

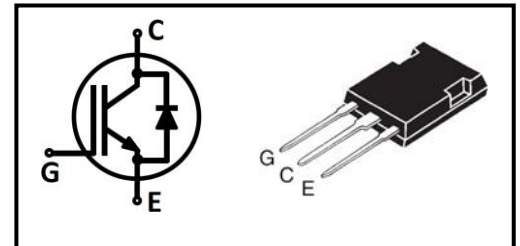
特征/Features

- 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
QMQ120N65GSF	QM120N65GSF	TO-247-3L Plus

应用领域/Applications

- 电机驱动/Motor drives
- 主逆变器/Main inverter
- PTC加热器/PTC heater
- 气候压缩机/Climate Compressor



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}	650	V
集电极电流 DC collector current ²	I_C	160	A
$T_C=25^\circ\text{C}$		120	
$T_C=100^\circ\text{C}$		480	
集电极脉冲电流 Pulsed collector current ³	I_{Cpuls}	480	
二极管正向电流 Diode forward current ²	I_F	160	
$T_C=25^\circ\text{C}$		120	
$T_C=100^\circ\text{C}$		480	
二极管脉冲电流 Diode pulsed current ³	I_{Fpuls}	480	
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 ($t_p \leq 10\mu\text{s}$)		± 30	
短路耐受时间 Short circuit withstand time $V_{GE}=15.0\text{V}, V_{CE}=400\text{V}, T_C=25^\circ\text{C}$	t_{SC}	5	μs
耗散功率 Power dissipation	P_{tot}	834	W
$T_C=25^\circ\text{C}$		417	
$T_C=100^\circ\text{C}$			
工作结温 Operating junction temperature	T_j	-55~175	$^\circ\text{C}$
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} ;

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}	-	-	-	0.18	K/W
二极管结-外壳热阻 Diode thermal resistance, junction-case	R_{thJCD}	-	-	-	0.32	
结-环境热阻 Thermal Resistance, junction-ambient	R_{thJA}	-	-	-	40	

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	$V_{(BR)CES}$	$V_{GE}=0V$, $I_C=0.25mA$	650	-	-	V
集电极-发射极饱和电压 Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V$, $I_C=120A$ $T_j=25^\circ\text{C}$	-	1.30	1.60	
		$T_j=125^\circ\text{C}$	-	1.42	-	
		$T_j=150^\circ\text{C}$	-	1.45	-	
二极管正向压降 Diode forward voltage	V_F	$V_{GE}=0V$, $I_F=120A$ $T_j=25^\circ\text{C}$	-	1.71	2.1	
		$T_j=125^\circ\text{C}$	-	1.55	-	
		$T_j=150^\circ\text{C}$	-	1.50	-	
阈值电压 G-E threshold voltage	$V_{GE(th)}$	$I_C=1.6mA$, $V_{CE}=V_{GE}$	4.0	5.0	6.0	
集电极-发射极漏电流 C-E leakage current	I_{CES}	$V_{CE}=650V$, $V_{GE}=0V$ $T_j=25^\circ\text{C}$	-	-	0.01	mA
		$T_j=150^\circ\text{C}$	-	-	1.0	
栅极-发射极漏电流 G-E leakage current	I_{GES}	$V_{CE}=0V$, $V_{GE}=20V$	-	-	250	nA

动态特性/Dynamic Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
输入电容 Input capacitance	C_{iss}	$V_{CE}=25V$, $V_{GE}=0V$, $f=1MHz$	-	10963	-	pF
输出电容 Output capacitance	C_{oss}		-	473	-	
反馈电容 Reverse transfer capacitance	C_{rss}		-	94	-	
栅电荷 Gate charge	Q_G	$V_{CC}=300V$, $I_C=120A$, $V_{GE}=15V$	-	404	-	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	$t_{d(on)}$	$T_j=25^\circ\text{C}$, $V_{CC}=400\text{V}$, $I_C=120\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, <i>Inductive load</i>	-	143	-	ns	
上升时间 Rise time	t_r		-	84	-		
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	492	-		
下降时间 Fall time	t_f			-	163	-	
开通损耗 Turn-on energy	E_{on}			-	3.46	-	mJ
关断损耗 Turn-off energy	E_{off}			-	7.79	-	
开关损耗 Total switching energy	E_{ts}			-	11.25	-	
开通延迟时间 Turn-on delay time	$t_{d(on)}$		$T_j=150^\circ\text{C}$, $V_{CC}=400\text{V}$, $I_C=120\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, <i>Inductive load</i>	-	138	-	ns
上升时间 Rise time	t_r			-	93	-	
关断延迟时间 Turn-off delay time	$t_{d(off)}$	-		569	-		
下降时间 Fall time	t_f			-	171	-	
开通损耗 Turn-on energy	E_{on}			-	6.84	-	mJ
关断损耗 Turn-off energy	E_{off}			-	8.62	-	
开关损耗 Total switching energy	E_{ts}			-	15.46	-	

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}	$T_j=25^\circ\text{C}$, $V_R=400\text{V}$, $I_F=120\text{A}$, $di_F/dt=1000\text{A}/\mu\text{s}$	-	58	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	0.715	-	μC
反向恢复峰值电流 Diode peak reverse recovery current	I_{rrm}		-	19	-	A
反向恢复时间 Diode reverse recovery time	t_{rr}	$T_j=150^\circ\text{C}$, $V_R=400\text{V}$, $I_F=120\text{A}$, $di_F/dt=1000\text{A}/\mu\text{s}$	-	139	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	3.135	-	μC
反向恢复峰值电流 Diode peak reverse recovery current	I_{rrm}		-	35	-	A

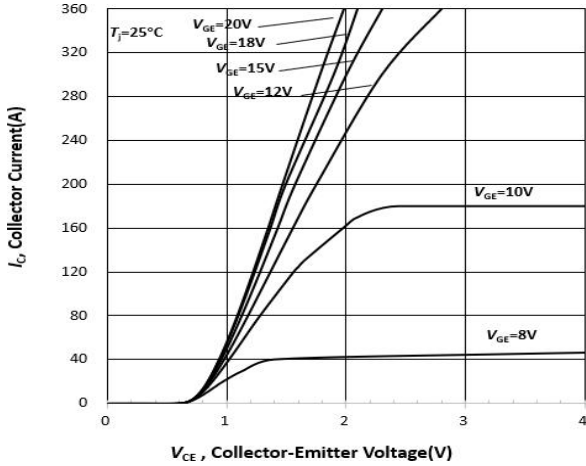


Figure 1. 典型输出特性/Typical output characteristic($T_j = 25^\circ\text{C}$)

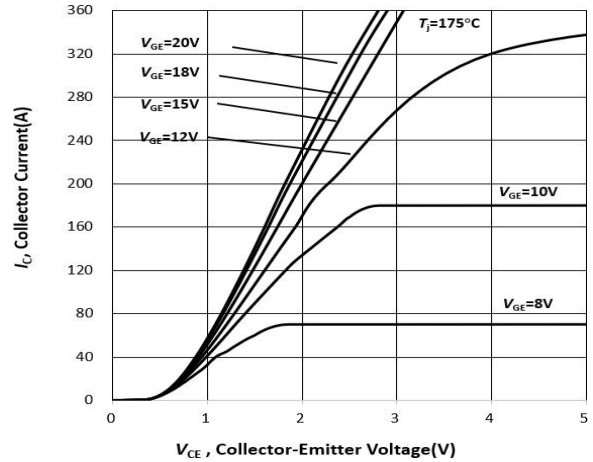


Figure 2. 典型输出特性/Typical output characteristic($T_j = 175^\circ\text{C}$)

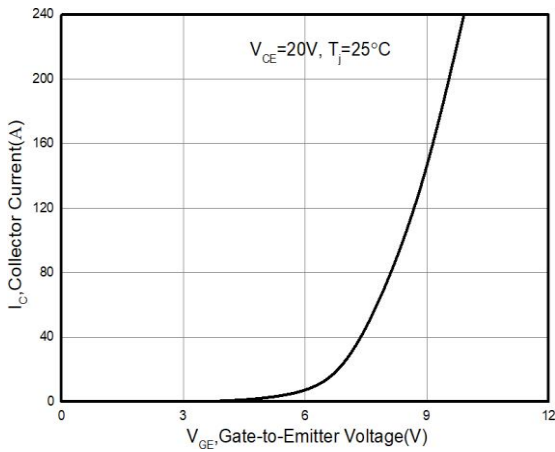


Figure 3. 典型传输特性/Typical transfer characteristic($T_j = 25^\circ\text{C}$)

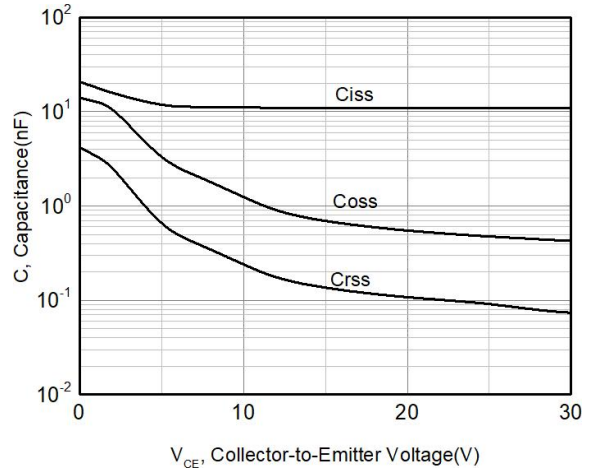


Figure 4. 电容特性/Capacitance characteristic ($V_{GE}=0\text{V}$, $f=1\text{MHz}$)

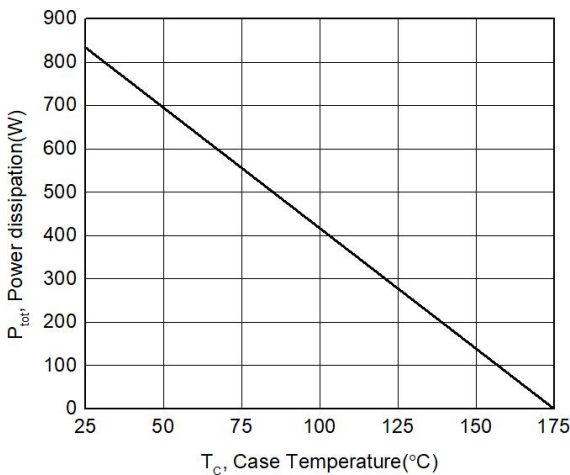


Figure 5. 功耗与外壳温度的关系曲线/ Power dissipation as a function of case temperature ($T_j \leq 175^\circ\text{C}$)

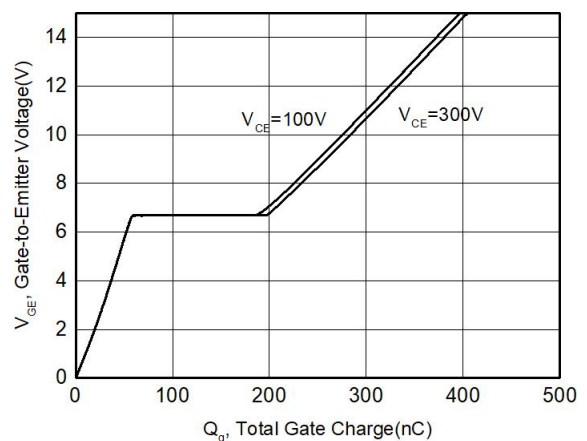
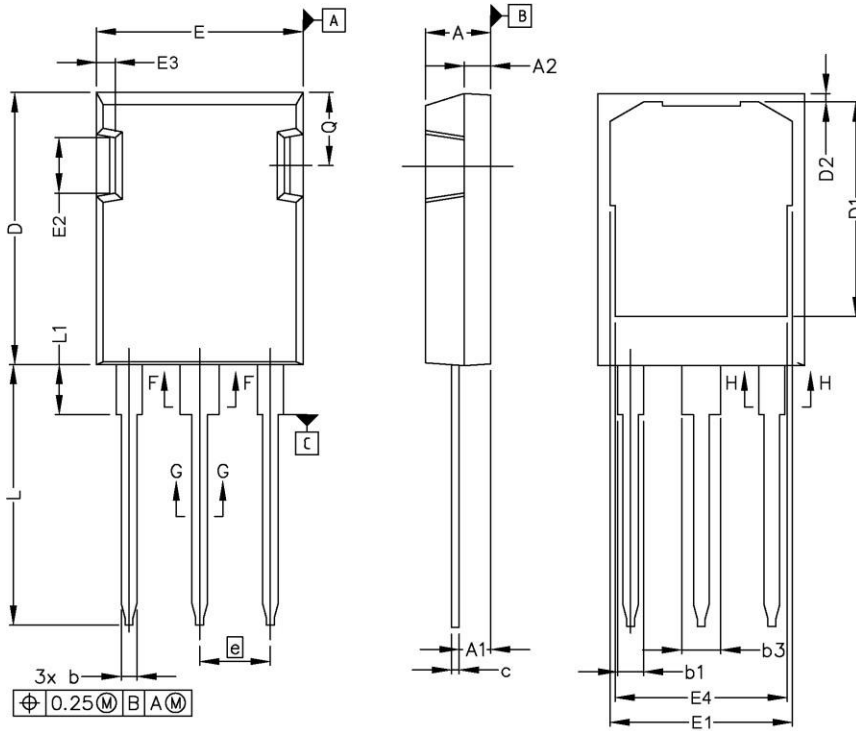


Figure 6. 典型栅极电荷/Typical gate charge ($I_c=50\text{A}$)

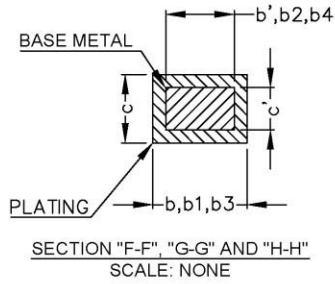
TO-247-3L Plus



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 & TOLERANCING 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)



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	2023-01-27
2.0	Update the English and Chinese versions	2023-04

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