

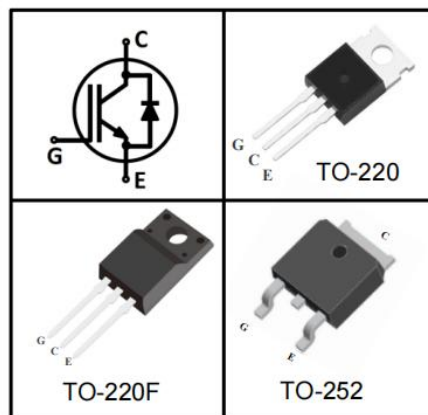
特征/Features

- 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
QMP10N65EF	QM10N65EF	TO-220-3
QMA10N65EF	QM10N65EF	TO-220F-3
QMD10N65EF	QM10N65EF	TO-252

应用领域/Applications

- 电机驱动/Motor Drives



最大额定值/Maximum Rated Values¹

Item	Symbol	Value			Unit	
		220	220F	252		
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	15			A	
$T_C=25^\circ\text{C}$						
$T_C=100^\circ\text{C}$						
集电极脉冲电流 Pulsed collector current ³	I_{Cpuls}	20			A	
二极管正向电流 Diode forward current ²	I_F	20				
$T_C=25^\circ\text{C}$						
$T_C=100^\circ\text{C}$						
二极管脉冲电流 Diode pulsed current ³	I_{Fpuls}	24			A	
短路承受时间 Short circuit withstanding time $V_{GE} = 15\text{V}, V_{CC} \leq 400\text{V}, T_J \leq 150^\circ\text{C}$	t_{SC}	5				us
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				
耗散功率 Power dissipation	P_{tot}	115 32 68			W	
$T_C=25^\circ\text{C}$						
$T_C=100^\circ\text{C}$						
工作结温 Operating junction temperature	T_J	-55~175			°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	Max.			Unit
			220	220F	252	
结-外壳热阻 IGBT thermal resistance, junction-case	R_{thJC}	-	1.3	4.6	2.2	K/W
二极管结-外壳热阻 Diode thermal resistance, junction-case	R_{thJCD}	-	2.4	4.6	2.9	
结-环境热阻 Thermal Resistance, junction-ambient	R_{thJA}	-	62.5	65	62.5	

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	$V_{CE(sat)}$	$V_{GE}=15V,$ $I_C=10A$ $T_j=25^\circ\text{C}$	-	1.40	1.80		
		$T_j=125^\circ\text{C}$	-	1.65	-		
		$T_j=150^\circ\text{C}$	-	1.85	-		
二极管正向压降 Diode forward voltage	V_F	$V_{GE}=0V,$ $I_F=10A$ $T_j=25^\circ\text{C}$	-	1.65	1.95		
		$T_j=125^\circ\text{C}$	-	1.30	-		
		$T_j=150^\circ\text{C}$	-	1.20	-		
阈值电压 G-E threshold voltage	$V_{GE(th)}$	$I_C=150\mu A,$ $V_{CE}=V_{GE}$	4.5	5.5	6.5		
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	
跨导 Transconductance	g_{FS}	$V_{CE}=20V,$ $I_C=10A$	-	5	-	S	

动态特性/Dynamic Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
输入电容 Input capacitance	C_{iss}	$V_{CE}=25V,$ $V_{GE}=0V,$ $f=1MHz$	-	1000	-	pF
输出电容 Output capacitance	C_{oss}		-	45	-	
反馈电容 Reverse transfer capacitance	C_{rss}		-	16	-	
栅电荷 Gate charge	Q_G	$V_{CC}=300V, I_C=10A,$ $V_{GE}=15V$	-	58	-	nC

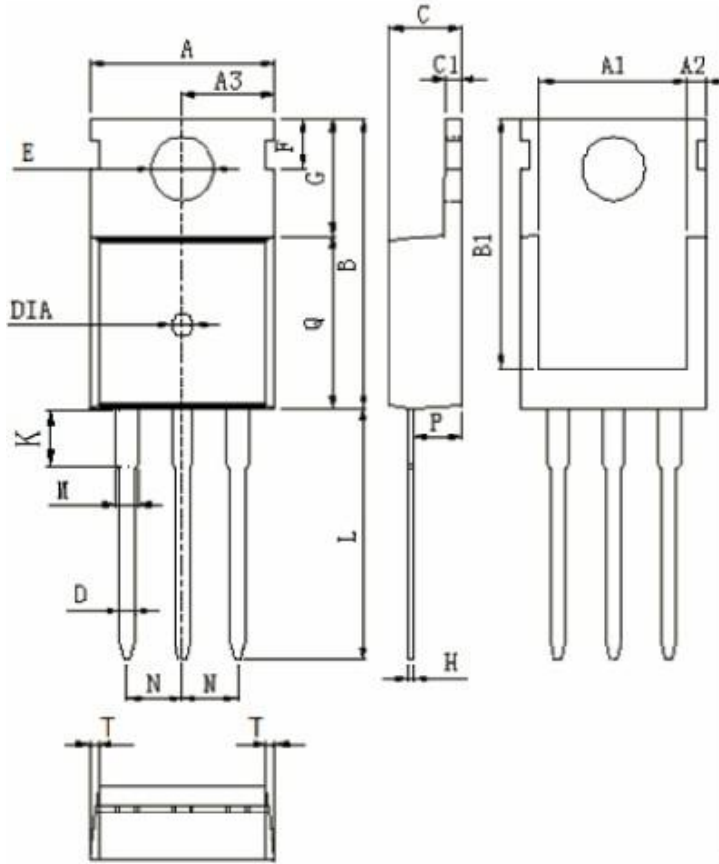
二极管开关特性/Diode

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
反向恢复时间 Diode reverse recovery time	t_{rr}	$T_j=25^{\circ}\text{C}$, $V_R=400\text{V}$, $I_F=10\text{A}$, $di_F/dt=570\text{A/us}$	-	66	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	0.23	-	μC
反向恢复峰值电流 Diode peak reverse recovery current	I_{rrm}		-	5.55	-	A

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	$t_{d(on)}$	$T_j=25^{\circ}\text{C}$, $V_{CC}=400\text{V}$, $I_C=10\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Inductive load	-	47	-	ns
上升时间 Rise time	t_r		-	28	-	
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	103	-	
下降时间 Fall time	t_f		-	87	-	mJ
开通损耗 Turn-on energy	E_{on}		-	0.17	-	
关断损耗 Turn-off energy	E_{off}		-	0.20	-	
开关损耗 Total switching energy	E_{ts}		-	0.37	-	

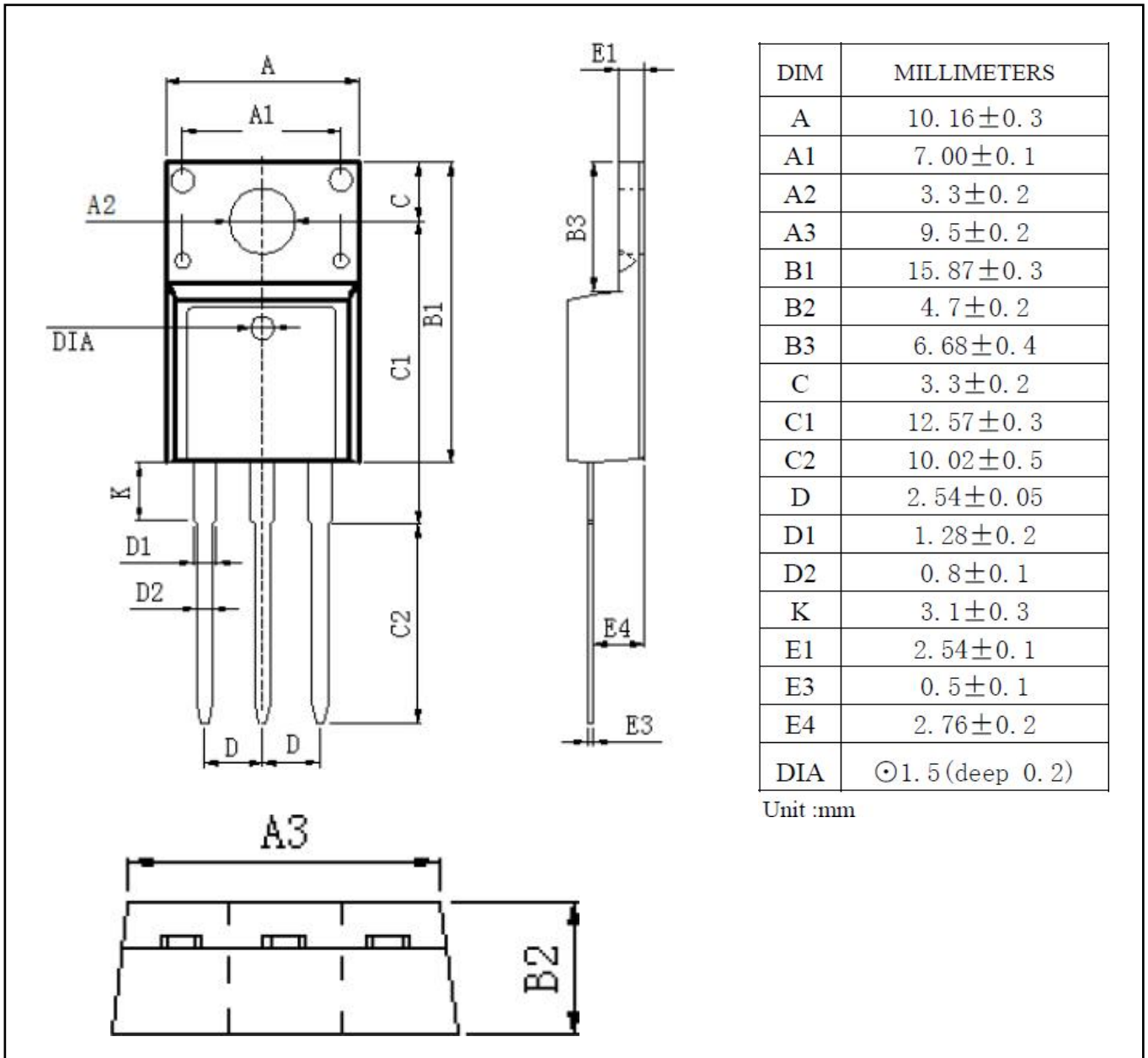
TO-220-3L



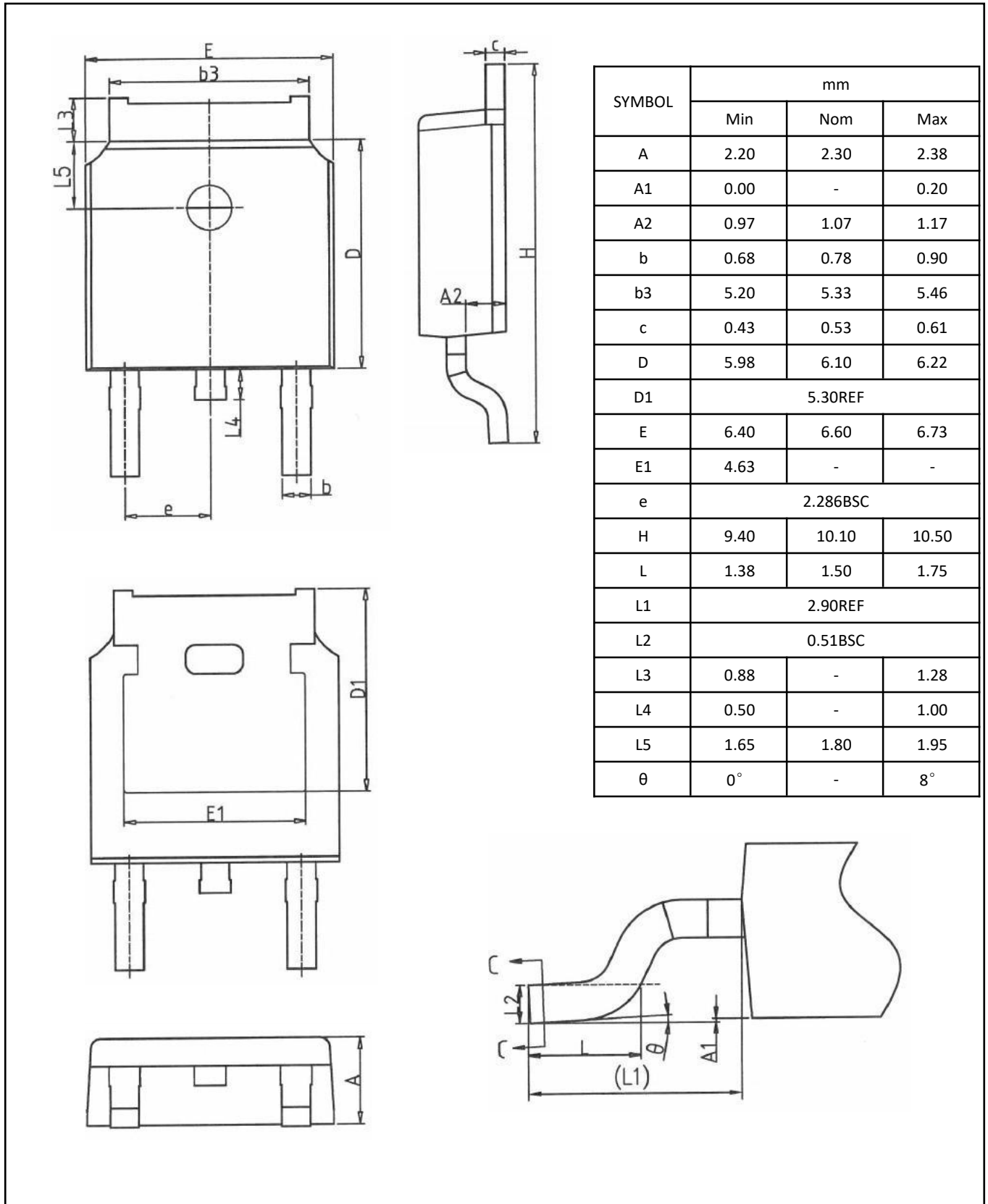
DIM	MILLIMETERS
A	10.0 ± 0.3
A1	8.64 ± 0.2
A2	1.15 ± 0.1
A3	5.0 ± 0.2
B	15.8 ± 0.4
B1	13.2 ± 0.3
C	4.56 ± 0.1
C1	1.3 ± 0.2
D	0.8 ± 0.2
E	3.6 ± 0.2
F	2.95 ± 0.3
G	6.5 ± 0.3
H	0.5 ± 0.1
K	3.1 ± 0.2
L	13.2 ± 0.4
M	1.25 ± 0.1
N	2.54 ± 0.1
P	2.4 ± 0.3
Q	9.0 ± 0.3
T	W:0.35
DIA	$\odot 1.5$ (deep 0.2)

Unit :mm

TO-220F-3L



TO-263



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	2020-01
2.0	Update the English and Chinese versions	2023-04

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