

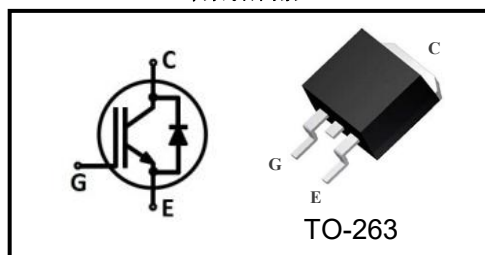
特征/Features

- 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

型号/Type	打标/Marking	封装/Package
QMC40N65EH	QM40N65EH	TO-263

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



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	75	A
$T_C=25^\circ\text{C}$		40	
$T_C=100^\circ\text{C}$		160	
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	I_F	40	
$T_C=25^\circ\text{C}$		20	
$T_C=100^\circ\text{C}$		120	
二极管脉冲电流 Diode pulsed current ³	I_{Fpuls}	120	
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}	250	W
$T_C=25^\circ\text{C}$		125	
$T_C=100^\circ\text{C}$			
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	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}	-	-	-	1.8	
结-环境热阻 Thermal Resistance, junction-ambient	R_{thJA}	-	-	-	65	

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	$V_{CE(sat)}$	$V_{GE}=15V, I_C=40A$ $T_j=25^\circ\text{C}$	-	1.50	-	
		$T_j=125^\circ\text{C}$	-	1.70	-	
		$T_j=150^\circ\text{C}$	-	1.80	-	
二极管正向压降 Diode forward voltage	V_F	$V_{GE}=0, I_F=20A$ $T_j=25^\circ\text{C}$	-	1.45	-	
		$T_j=125^\circ\text{C}$	-	1.30	-	
		$T_j=150^\circ\text{C}$	-	1.20	-	
阈值电压 G-E threshold voltage	$V_{GE(th)}$	$I_C=0.8mA,$ $V_{CE}=V_{GE}$		5.5		
集电极-发射极漏电流 C-E leakage current	I_{CES}	$V_{CE}=650V, V_{GE}=0V$ $T_j=25^\circ\text{C}$	-	-	0.1	mA
		$T_j=150^\circ\text{C}$	-	-	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	$t_{d(on)}$	$T_j=25\text{ }^\circ\text{C}$, $V_{CC}=400\text{V}$, $I_C=40\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, <i>Inductive load</i>	-	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}			-	0.81	-	mJ
关断损耗 Turn-off energy	E_{off}			-	0.85	-	
开关损耗 Total switching energy	E_{ts}			-	1.66	-	
开通延迟时间 Turn-on delay time	$t_{d(on)}$		$T_j=150\text{ }^\circ\text{C}$, $V_{CC}=400\text{V}$, $I_C=40\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, <i>Inductive load</i>	-	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			-	60	-	
开通损耗 Turn-on energy	E_{on}			-	1.43	-	mJ
关断损耗 Turn-off energy	E_{off}			-	1.12	-	
开关损耗 Total switching energy	E_{ts}			-	2.55	-	

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}	$T_j=25\text{ }^\circ\text{C}$, $V_R=400\text{V}$, $I_F=40\text{A}$, $di_F/dt=640\text{A}/\mu\text{s}$	-	150	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	1.06	-	μC
反向恢复峰值电流 Diode peak reverse recovery current	I_{rrm}		-	15.4	-	A
反向恢复时间 Diode reverse recovery time	t_{rr}	$T_j=150\text{ }^\circ\text{C}$, $V_R=400\text{V}$, $I_F=40\text{A}$, $di_F/dt=640\text{A}/\mu\text{s}$	-	240	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	2.32	-	μC
反向恢复峰值电流 Diode peak reverse recovery current	I_{rrm}		-	21.0	-	A

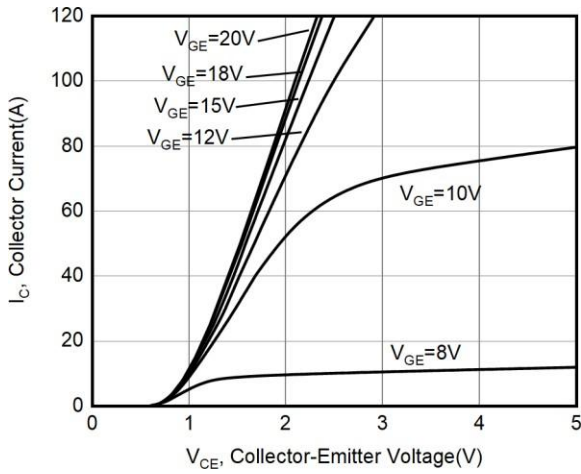


Figure 1. 典型输出特性/ Typical output characteristic ($T_j=25^{\circ}\text{C}$)

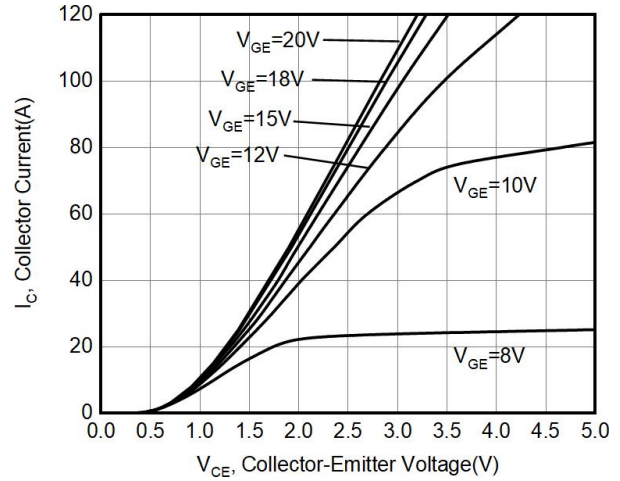


Figure 3. 典型输出特性/ Typical output characteristic ($T_j=150^{\circ}\text{C}$)

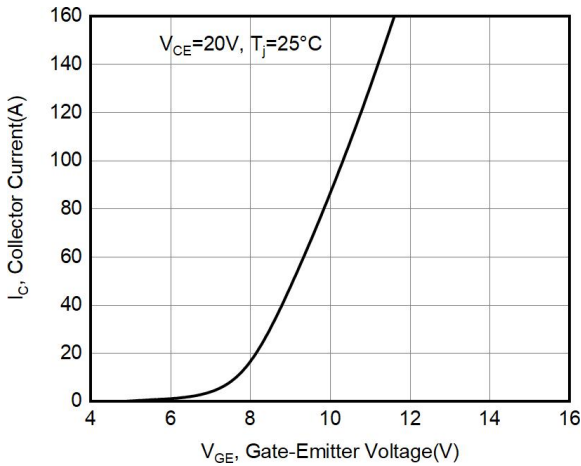


Figure 3. 典型传输特性/ Typical transfer characteristic ($T_j=25^{\circ}\text{C}$)

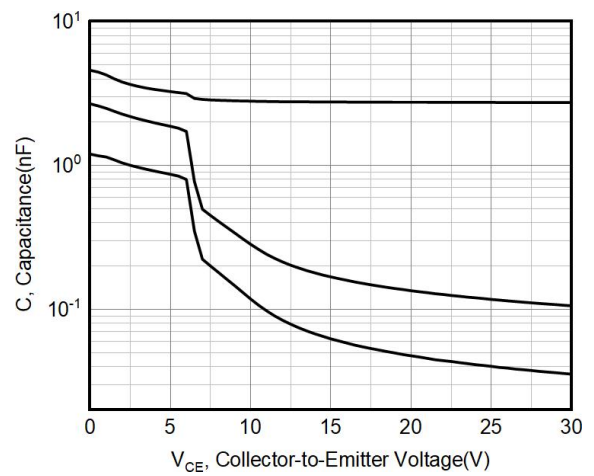


Figure 4. 电容特性/ Capacitance characteristic ($V_{GE}=0\text{V}$, $f=1\text{MHz}$)

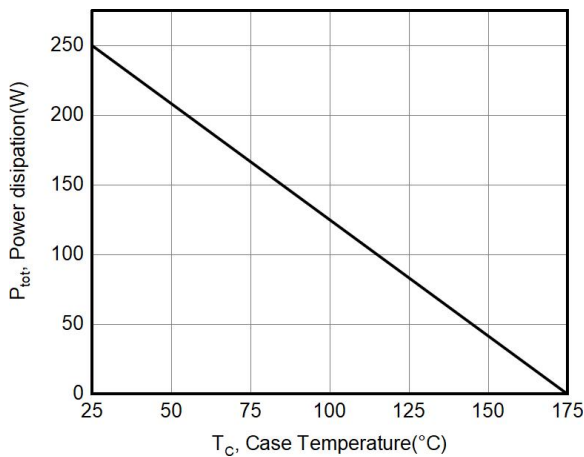


Figure 5. 功耗与外壳温度的关系曲线/Power dissipation as a function of case temperature ($T_j \leq 175^{\circ}\text{C}$)

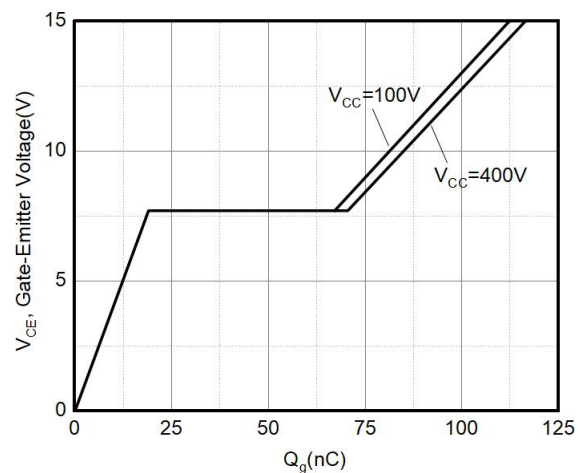


Figure 6. 典型栅极电荷/Typical gate charge ($I_C=40\text{A}$)

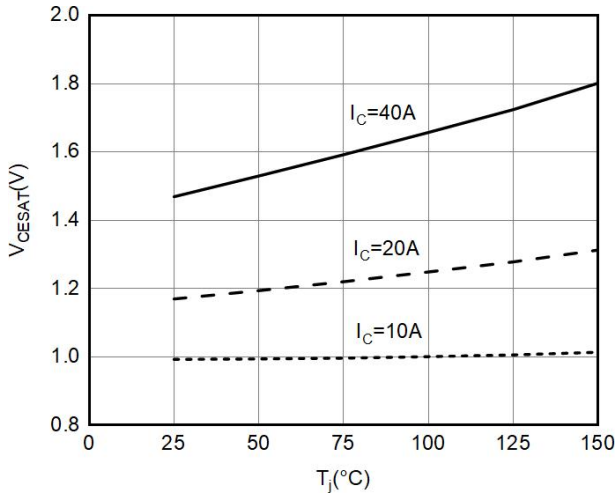


Figure 7. V_{CESAT} 作为结温的函数曲线/ V_{CESAT} as a function of junction temperature ($V_{GE}=15V$)

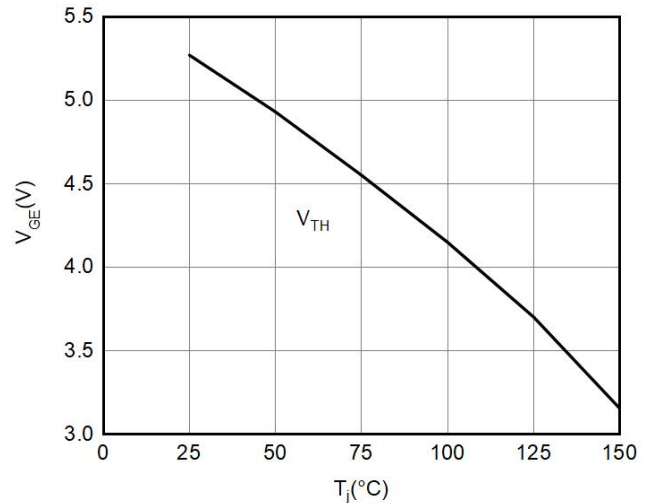


Figure 8. V_{TH} 与结温的关系曲线/ V_{TH} as a function of junction temperature ($I_{CE}=250\mu A$)

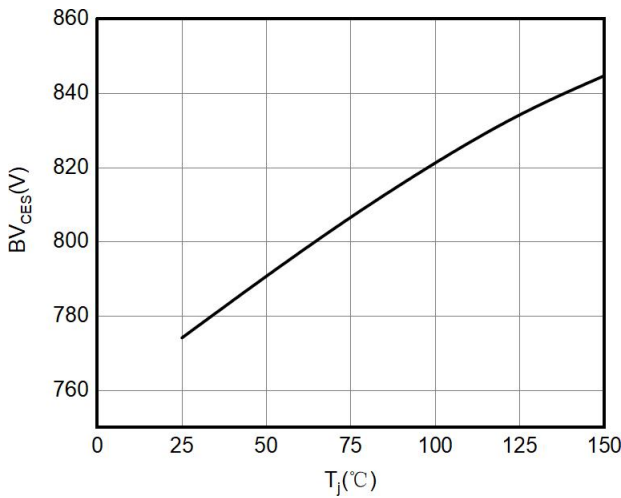


Figure 9. BV作为结温的函数曲线/BV as a function of junction temperature ($I_{CE}=250\mu A$)

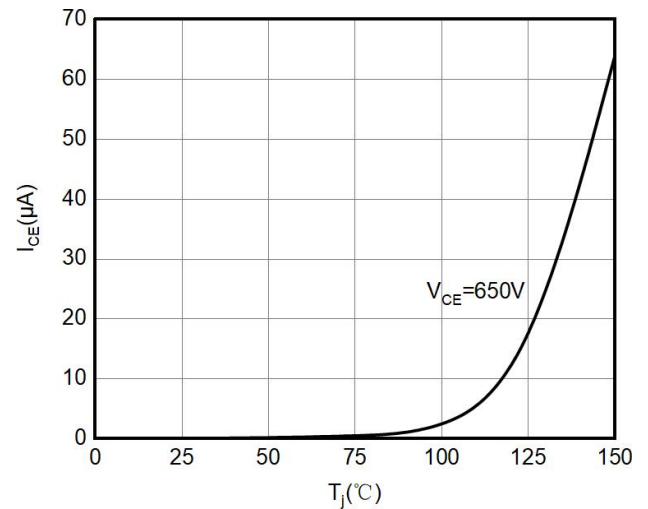


Figure 10. I_{CES} 漏电流与结温的关系曲线/ I_{CES} leakage current as a function of junction temperature

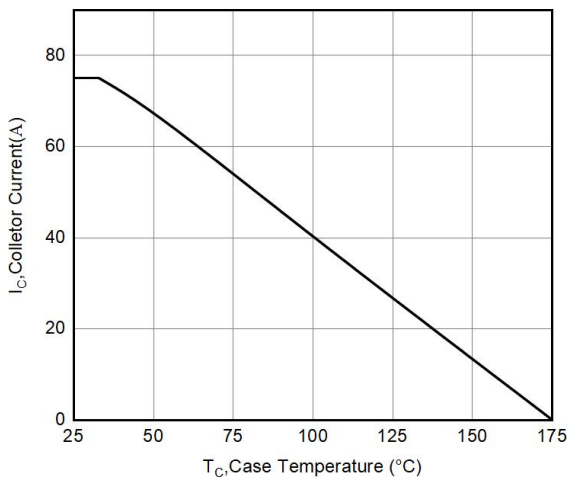


Figure 11. 集电极电流与外壳温度的关系 / Collector current as a function of case temperature ($V_{GE} \geq 15V, T_J \leq 150^\circ C$)

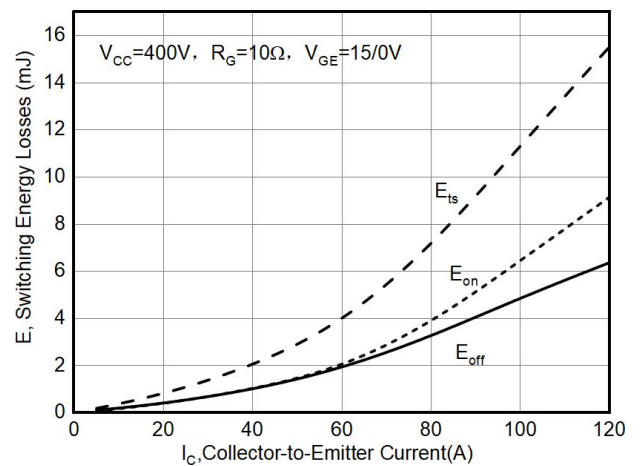


Figure 12. E_{on} , E_{off} 作为 I_C 的函数曲线 / E_{on} , E_{off} as a function of I_C ($T_J=25^\circ C$)

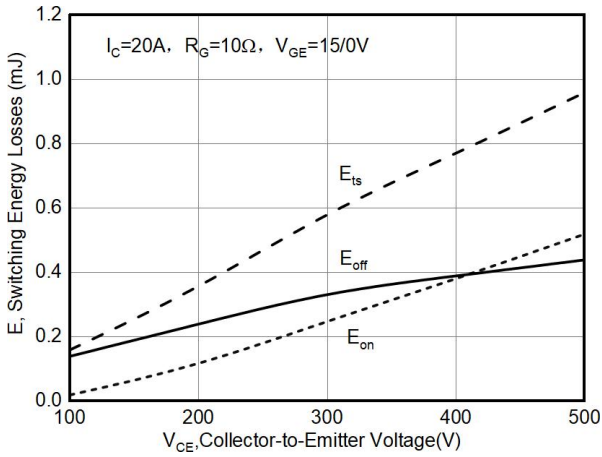


Figure 13. E_{on}, E_{off} 作为 V_{CE} 的函数曲线
 E_{on}, E_{off} as a function of V_{CE} ($T_j=25^\circ\text{C}$)

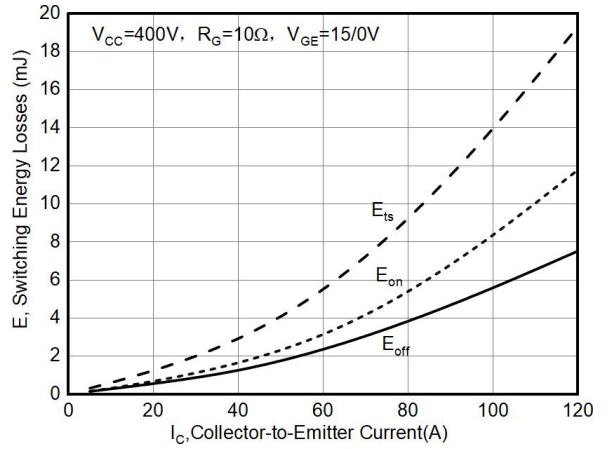


Figure 14. E_{on}, E_{off} 作为 I_C 的函数曲线
 E_{on}, E_{off} as a function of I_C ($T_j=150^\circ\text{C}$)

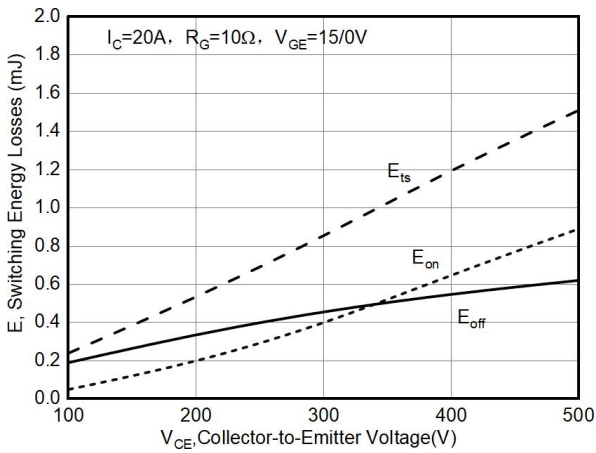


Figure 15. E_{on}, E_{off} 作为 V_{CE} 的函数曲线
 E_{on}, E_{off} as a function of V_{CE} ($T_j=150^\circ\text{C}$)

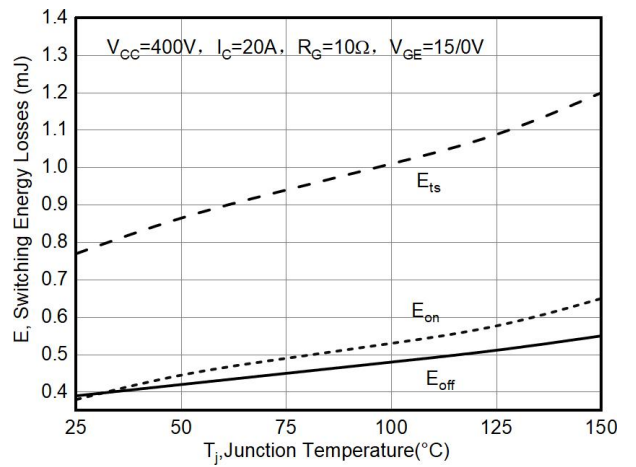


Figure 16. E_{on}, E_{off} 作为结温的函数
 E_{on}, E_{off} as a function of junction temperature

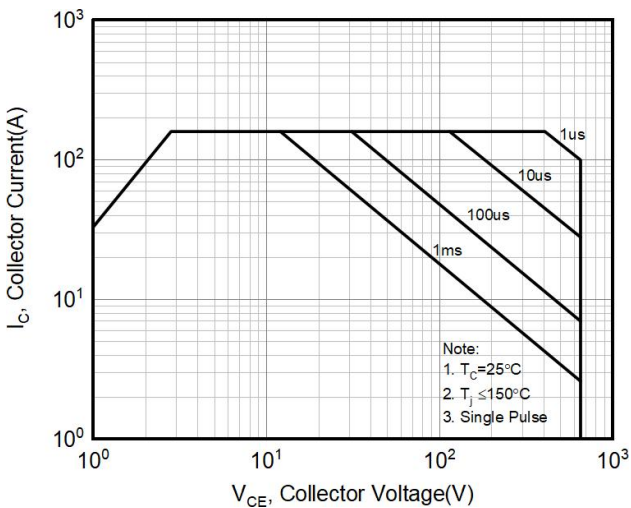
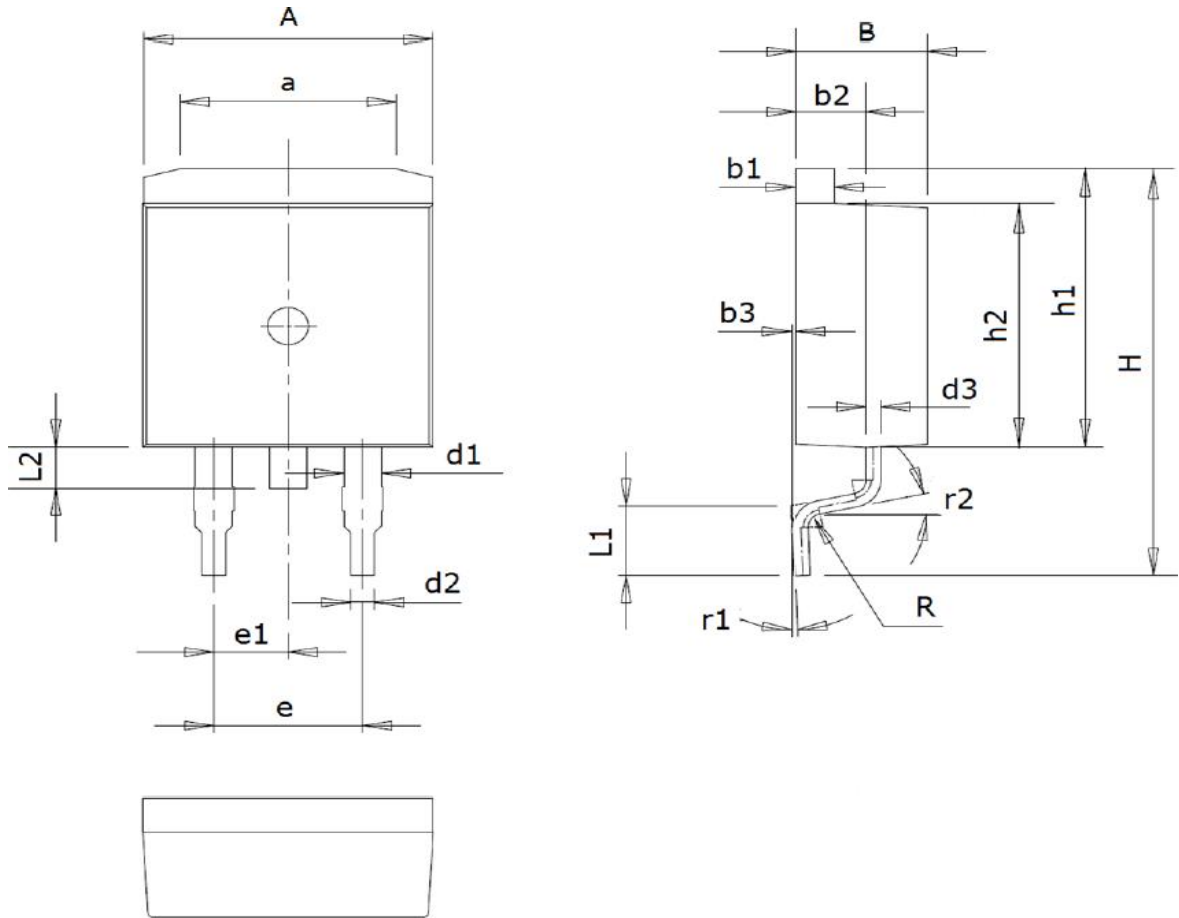


Figure 17. 正偏安全工作区/FBSOA

TO-263



Symbol	Dimensions (mm)	Symbol	Dimensions (mm)	Symbol	Dimensions (mm)
A	9.86~10.26	d2	0.7~0.96	L1	2.0~2.6
a	7.0~7.8	d3	0.3~0.53	L2	1.3~1.8
B	4.37~4.77	e	5.08	R	0.5
b1	1.22~1.42	e1	2.54	r1	0-9°
b2	2.2~2.6	H	14.7~15.5	r2	12°
b3	0~0.25	h1	10.3~10.7		
d1	1.17~1.47	h2	9.1~9.4		

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	2023-02
2.0	Update the English and Chinese versions	2023-04

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