QMW40N65E

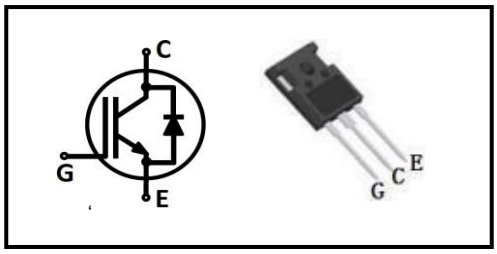
650V-40A Trench and Field Stop IGBT

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}
- 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

- 空气压缩机/Climate Compressor
- 不间断电源/UPS
- 功率因数校正/PFC
- PTC加热器/PTC Heater



型号/Type	打标/Marking	封装/Package
QMW40N65E	QM40N65E	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}	650	V
集电极电流 DC collector current[2]			A
T_C=25℃	I_C	75	
T_C=100℃		40	
集电极脉冲电流 Pulsed collector current[3]	I_{Cpuls}	160	
二极管正向电流 Diode forward current[2]			
T_C=25℃	I_F	75	
T_C=100℃		40	
二极管脉冲电流 Diode pulsed current[3]	I_{Fpuls}	160	
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)		±30	
耗散功率 Power dissipation			W
T_C=25℃	P_{tot}	250	
T_C=100℃		125	
工作结温 Operating junction temperature	T_j	-55~175	℃
储存温度 Storage temperature	T_{stg}	-55~150	

1:Reference standard: JESD-022
2: limited by Tjmax
3: Tp limited by Tjmax ;

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}	-	-	-	0.6	K/W
二极管结－外壳热阻 Diode thermal resistance, junction-case	R_{thJCD}	-	-	-	1.25	
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 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	650	-	-	V
集电极－发射极饱和电压 Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V,I_C=40A T_j=25℃	-	1.50		
		T_j=125℃	-	1.70	-	
		T_j=150℃	-	1.80	-	
二极管正向压降 Diode forward voltage	V_F	V_{GE}=0，I_F=20A T_j=25℃	-	1.45		
		Tj=125℃	-	1.30	-	
		Tj=150℃	-	1.20	-	
阈值电压 G-E threshold voltage	$V_{GE(th)}$	I_C=0.8mA, V_{CE}=V_{GE}		5.5		
集电极-发射极漏电流 C-E leakage current	I_{CES}	V_{CE}=650V,V_{GE}=0V Tj=25℃	-	-	0.1	mA
		Tj=150℃	-	-	1	
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=40A	-	35	-	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	-	2700	-	pF
输出电容 Output capacitance	C_{oss}		-	120	-	
反馈电容 Reverse transfer capacitance	C_{rss}		-	40	-	
栅电荷 Gate charge	Q_G	V_{CC}=100V, I_C=40A, V_{GE}=15V	-	110	-	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 ℃, V_{CC}=400V, I_C=40A, V_{GE}=0/15V, R_G=10Ω, Inductive load	-	85	-	ns
上升时间 Rise time	t_r		-	55	-	
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	190	-	
下降时间 Fall time	t_f		-	40	-	
开通损耗 Turn-on energy	E_{on}		-	0.94	-	mJ
关断损耗 Turn-off energy	E_{off}		-	0.85	-	
开关损耗 Total switching energy	E_{ts}		-	1.79	-	
开通延迟时间 Turn-on delay time	$t_{d(on)}$	T_j=150 ℃, V_{CC}=400V, I_C=40A, V_{GE}=0/15V, R_G=10Ω, Inductive load	-	85	-	ns
上升时间 Rise time	t_r		-	70	-	
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	210	-	
下降时间 Fall time	t_f		-	80	-	
开通损耗 Turn-on energy	E_{on}		-	1.94	-	mJ
关断损耗 Turn-off energy	E_{off}		-	1.12	-	
开关损耗 Total switching energy	E_{ts}		-	3.07	-	

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=400V, I_F=40A, di_F/dt=640A/μs	-	80	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	0.92	-	μC
反向恢复峰值电流 Diode peak reverse recovery current	I_{rrm}		-	18.6	-	A
反向恢复时间 Diode reverse recovery time	t_{rr}	T_j=150 ℃, V_R=400V, I_F=40A, di_F/dt=640A/μs	-	150	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	2.40	-	μC
反向恢复峰值电流 Diode peak reverse recovery current	I_{rrm}		-	25.4	-	A

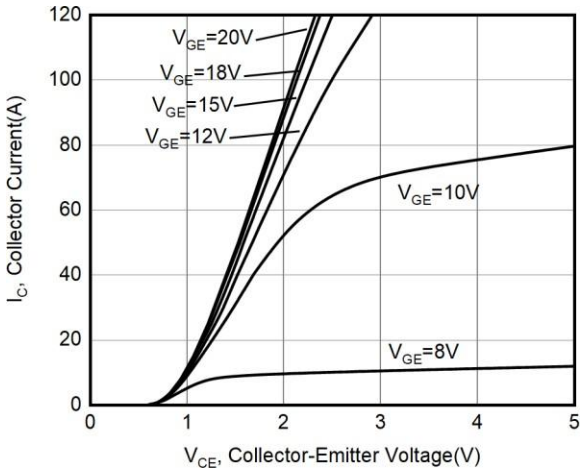


Figure 1. 典型输出特性/ Typical output characteristic (T_j =25℃)

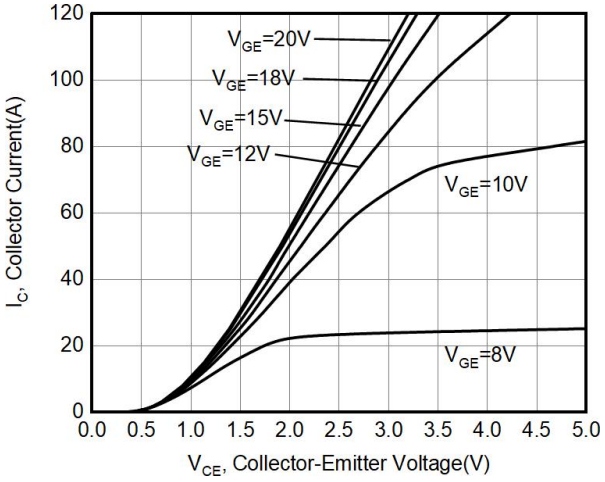


Figure 3. 典型输出特性/ Typical output characteristic (T_j =150℃)

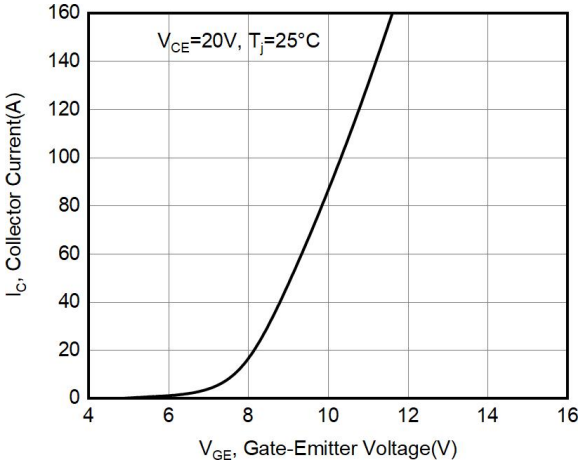


Figure 3.典型传输特性/ Typical transfer characteristic(T_j =25℃)

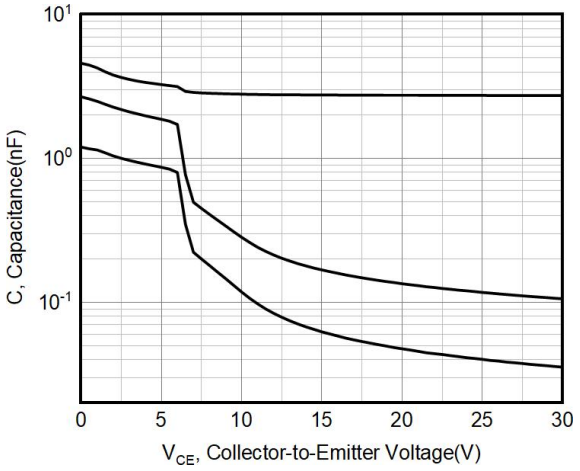


Figure 4.电容特性/ Capacitance characteristic(V_{GE}=0V, f=1MHz)

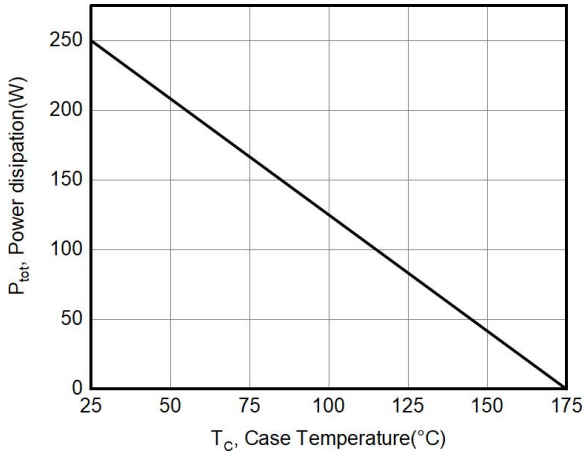


Figure 5. 功耗与外壳温度的关系曲线/Power dissipation as a function of case temperature (T_j≤175℃)

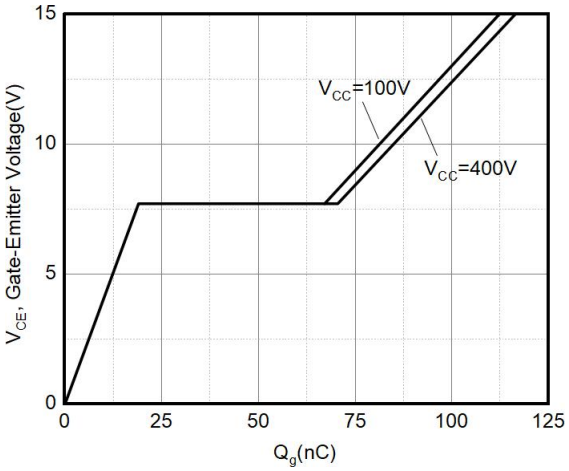


Figure 6. 典型栅极电荷/Typical gate charge (I_C =40A)

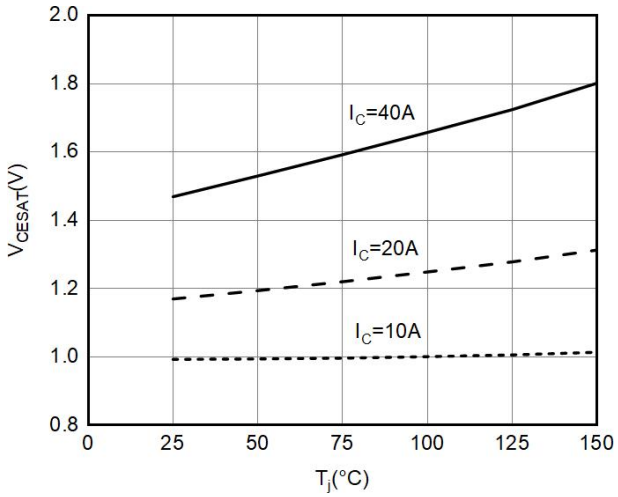


Figure 7. V_{CESAT}作为结温的函数曲线/V_{CESAT} as a function of junction temperature (V_{GE}=15V)

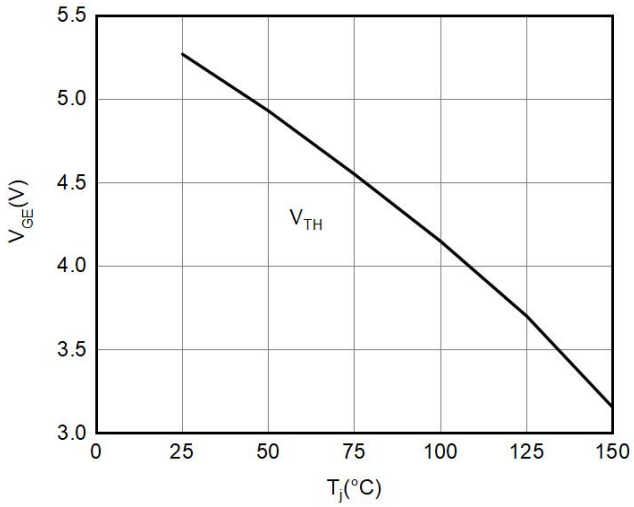


Figure 8. V_{TH}与结温的关系曲线/V_{TH} as a function of junction temperature (I_{CE}=250μA)

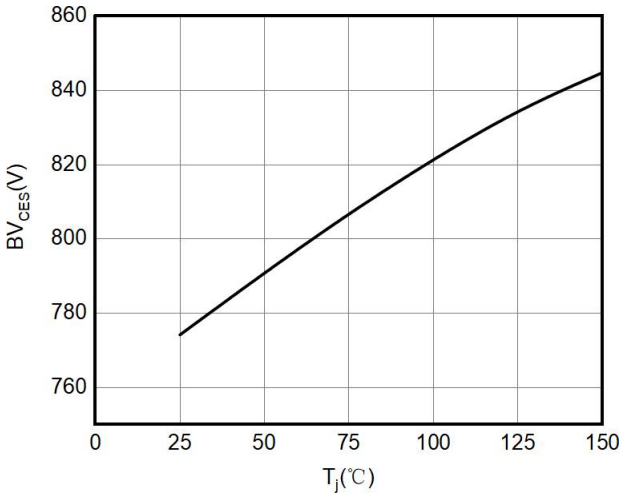


Figure 9. BV作为结温的函数曲线/BV as a function of junction temperature (I_{CE}=250μA)

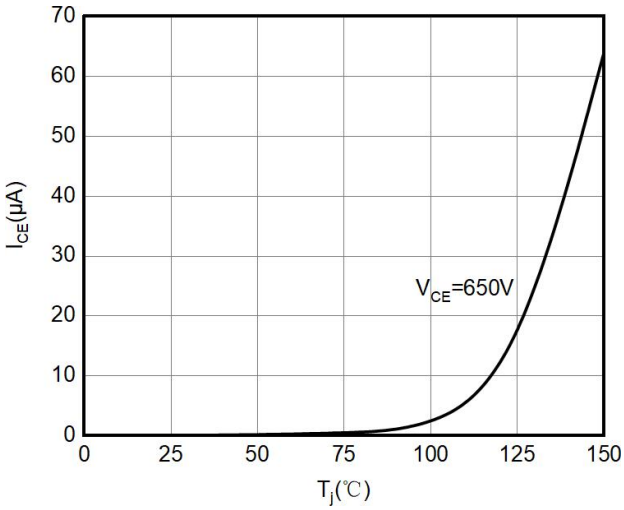


Figure 10.I_{CES}漏电流与结温的关系曲线/ I_{CES} leakage current as a function of junction temperature

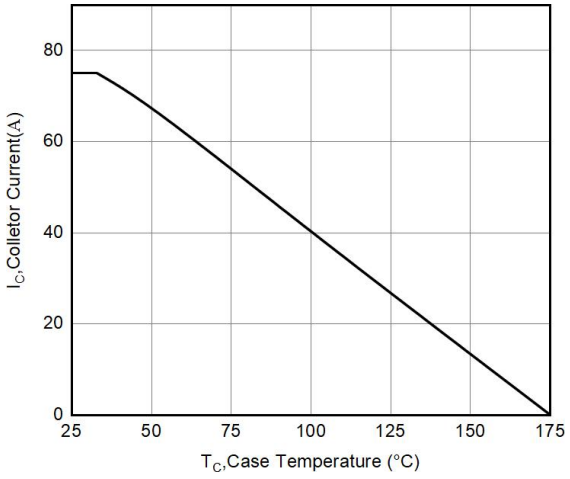


Figure 11.集电极电流与外壳温度的关系 / Collector current as a function of case temperature(V_{GE}≥15V, T_j≤150℃)

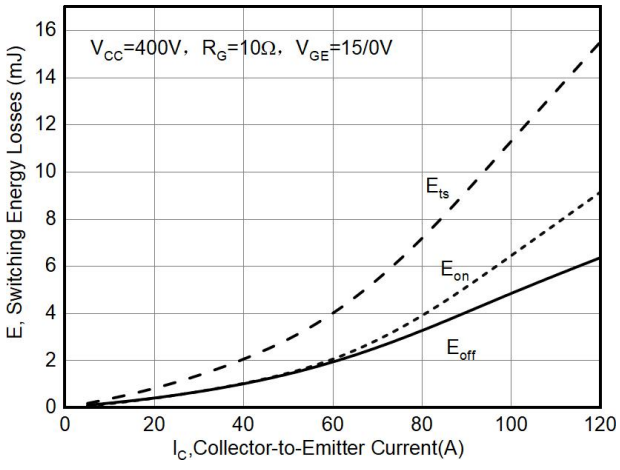


Figure 12. E_{on}， E_{off} 作为 I_C 的函数曲线 /E_{on}, E_{off} as a function of I_C(T_j=25℃)

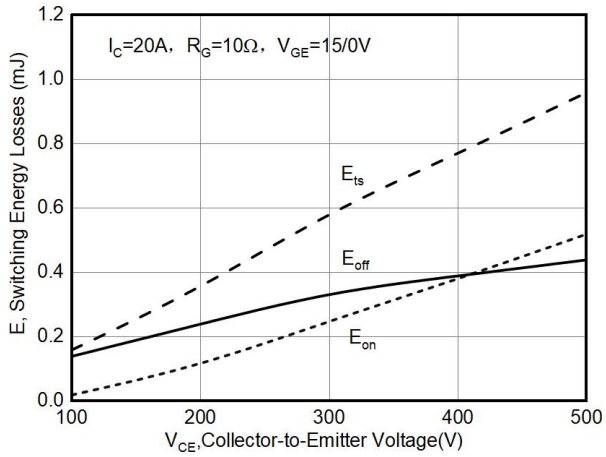


Figure 13. E_{on}, E_{off} 作为 V_{CE} 的函数曲线

/E_{on}, E_{off} as a function of V_{CE} (T_j=25℃)

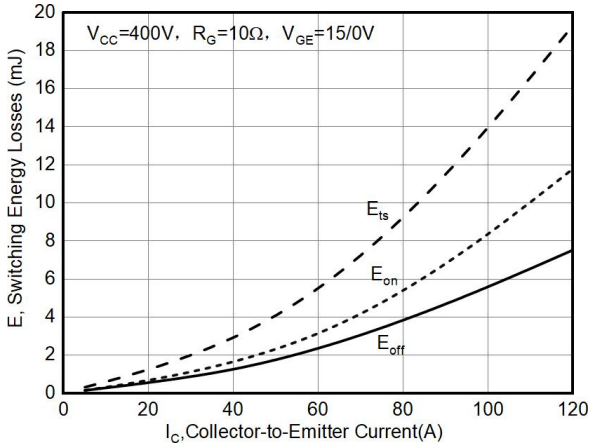


Figure 14. E_{on},E_{off} 作为 I_C 的函数曲线

/E_{on}, E_{off} as a function of I_C(T_j=150℃)

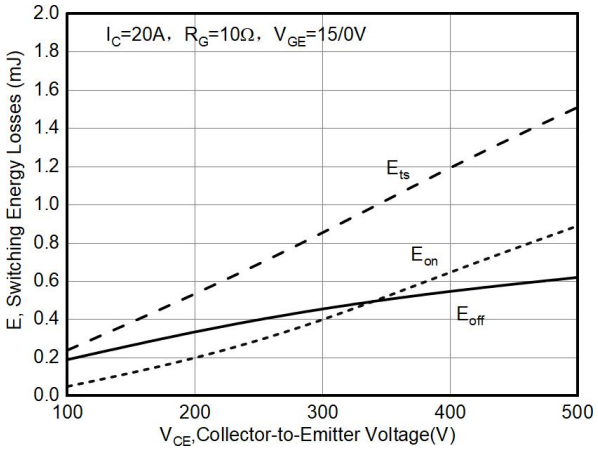


Figure 15. E_{on}, E_{off} 作为 V_{CE} 的函数曲/E_{on}, E_{off} as a function of V_{CE}(T_j=150℃)

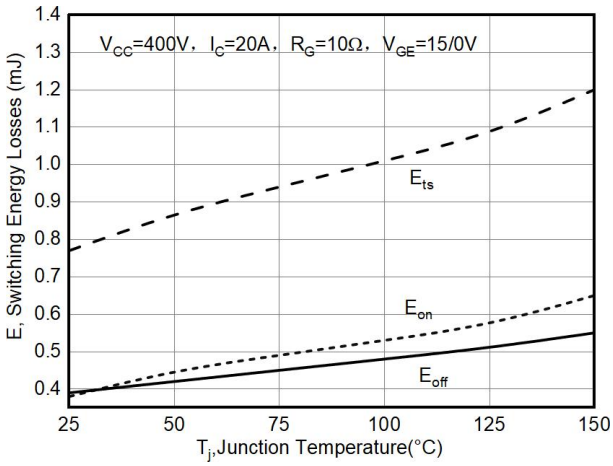


Figure 16. E_{on}，E_{off}作为结温的函数/E_{on}， E_{off} as a function of junction temperature

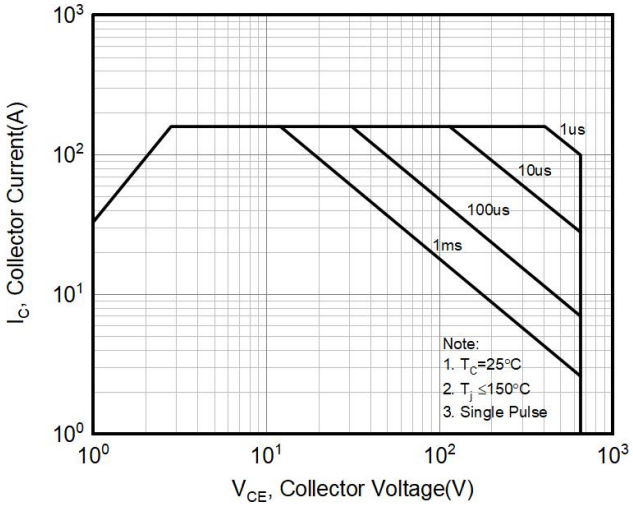


Figure 17. 正偏安全工作区/FBSOA

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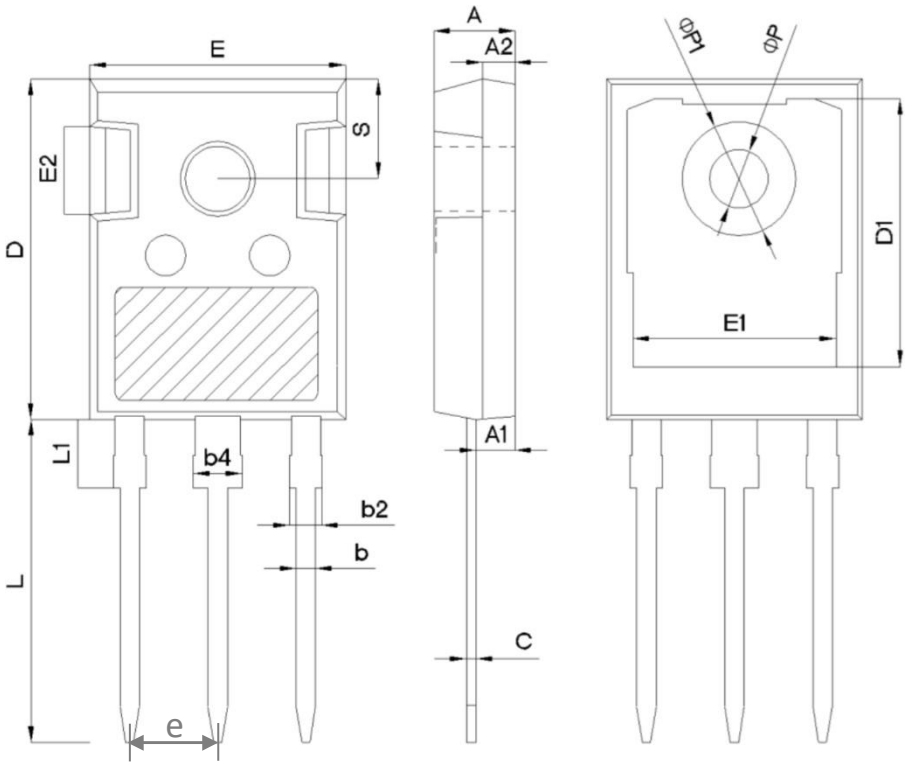

SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2 21	2 41	2 61
A2	1 85	2 00	2 15
b	1. 11	1.21	1.36
b_2	1 91	2 01	2 21
b_4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16 25	16 55	16 85
E	15.50	15.80	16. 10
E1	13 00	13 30	13 60
E2	4 80	5 00	5 20
E3	2.30	2.50	2.70
e	5 44BSC		
L	19.62	19.92	20.22
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	2022-10
2.0	Update the English and Chinese versions	2023-04

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