

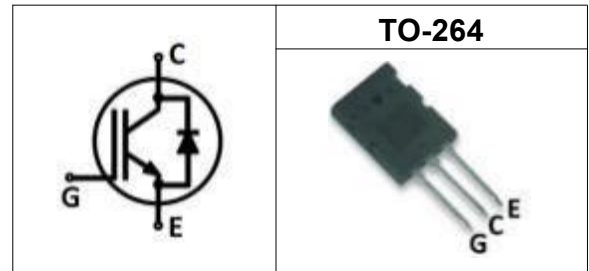
### 特征/Features

- 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

型号/Type	打标/Marking	封装/Package
QML75N120BF	QM75N120BF	TO-264

### 应用领域/ Applications

- 不间断电源/UPS
- 逆变焊机/Inverter welded



### 最大额定值/Maximum Rated Values<sup>1</sup>

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 $T_{vjmax}^2$	$I_C$	150 75	A
$T_C=25^\circ C$ $T_C=100^\circ C$			
集电极脉冲电流 Pulsed collector current, $t_p$ limited by $T_{vjmax}^3$	$I_{Cpuls}$	300	
二极管正向电流 Diode forward current, limited by $T_{vjmax}^2$	$I_F$	75	A
$T_C=25^\circ C$ $T_C=100^\circ C$			
二极管脉冲电流 Diode pulsed current, $t_p$ limited by $T_{vjmax}^3$	$I_{Fpuls}$	300	
栅极-发射极电压 Gate-emitter voltage	$V_{GE}$	$\pm 20$	V
短路承受时间 Short circuit withstand time <sup>4</sup>	$t_{SC}$	10	$\mu s$
$V_{GE}=15V, V_{CC}=600V, T_j \leq 150^\circ C$			
耗散功率 Power dissipation	$P_{tot}$	500 200	W
$T_C=25^\circ C$ $T_C=100^\circ C$			
工作结温 Operating junction temperature	$T_j$	- 55~150	$^\circ C$
储存温度 Storage temperature	$T_{stg}$	- 55~150	

1: Reference standard : JESD-022 2: limited by  $T_{jmax}$  3 :  $T_p$  limited by  $T_{jmax}$   
4: Allowed short circuit times : <1000 ; short circuit interval : >1s

## 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	$R_{thJCD}$	-	-	-	0.7	
结-环境热阻 Thermal Resistance, junction-ambient	$R_{thJA}$	-	-	-	25	

## 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	$V_{CE(sat)}$	$V_{GE}=15V,$ $I_C=75A$ $T_j=25^\circ\text{C}$	-	1.9	2.2	
二极管正向压降 Diode forward voltage	$V_F$	$V_{GE}=0V,$ $I_F=75A$ $T_j=25^\circ\text{C}$	-	2.3	-	
阈值电压 G-E threshold voltage	$V_{GE(th)}$	$I_C=2.4mA,$ $V_{CE}=V_{GE}$	5.0	6.0	7.0	
集电极-发射极漏电流 C-E leakage current	$I_{CES}$	$V_{CE}=1200V,$ $V_{GE}=0V$ $T_j=25^\circ\text{C}$ $T_j=150^\circ\text{C}$	- -	- -	0.1 4	mA
栅极-发射极漏电流 G-E leakage current	$I_{GES}$	$V_{CE}=0V,$ $V_{GE}=20V$	-	-	250	nA
跨导 Transconductance	$g_{FS}$	$V_{CE}=20V,$ $I_C=75A$	-	30	-	S

## 动态特性/Dynamic Characteristics

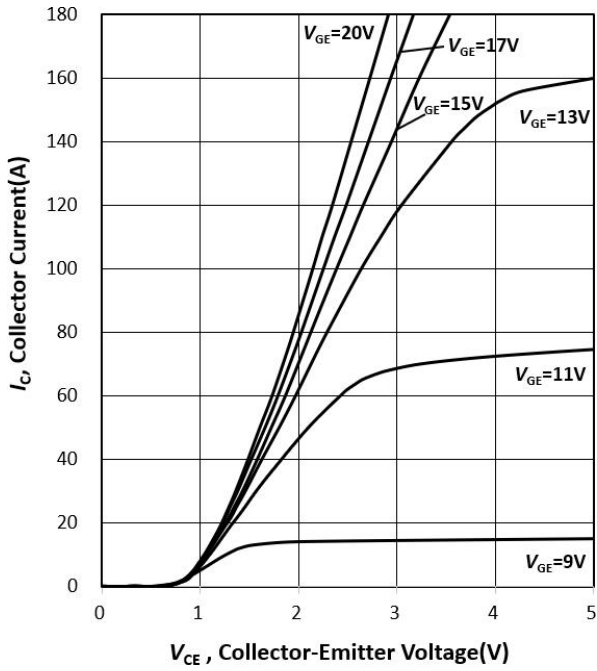
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
输入电容 Input capacitance	$C_{iss}$	$V_{CE}=25V,$ $V_{GE}=0V,$ $f=1MHz$	-	5235	-	pF
输出电容 Output capacitance	$C_{oss}$		-	400	-	
反馈电容 Reverse transfer capacitance	$C_{rss}$		-	192	-	
栅电荷 Gate charge	$Q_G$	$V_{CC}=600V,$ $I_C=75A,$ $V_{GE}=15V$	-	622	-	nC

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

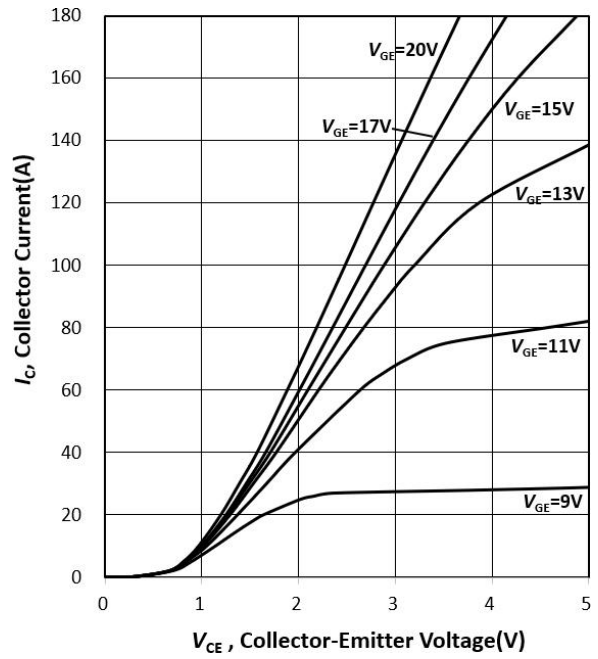
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
开通延迟时间 Turn-on delay time	$t_{d(on)}$	$T_j=25^\circ\text{C}$ , $V_{CC}=600\text{V}$ , $I_C=75\text{A}$ , $V_{GE}=0/15\text{V}$ , $R_G=6\Omega$ , Inductive load	-	92	-	ns
上升时间 Rise time	$t_r$		-	163	-	
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	329	-	
下降时间 Fall time	$t_f$		-	90	-	mJ
开通损耗 Turn-on energy	$E_{on}$		-	12.5	-	
关断损耗 Turn-off energy	$E_{off}$		-	3.7	-	
开关损耗 Total switching energy	$E_{is}$		-	16.2	-	

## 二极管开关特性/Diode Characteristics

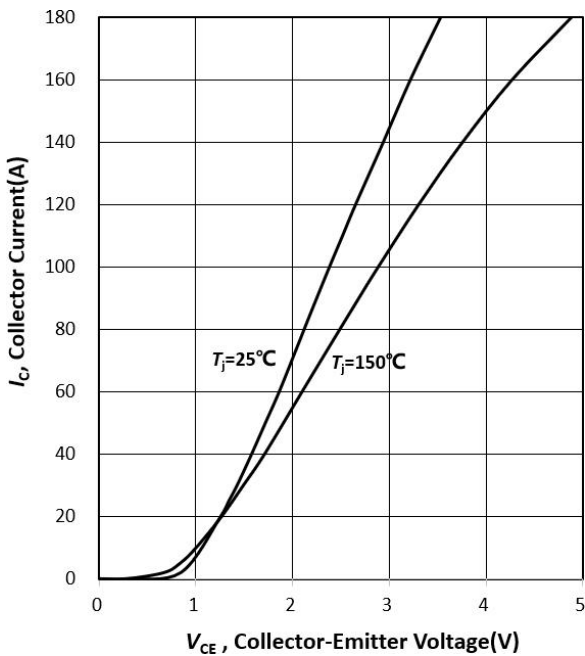
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
反向恢复时间 Diode reverse recovery time	$t_{rr}$	$T_j=25^\circ\text{C}$ , $V_R=600\text{V}$ , $I_F=75\text{A}$ , $di_F/dt=340\text{A}/\mu\text{s}$	-	307	-	ns
反向恢复电荷 Diode reverse recovery charge	$Q_{rr}$		-	1.53	-	$\mu\text{C}$
反向恢复峰值电流 Diode peak reverse recovery current	$I_{rrm}$		-	17	-	A



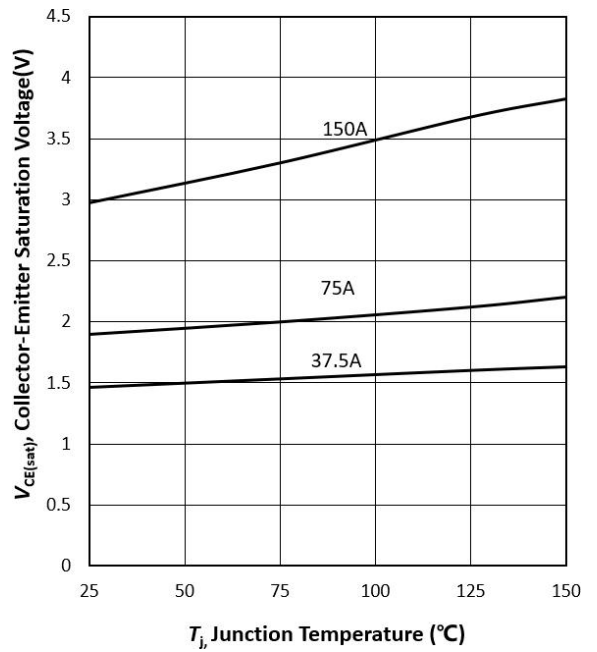
**Figure 1. 典型输出特性/  
Typical output characteristic  
( $T_j=25^{\circ}\text{C}$ )**



**Figure 2. 典型输出特性/  
Typical output characteristic  
( $T_j=150^{\circ}\text{C}$ )**



**Figure 3 典型饱和压降特性/Typical saturation  
pressure drop characteristics ( $V_{GE}=15\text{V}$ )**



**Figure 4 饱和压降温度特性/Saturation voltage drop  
temperature characteristics ( $V_{GE}=15\text{V}$ )**

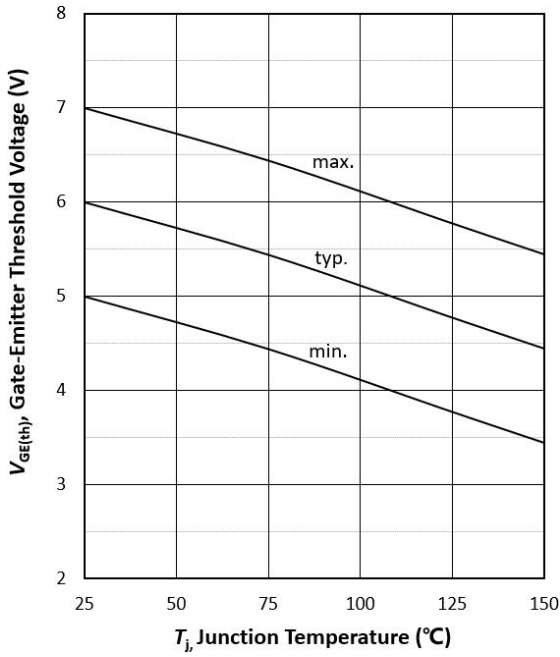


Figure 5 阈值电压温度特性/ $V_{GE(th)}$  Threshold voltage temperature characteristics ( $I_C=2.4mA$ )

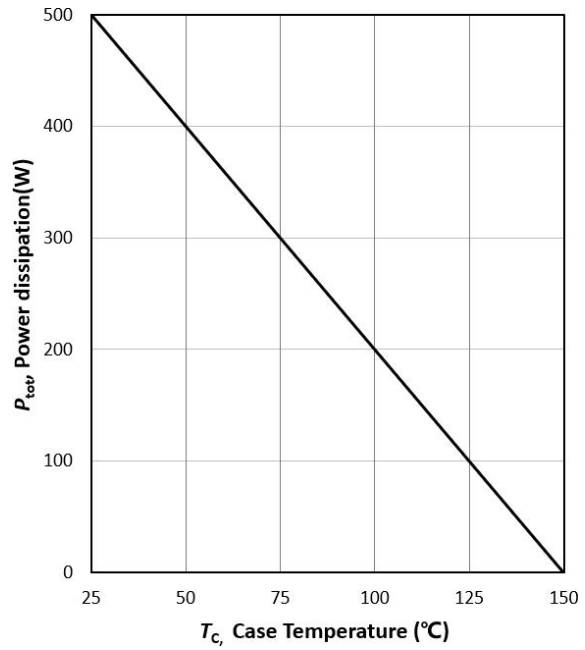


Figure 6. 功耗与外壳温度的关系/  
Power dissipation as a function of case temperature ( $T_j \leq 175^\circ C$ )

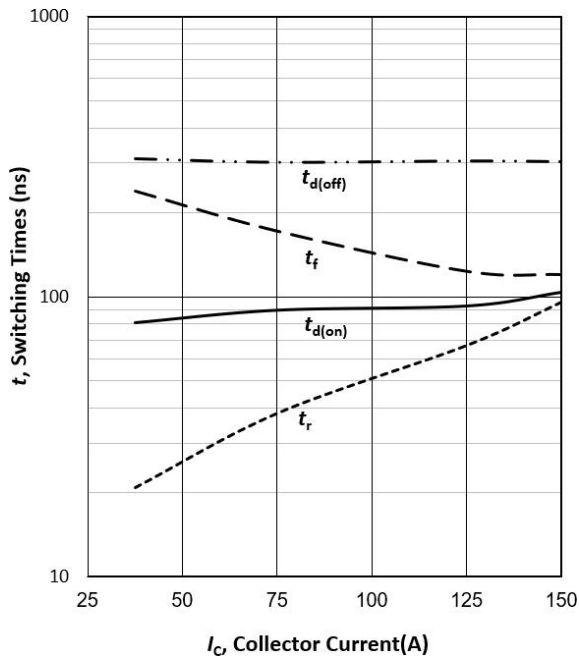


Figure 7. 典型开关时间与集电极电流的关系  
/Typical switching times as a function of collector current (inductive load,  $T_{vj}=25^\circ C, V_{CE}=600V, V_{GE}=0/15V, R_G=7.5\Omega$ )

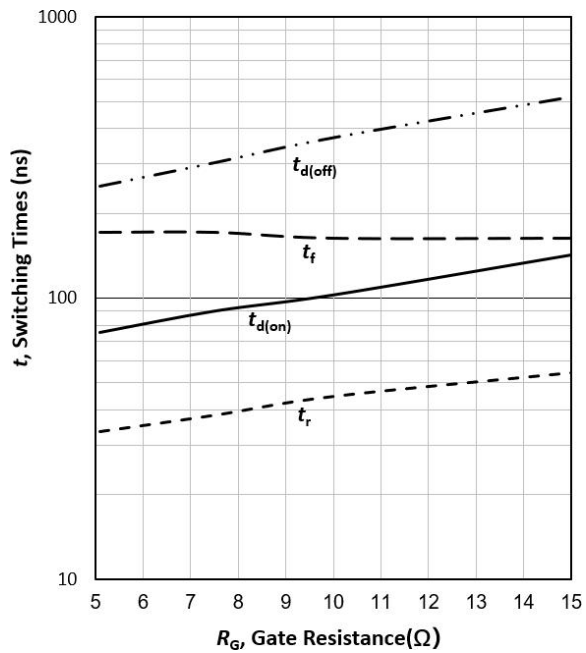
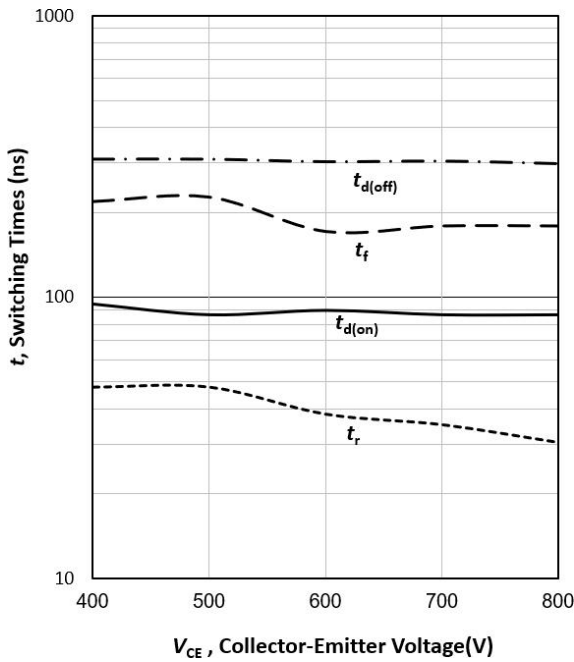
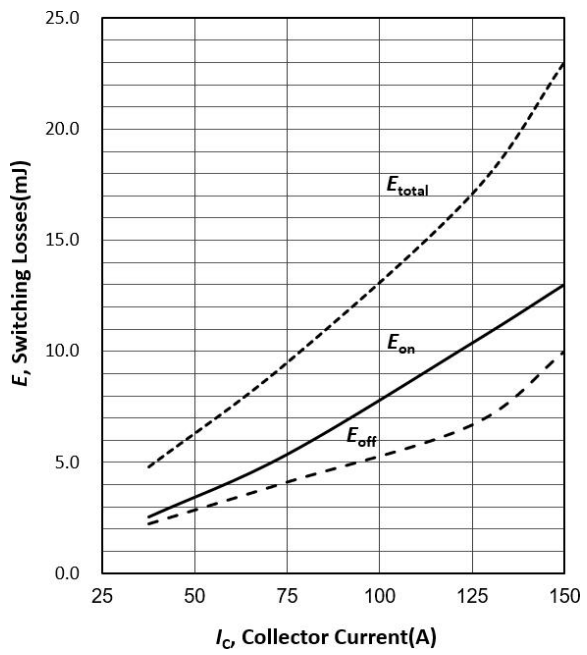


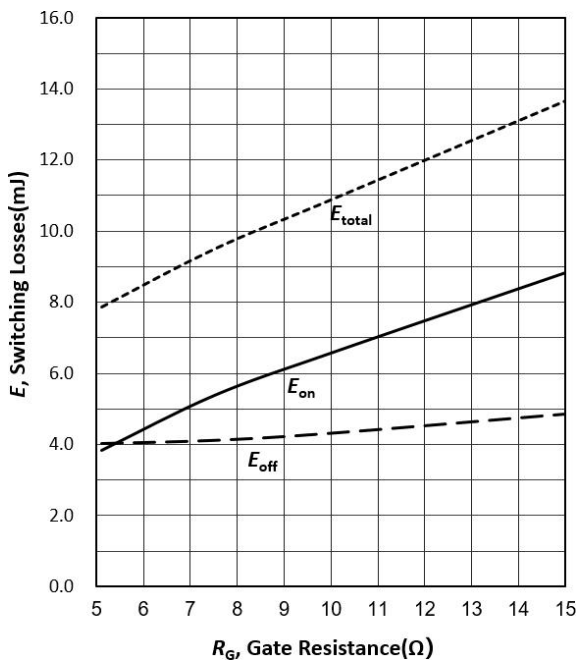
Figure 8. 典型开关时间与栅极电阻的关系  
/Typical switching times as a function of gate resistor (inductive load,  $T_{vj}=75^\circ C, V_{CE}=600V, V_{GE}=0/15V, I_C=75A$ )



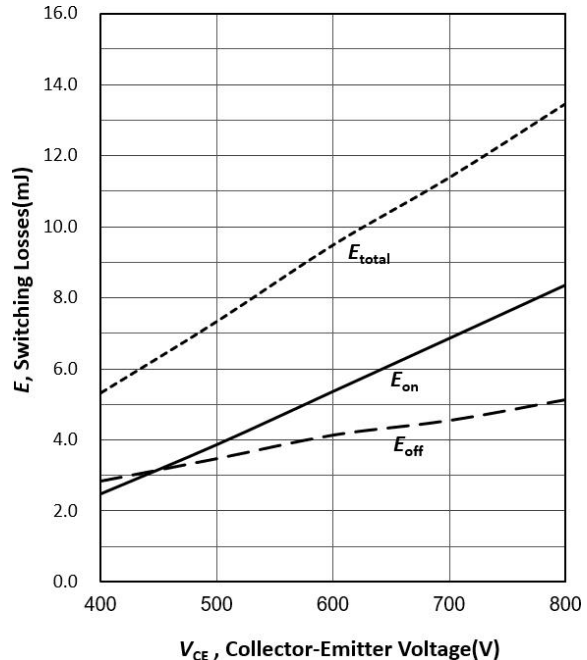
**Figure 9** 开关时间与集电极-发射极电压的关系/Switching time vs. collector-emitter voltage  
(inductive load,  $T_{vj}=25^{\circ}\text{C}$ ,  $V_{GE}=0/15\text{V}$ ,  $I_C=75\text{A}$ ,  $R_G=7.5\Omega$ )



**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,  $T_{vj}=25^{\circ}\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $R_G=7.5\Omega$ )



**Figure 11.** 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,  $T_{vj}=25^{\circ}\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $I_C=75\text{A}$ )



**Figure 12.** 开关损耗与集电极-发射极电压的关系 /Switching loss vs. collector-emitter voltage  
(inductive load,  $T_{vj}=25^{\circ}\text{C}$ ,  $V_{GE}=0/15\text{V}$ ,  $I_C=75\text{A}$ ,  $R_G=7.5\Omega$ )

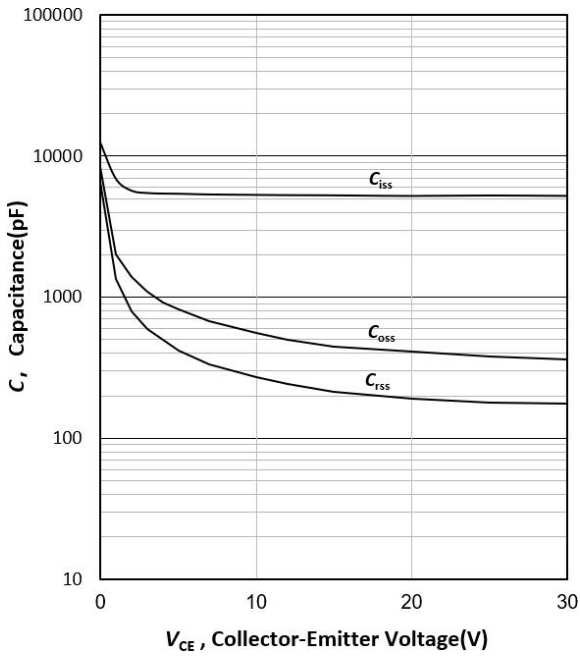


Figure 13 电容与集电极-发射极电压的关系/Capacitance characteristic ( $V_{GE}=0V, f=1MHz$ )

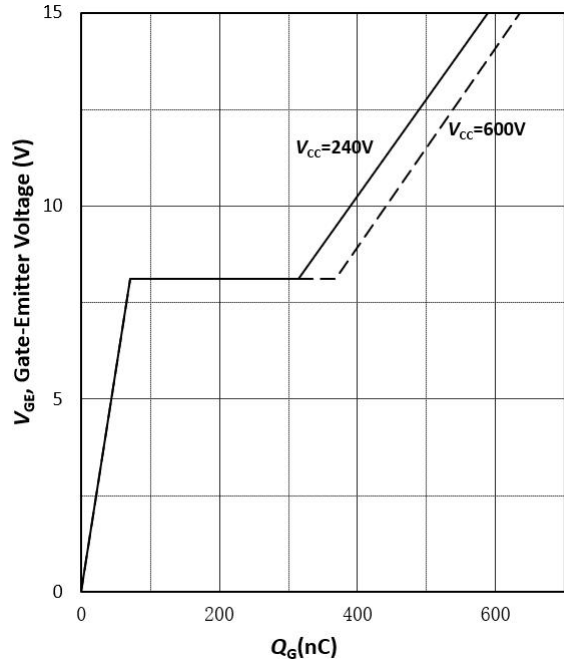


Figure 14. 典型栅极电荷/  
Typical gate charge

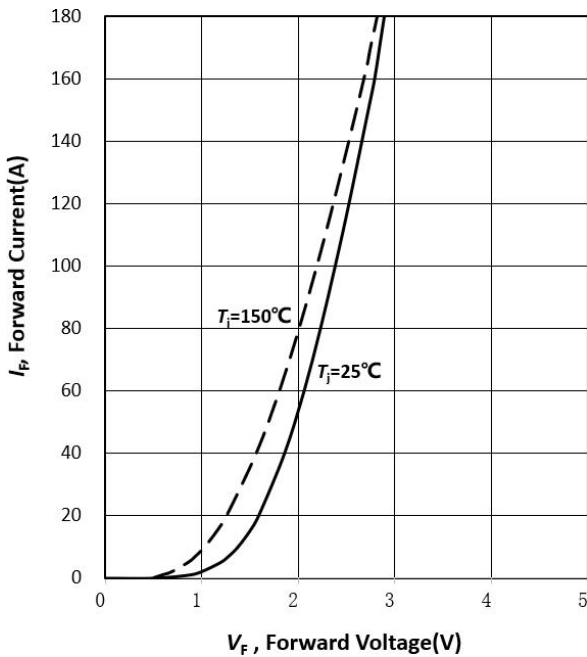


Figure 15. 二极管正向特性  
/Typical diode forward current as a function of forward voltage

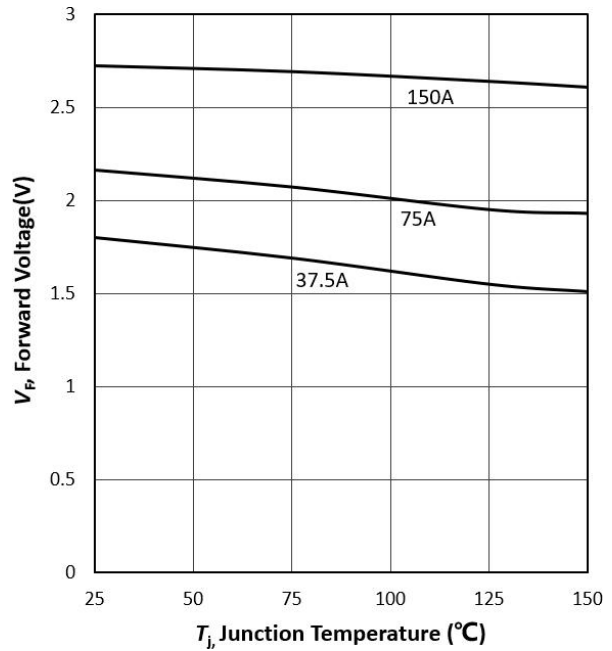


Figure 16. 二极管正向压降与结温的关系  
/Typical diode forward voltage as a function of junction temperature



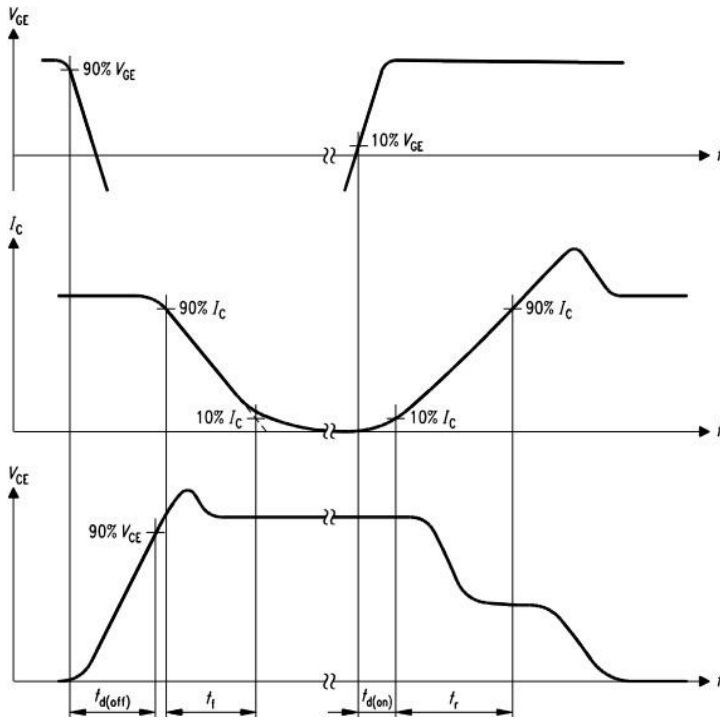


Figure A. 开关时间的定义/Definition of switching times

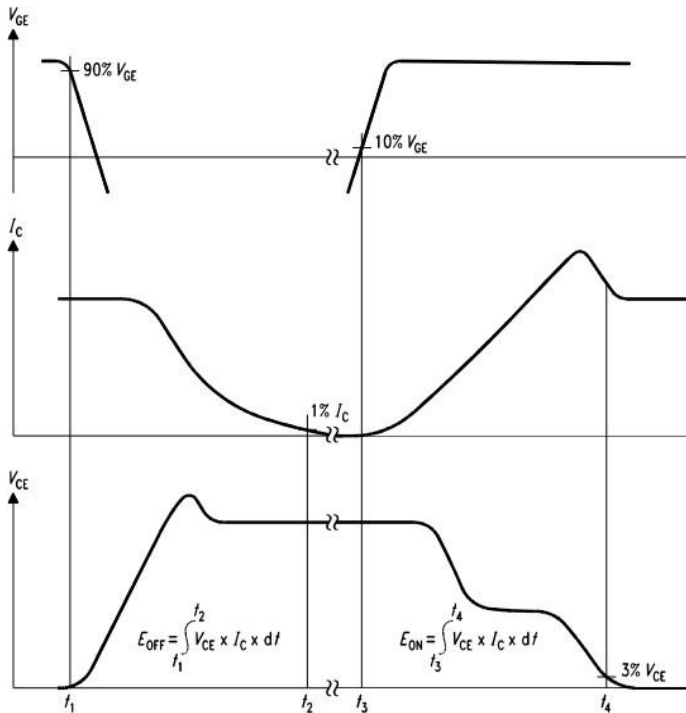


Figure B. 开关损耗的定义/  
Definition of switching losses

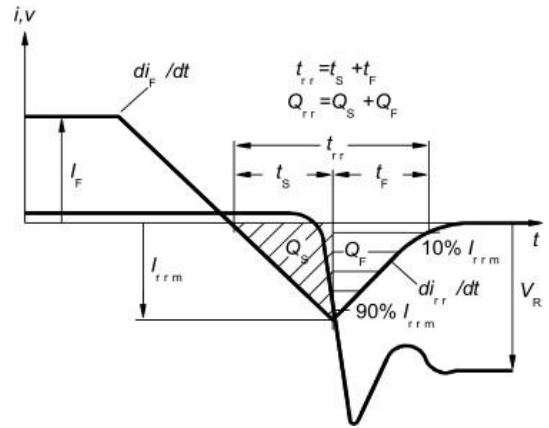


Figure C. 二极管开关特性的定义  
/Definition of diodes switching characteristics

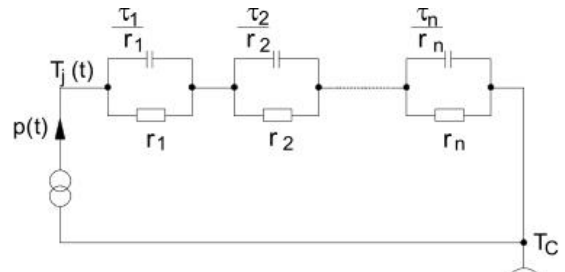


图 D 热等效电路

Figure D Thermally equivalent circuit

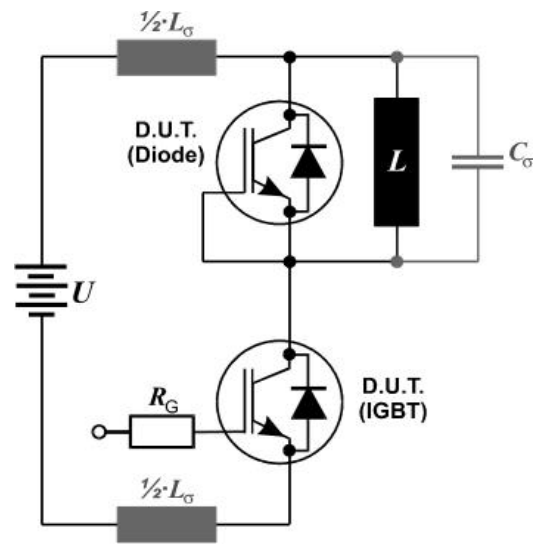


Figure D. 开关测试电路/  
Switching test circuit





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