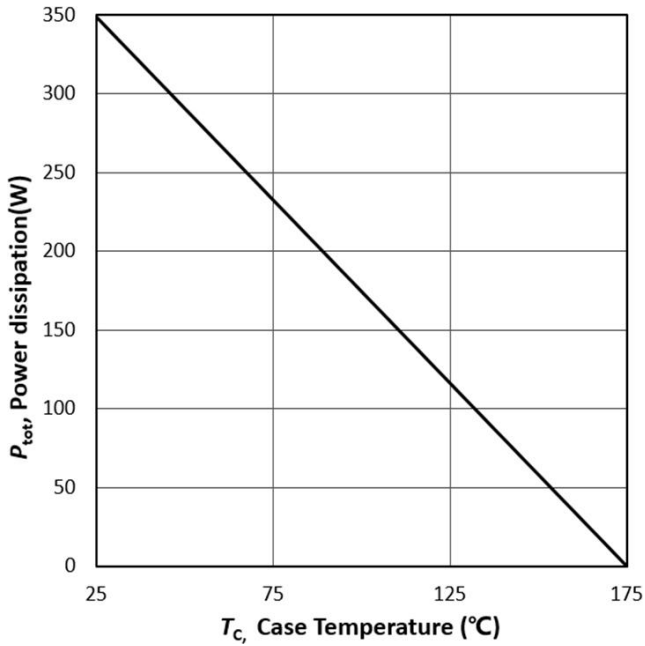


Figure 5. 功耗与外壳温度的关系曲线/Power dissipation as a function of case temperature ($T_j \leq 175^\circ\text{C}$)

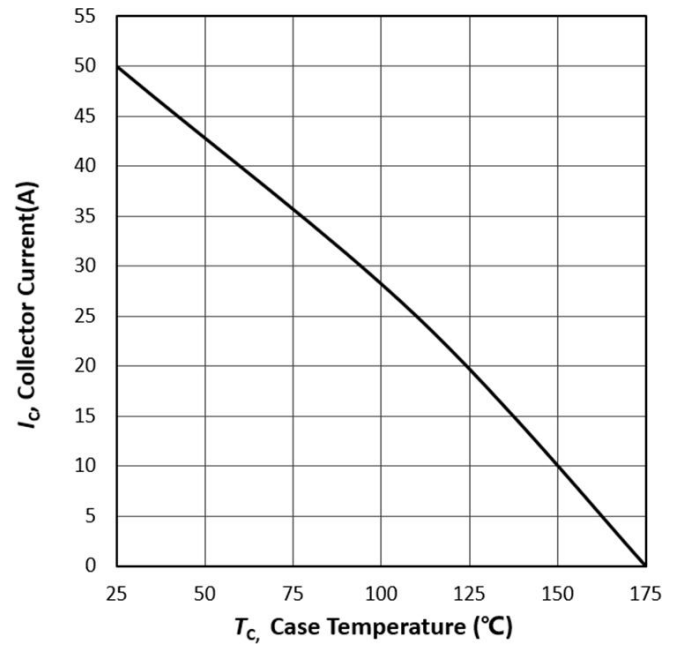


Figure 6. 集电极电流与外壳温度的关系 /Collector current as a function of case temperature ($V_{GE} \geq 15\text{V}$, $T_j \leq 175^\circ\text{C}$)

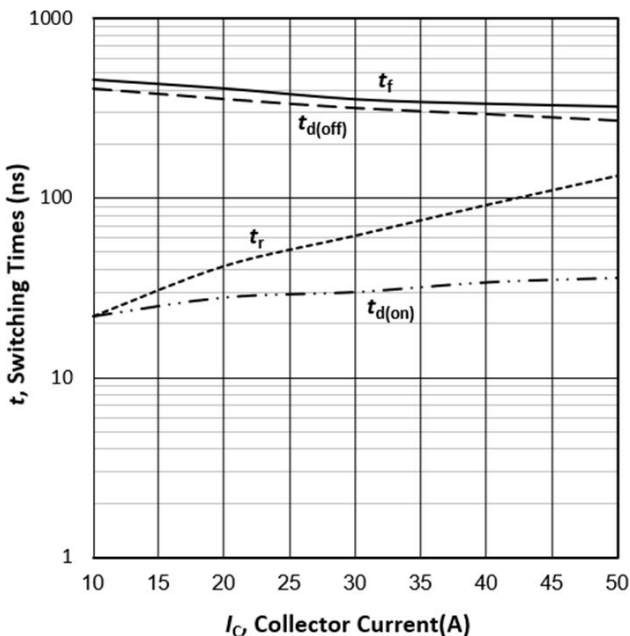


Figure 7. 典型开关时间与集电极电流的关系 /Typical switching times as a function of collector current (inductive load, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=25\text{A}$, $R_G=16\Omega$, Dynamic test circuit in Figure E)

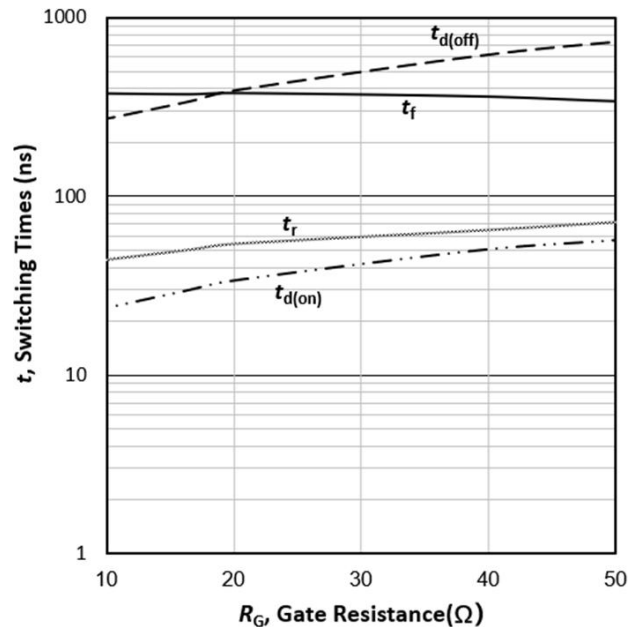


Figure 8. 典型开关时间与栅极电阻器的关系 /Typical switching times as a function of gate resistor (inductive load, $T=175^\circ\text{C}$,

$V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=25\text{A}$, Dynamic test circuit in Figure E)

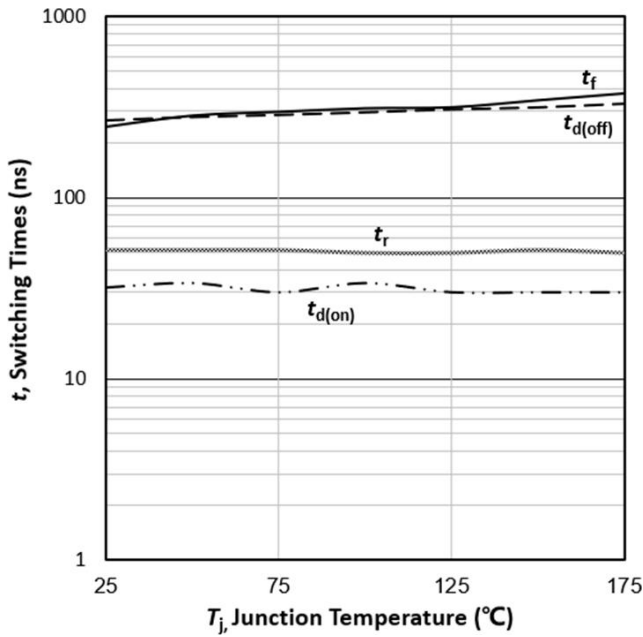


Figure 9. 典型开关时间与结温的关系/Typical switching times as a function of junction temperature (inductive load, $V_{CE}=600V$, $V_{GE}=0/15V$, $I_C=25A$, $R_G=16\Omega$, Dynamic test circuit in Figure E)

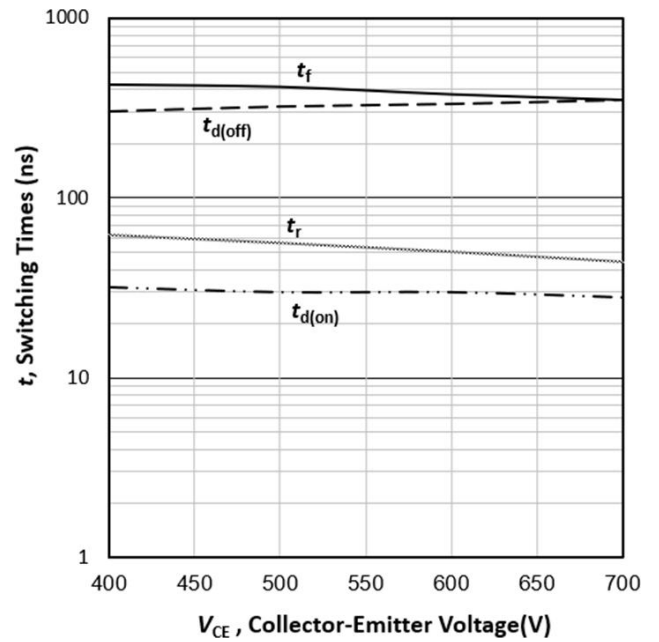


Figure 10. 典型开关时间与集电极发射极电压的关系/Typical switching times as a function of collector emitter voltage (inductive load, $T_j=175^\circ C$, $V_{GE}=0/15V$, $I_C=25A$, $R_G=16\Omega$, Dynamic test circuit in Figure E)

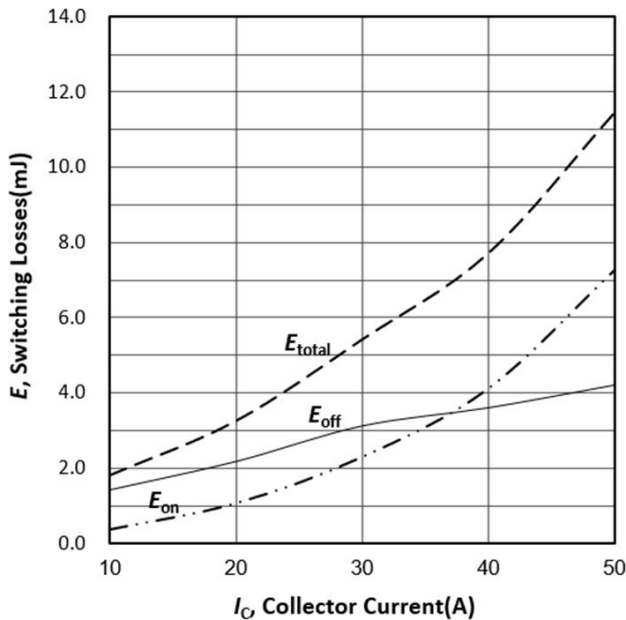


Figure 11. 典型开关能量损耗与集电极电流的关系/Typical switching energy losses as a function of collector current (inductive load, $T_j=175^\circ C$, $V_{CE}=600V$, $V_{GE}=0/15V$, $R_G=16\Omega$, Dynamic test circuit in Figure E)

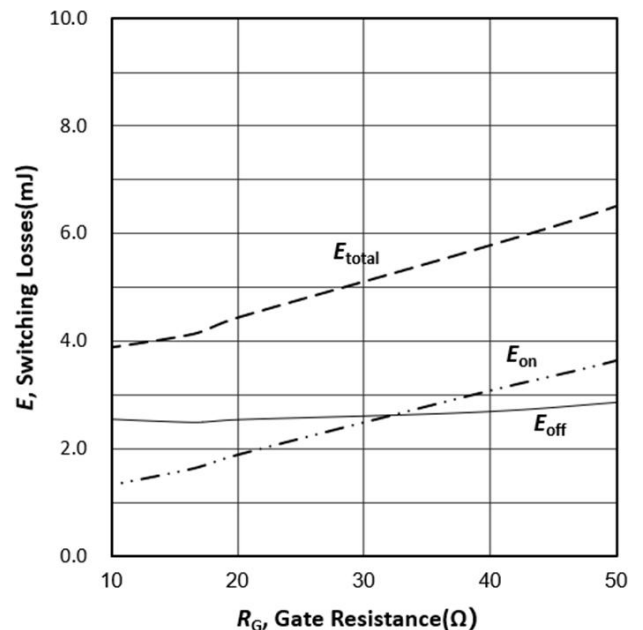


Figure 12. 典型开关能量损耗与栅极电阻器的关系/Typical switching energy losses as a function of gate resistor (inductive load, $T_j=175^\circ C$, $V_{CE}=600V$, $V_{GE}=0/15V$, $I_C=25A$, Dynamic test circuit in Figure E)

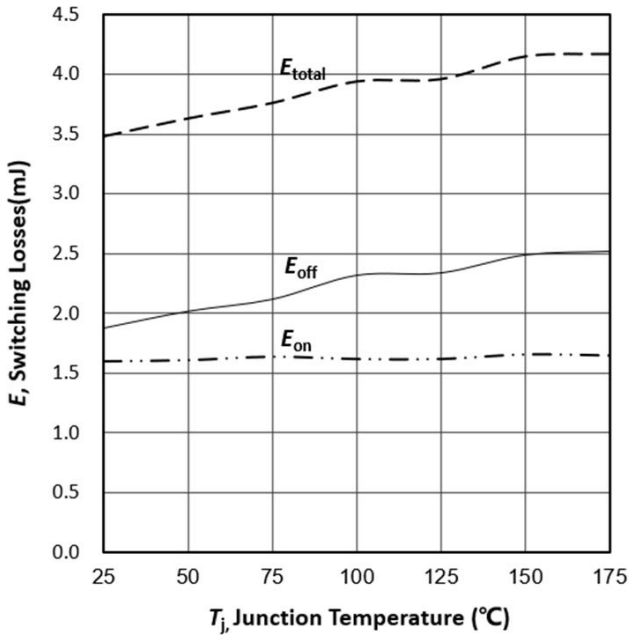


Figure 13. 典型开关能量损耗与结温的关系
/Typical switching energy losses as a function of junction temperature (inductive load, $V_{CE}=600V$, $V_{GE}=0/15V$, $I_C=25A$, $R_G=16\Omega$, Dynamic test circuit in Figure E)

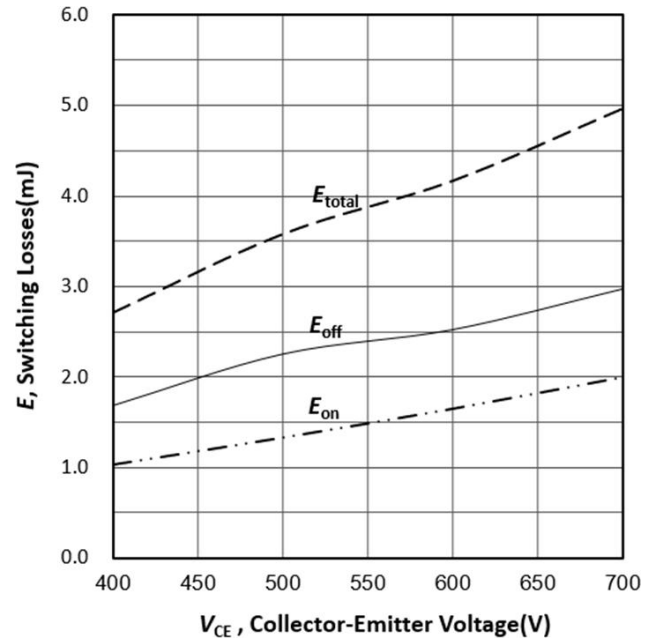


Figure 14. 典型开关能量损耗与集电极发射极电压的关系/Typical switching energy losses as a function of collector emitter voltage (inductive load, $T_j=175^\circ C$, $V_{GE}=0/15V$, $I_C=25A$, $R_G=16\Omega$, Dynamic test circuit in Figure E)

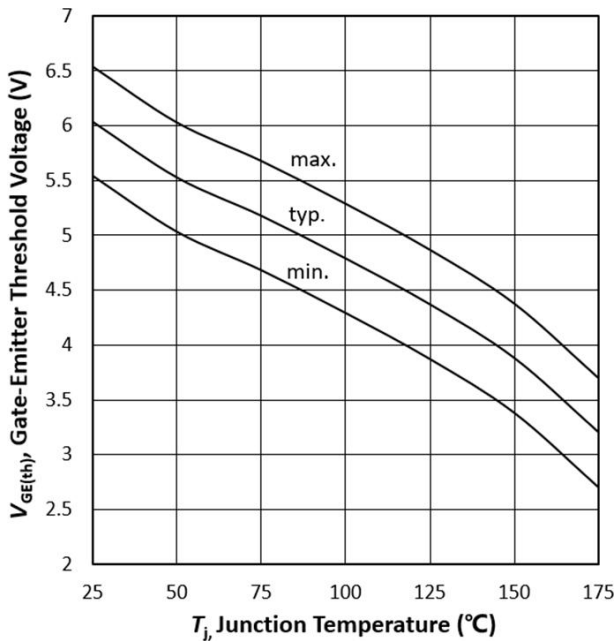


Figure 15. 栅极-发射极阈值电压与结温的关系
/Gate - emitter threshold voltage as a function of junction temperature ($I_C=1mA$)

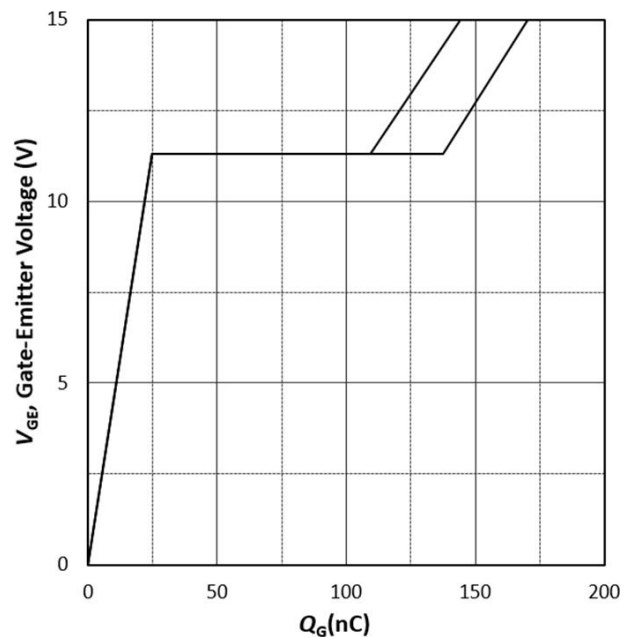


Figure 16. 典型栅极电荷/Typical gate charge ($I_C=25A$)

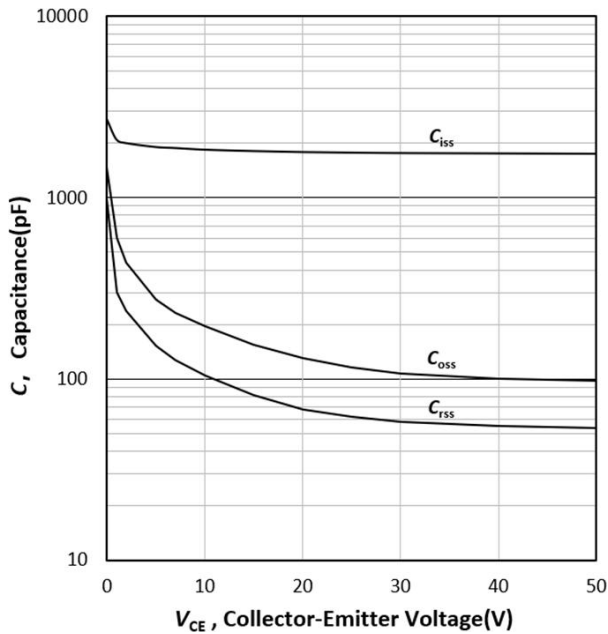


Figure 17. 典型电容与集电极-发射极电压的函数关系/Typical capacitance as a function of collector - emitter voltage ($V_{GE}=0V$, $f=1MHz$)

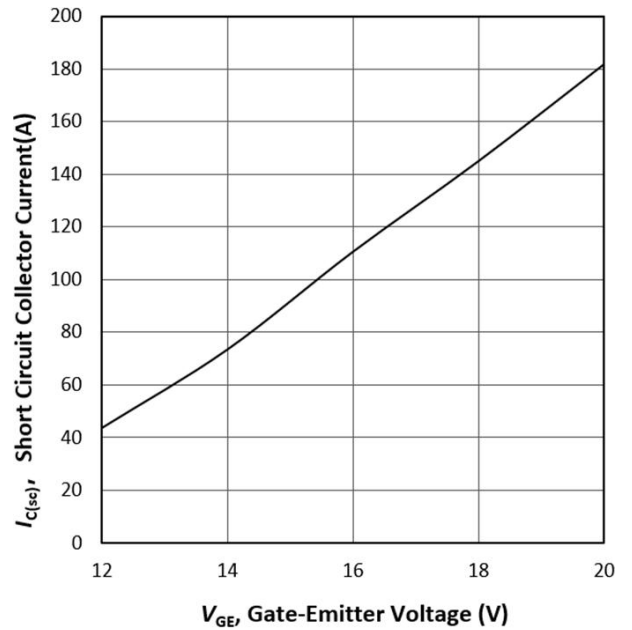


Figure 18. 典型短路集电极电流与栅极发射极电压/Typical short circuit collector current as a function of gate emitter voltage ($V_{CE} \leq 600V$, $T_j \leq 175^\circ C$)

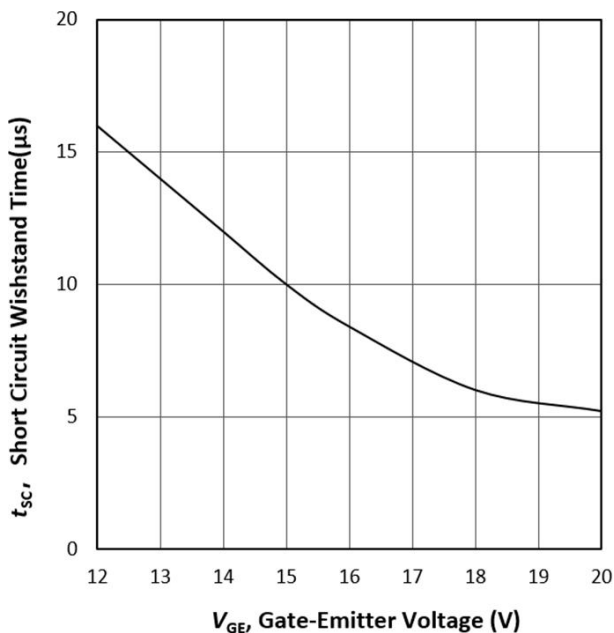


Figure 19. 典型短路耐受时间与栅极发射极电压的关系/Typical short circuit withstand time as a function of gate emitter voltage ($V_{CE}=600V$, start at $T_{jmax} \leq 175^\circ C$)

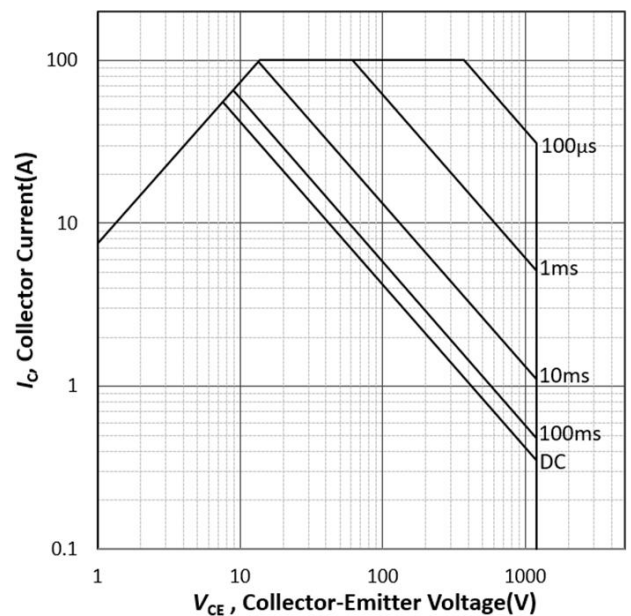


Figure 20. 正向偏置安全工作区/Forward Bias SOA ($D=0$, $T_C=25^\circ C$, $T_j \leq 175^\circ C$, $V_{GE}=15V$)

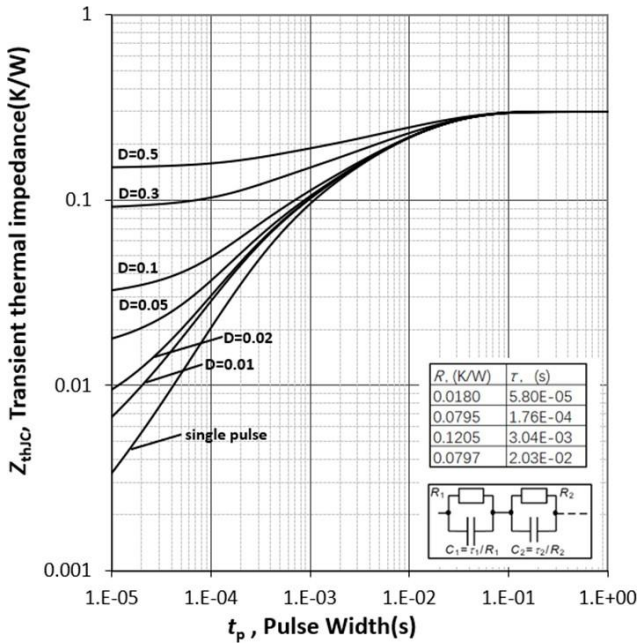


Figure 21. IGBT瞬态热阻（典型值）/IGBT transient thermal impedance(typical) ($D=t_p/T$)

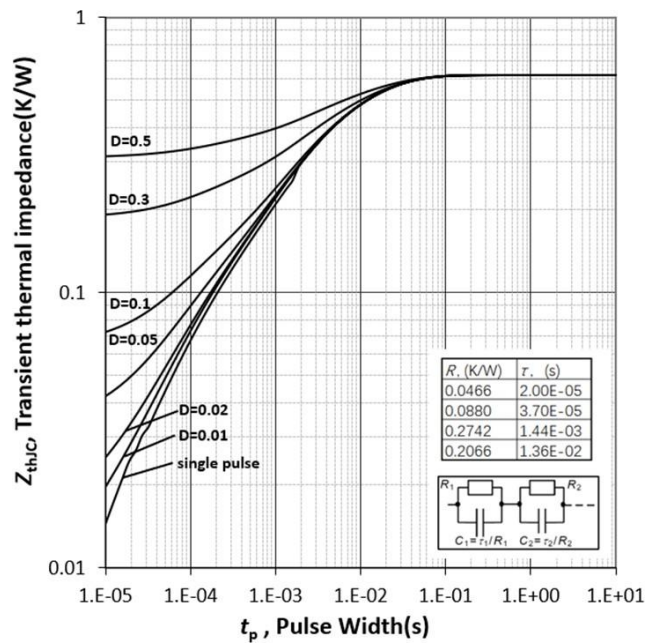


Figure 22. FRD瞬态热阻（典型值）/FRD transient thermal impedance(typical) ($D=t_p/T$)

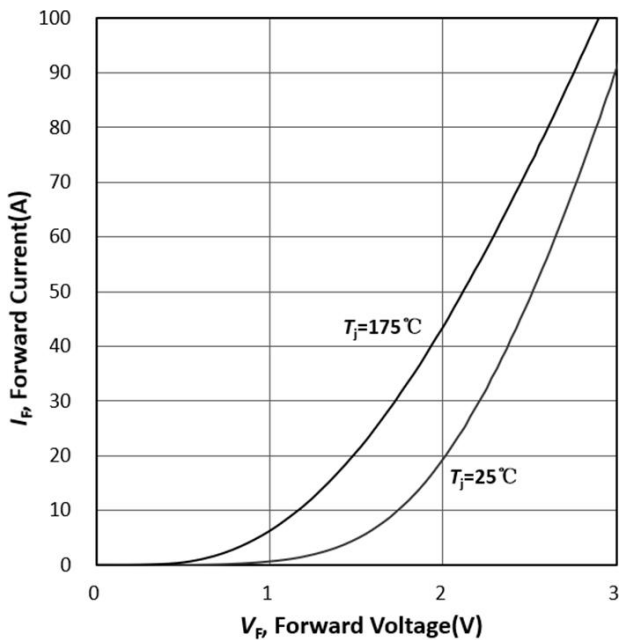


Figure 23. 典型二极管正向电流与正向电压的函数关系/Typical diode forward current as a function of forward voltage

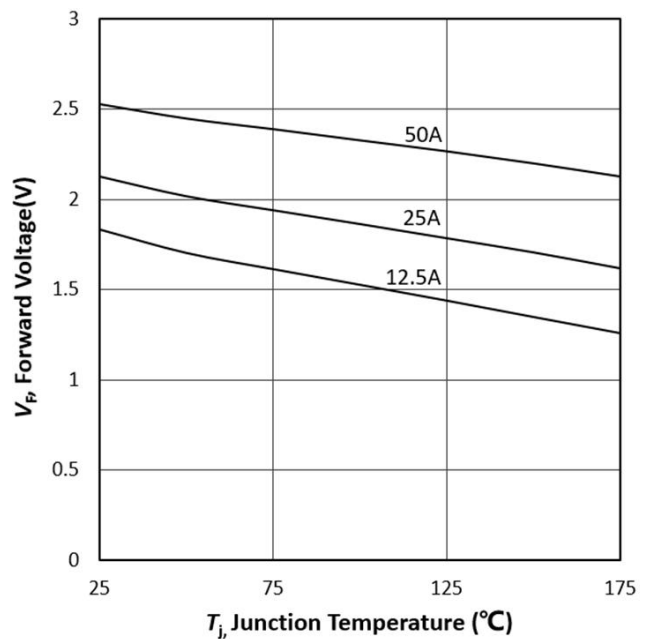


Figure 24. 典型二极管正向电压与结温的关系 /Typical diode forward voltage as a function of junction temperature

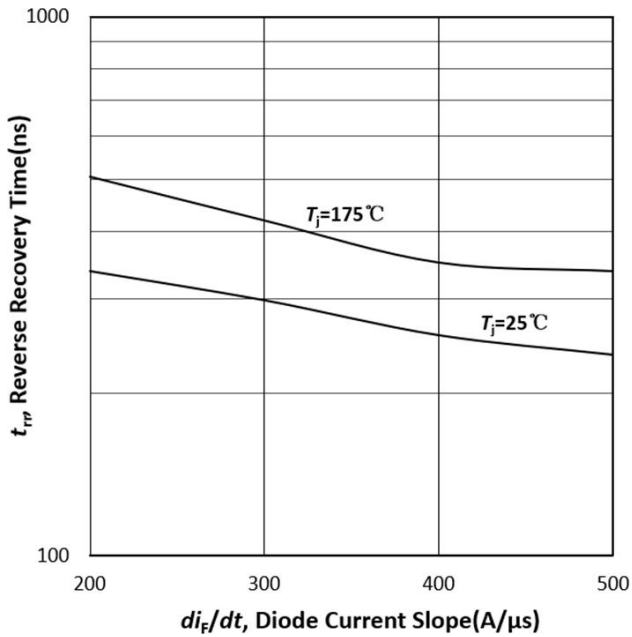


Figure 25. 典型反向恢复时间与二极管电流斜率关系/Typical reverse recovery time as a function of diode current slope ($V_R=600\text{V}$, $I_F=25\text{A}$, Dynamic test circuit in Figure E)

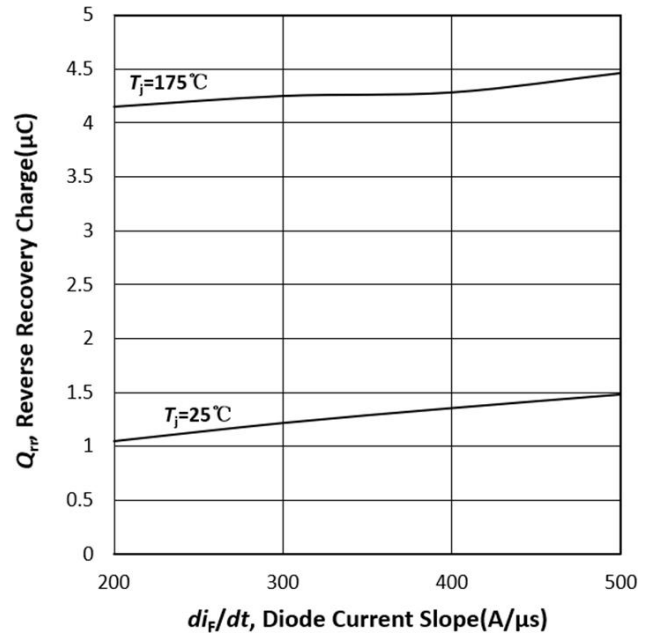


Figure 26. 典型反向恢复电荷与二极管电流斜率的关系/Typical reverse recovery charge as a function of diode current slope ($V_R=600\text{V}$, $I_F=25\text{A}$, Dynamic test circuit in Figure E)

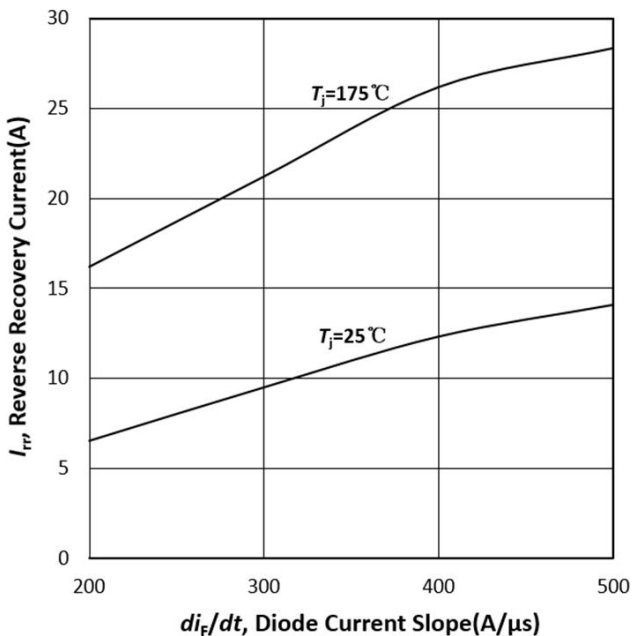


Figure 27. 典型反向恢复电流与二极管电流斜率的关系/Typical reverse recovery current as a function of diode current slope ($V_R=600\text{V}$, $I_F=25\text{A}$, Dynamic test circuit in Figure E)

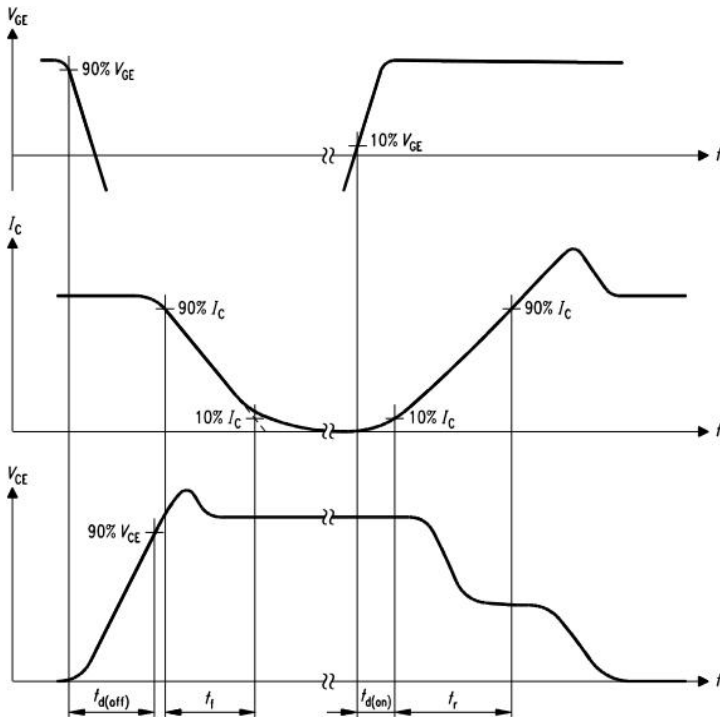


Figure A. 开关时间的定义
/Definition of switching times

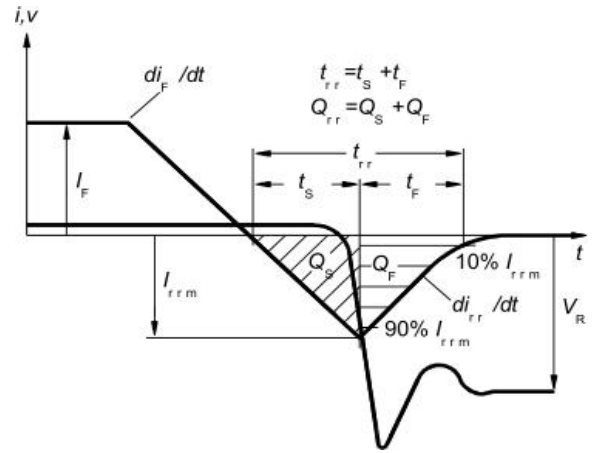


Figure C. 二极管开关特性的定义
/ Definition of diodes switching characteristics

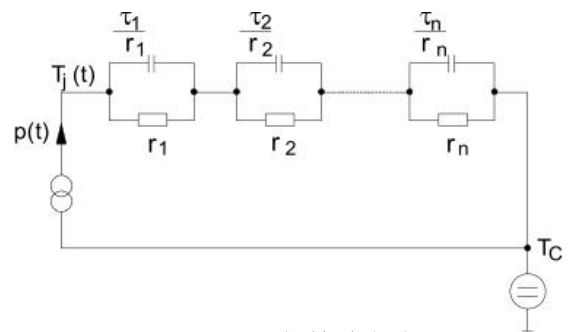


Figure D. 热等效电路/
Thermal equivalent circuit

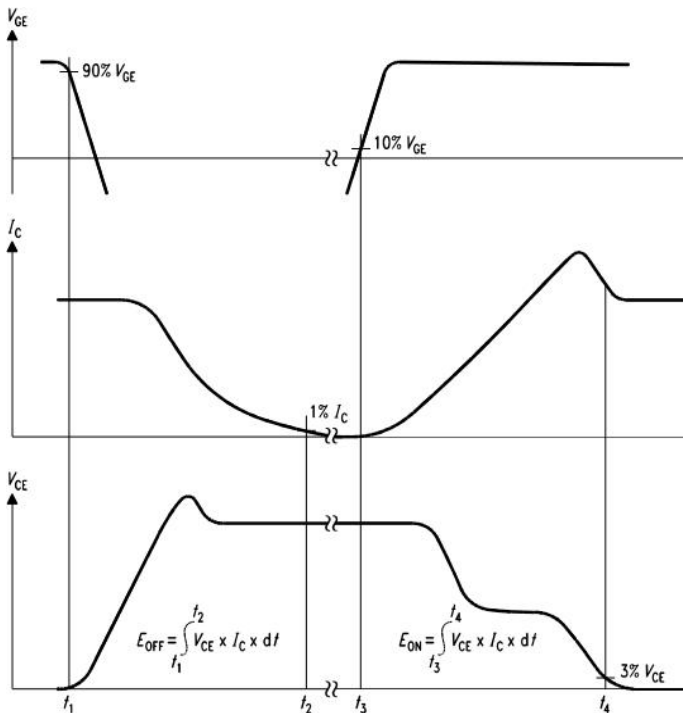


Figure B. 开关损耗的定义/
Definition of switching losses

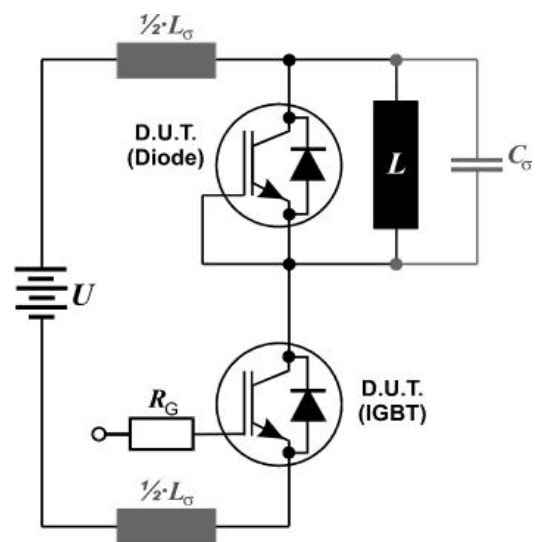
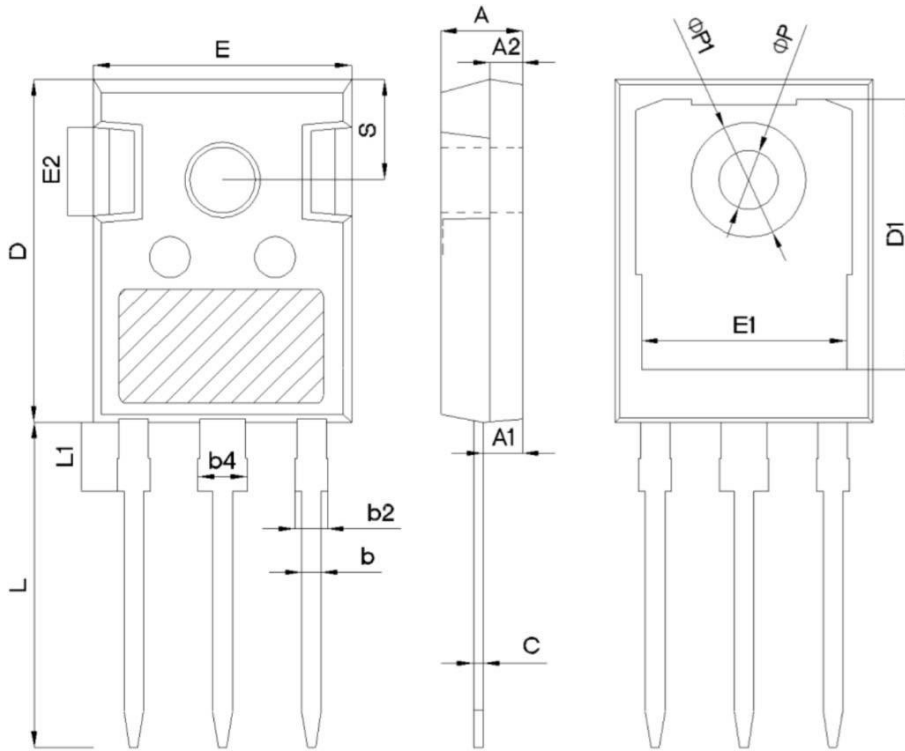


Figure E. 开关测试电路/Switching test circuit

TO-247



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15BSC		

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	2022-11
2.0	Update the English and Chinese versions	2023-04

使用条件和条款

- 1、本数据手册给出的产品规格、特性、数据、材料和结构如有更改，恕不另行通知；
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