

HE15R120H6DHU

High Performance Field Stop IGBT Power Transistor

Product features/产品特点

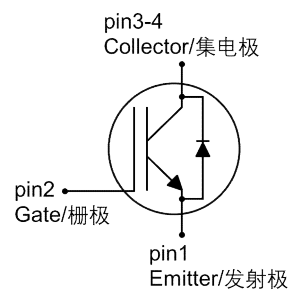
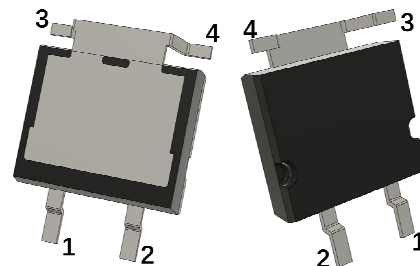
- Top side cooling technology
顶部散热技术
- Advanced Trench+FS IGBT technology
先进的沟槽栅+场截止技术
- Low gate charge
低栅极电荷
- Short-Circuit Withstand Time, $t_{SC} \leq 10\mu s$
短路承受时间 $t_{SC} \leq 10\mu s$
- Maximum junction temperature: $T_{j,MAX} = 175^\circ C$
最高结温 $T_{j,MAX} = 175^\circ C$
- $V_{CE(sat)}$ with positive temperature coefficient (PTC)
具有正温度系数的 V_{CEsat}
- Halogen free, RoHS compliant
无卤, 符合RoHS

Applications/应用领域

- Uninterruptible power supplies
不间断电源 (UPS)
- PFC applications
功率校正因数
- Motor Drives
电机驱动
- General purpose inverters
通用变频器

Key performance parameters/关键性能参数

Parameter/参数	Value/值	Unit/单位
V_{CE}	1200	V
I_C	15	A
$V_{CEsat,typ}$	1.45	V



Package parameters/封装信息

Type/型号	Package/封装	Marking/标识	Packaging method/包装方式
HE15R120H6DHU	TSC263-4L	HE15R120DHU	Tape and Reel/卷带包装

HE15R120H6DHU

High performance field stop IGBT power transistor



1. Maximum ratings at $T_j=25^{\circ}\text{C}$, unless otherwise specified.

最大额定值 默认 $T_j=25^{\circ}\text{C}$ 除非另有说明

Table 1 Characteristic values/特征值

Parameter 参数	Symbol 符号	Test condition 测试条件	Value 值	Unit 单位
Collector-to-emitter voltage 集电极-发射极电压	V_{CE}	$T_j \geq 25^{\circ}\text{C}$	1200	V
DC Collector current 集电极连续直流电流	I_C^1	$T_C = 25^{\circ}\text{C}$	30	A
		$T_C = 100^{\circ}\text{C}$	15	
Pulsed Collector current 集电极脉冲电流	I_{Cpuls}^2		60	A
Turn off safe operating area 关断安全工作区	— ²	$V_{CE} \leq 1200\text{V}, T_j \leq 175^{\circ}\text{C}$	60	A
Diode continuous forward current 二极管连续直流电流	I_F^1	$T_C = 25^{\circ}\text{C}$	30	A
		$T_C = 100^{\circ}\text{C}$	15	
Diode pulsed current 二极管脉冲电流	I_{Fpuls}^2		60	A
Gate-emitter voltage 栅极-发射极峰值电压	V_{GE}		± 20	V
Transient gate-emitter voltage 瞬态栅极-发射极电压	V_{GE}	$t_p \leq 10\mu\text{s}, D < 0.01$	± 30	V
Short circuit withstand time 短路耐量	t_{sc}	$V_{GE} = 15\text{V}, V_{CC} \leq 800\text{V}$	10	μs
Power dissipation 总耗散功率	P_{tot}	$T_C = 25^{\circ}\text{C}$	469	W
		$T_C = 100^{\circ}\text{C}$	234	

1. Limited by $T_j(\text{max})$ /受限于最高结温

2. Pulse width t_p limited by $T_j(\text{max})$ /脉宽受限于最大结温



2. Package 封装

Table 2 Characteristic values/特征值

Parameter 参数	Symbol 符号	Test condition 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Operating Junction Temperature 可工作结温	T_j		-40		175	°C
Storage Temperature Range 储存温度	T_{stg}		-55		150	°C
Soldering temperature, reflow solderin 焊接温度, 回流焊	T_{sold}	Reflow MSL1			260	°C
IGBT thermal resistance, junction-to-case IGBT 芯片到壳热阻	$R_{th(j-C)}$				0.32	K/W
Diode thermal resistance, junction-to-case 二极管芯片到壳热阻	$R_{th(j-C)}$				0.75	K/W
Thermal resistance, junction-to-ambient 结到环境热阻	$R_{th(j-A)}$				61	K/W

HE15R120H6DHU

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3. Static electrical characteristic at $T_j=25^{\circ}\text{C}$, unless otherwise specified.

静态电气特性 默认 $T_j=25^{\circ}\text{C}$ 除非另有说明

Table 3 Characteristic values/特征值

Parameter 参数	Symbol 符号	Test condition 测试条件	Value/值			Units 单位
			Min.	Typ.	Max.	
Collector - Emitter breakdown voltage 集电极-发射极击穿电压	$V_{(BR)CES}$	$V_{GE}=0V, I_C=0.25mA$	1200			V
Collector-Emitter Saturation voltage 集电极-发射极饱和压降	V_{CEsat}	$V_{GE}=15V, I_C=15A$		1.45	1.75	V
		$T_j=175^{\circ}\text{C}$		1.70		
Gate threshold voltage 门极开启阈值电压	V_{GEth}	$V_{GE}=V_{CE}, I_C=0.5mA$	4.4	5.2	6.0	V
Diode Forward Voltage 二极管正向导通压降	V_F	$V_{GE}=0V, I_F=15A$		1.94		V
		$T_j=175^{\circ}\text{C}$		1.70		
Gate to Emitter Leakage current 门极-发射极漏电流	I_{GES}	$V_{GE}=20V, V_{CE}=0V$			400	nA
		$V_{GE}=-20V, V_{CE}=0V$			-400	
Zero gate voltage collector current 集电极-发射极漏电流	I_{CES}	$V_{CE}=1200V, V_{GE}=0V$			50	μA
		$T_j=175^{\circ}\text{C}$			500	
Transconductance 跨导	g_{fs}	$V_{CE}=20V, I_C=15A$		11		S

4. Dynamic electrical characteristic at $T_j=25^{\circ}\text{C}$, unless otherwise specified.

动态电气特性 默认 $T_j=25^{\circ}\text{C}$ 除非另有说明

Table 4 Characteristic values/特征值

Parameter 参数	Symbol 符号	Test condition 测试条件	Value/值			Units 单位
			Min.	Typ.	Max.	
Input capacitance 输入电容	C_{ies}	$V_{GE}=0V, V_{CE}=25V,$ $f=1MHz$		2275		pF
Output capacitance 输出电容	C_{oes}			90		
Reverse transfer capacitance 反向传输电容	C_{res}			16		
Total gate charge 门极电荷	Q_g	$V_{GE}=15V,$ $I_C=15A, V_{CC}=960V$		68		nC



5. Switching characteristic inductive load at $T_j=25^{\circ}\text{C}$, unless otherwise specified.

开关特性感性负载 默认 $T_j=25^{\circ}\text{C}$ 除非另有说明

Table 5 IGBT Characteristic values/IGBT特征值

Parameter 参数	Symbol 符号	Test condition 测试条件		Value/值			Units 单位
				Min.	Typ.	Max.	
Turn-on delay time 开启延迟时间	$t_{d(on)}$	$V_{GE}=0/15\text{V}$ $V_{CC}=600\text{V}$ $I_C=15\text{A}$ $R_{G(on)}=5\Omega$ $R_{G(off)}=5\Omega$	$T_j=25^{\circ}\text{C}$		30		ns
			$T_j=150^{\circ}\text{C}$		35		
Rise time 上升时间	t_r		$T_j=25^{\circ}\text{C}$		35		ns
			$T_j=150^{\circ}\text{C}$		41		
Turn-off delay time 关闭延迟时间	$t_{d(off)}$		$T_j=25^{\circ}\text{C}$		75		ns
			$T_j=150^{\circ}\text{C}$		243		
Fall time 下降时间	t_f		$T_j=25^{\circ}\text{C}$		275		ns
			$T_j=150^{\circ}\text{C}$		285		
Turn-on switch loss 单次开启损耗	E_{on}		$T_j=25^{\circ}\text{C}$		1.15		mJ
			$T_j=150^{\circ}\text{C}$		1.48		
Turn-off switch loss 单次关闭损耗	E_{off}		$T_j=25^{\circ}\text{C}$		1.12		mJ
			$T_j=150^{\circ}\text{C}$		2.10		
Total switching energy 总开关损耗	E_{ts}		$T_j=25^{\circ}\text{C}$		2.27		mJ
			$T_j=150^{\circ}\text{C}$		3.58		

Table 6 Diode Characteristic values/二极管特征值

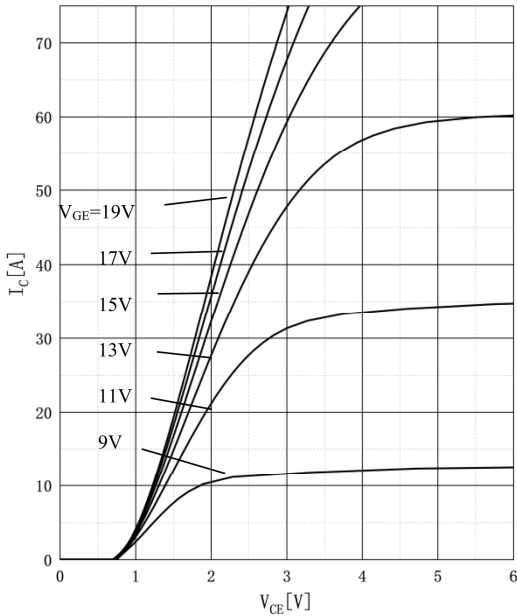
Parameter 参数	Symbol 符号	Test condition 测试条件		Value/值			Units 单位
				Min.	Typ.	Max.	
Diode Reverse Recovery Time 二极管反向恢复时间	t_{rr}	$V_R=600\text{V}$ $I_F=15\text{A}$ $di_F/dt=-600\text{A}/\mu\text{s}$	$T_j=25^{\circ}\text{C}$		70		ns
			$T_j=150^{\circ}\text{C}$		76		
Diode Reverse Recovery Charge 二极管反向恢复电量	Q_{rr}		$T_j=25^{\circ}\text{C}$		220		nC
			$T_j=150^{\circ}\text{C}$		465		
Peak reverse recovery current 反向恢复峰值电流	I_{rrm}		$T_j=25^{\circ}\text{C}$		9.7		A
			$T_j=150^{\circ}\text{C}$		11		



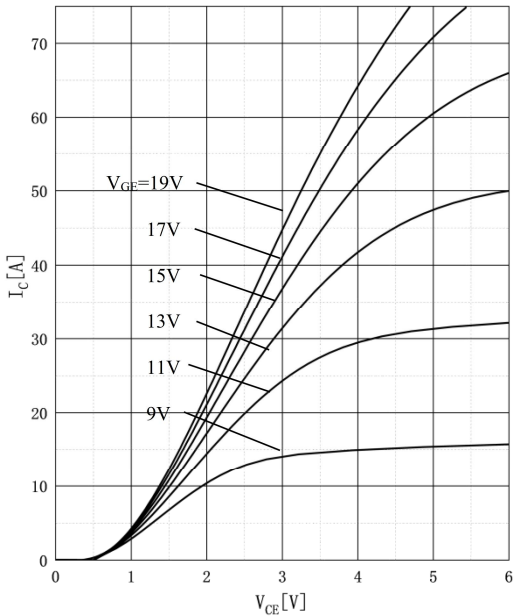
6. Characteristics diagrams

特性曲线

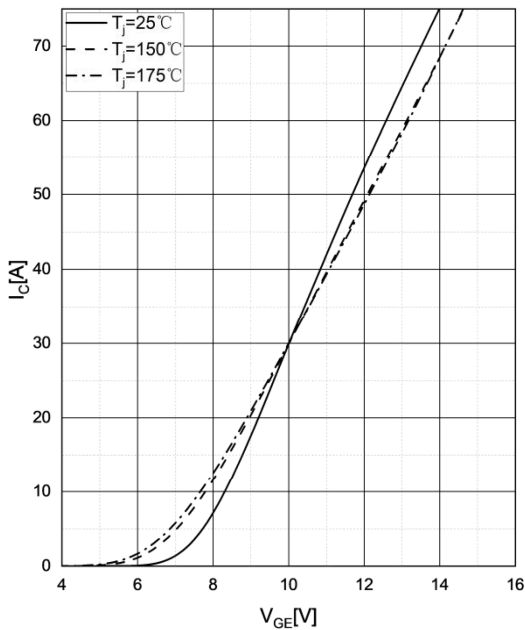
Typ. Output characteristic/输出特性
 $I_C = f(V_{CE})$; $T_J = 25^\circ\text{C}$



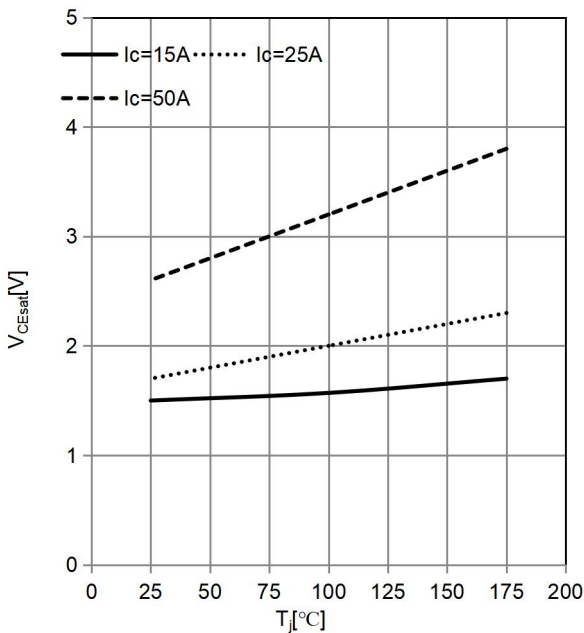
Typ. Output characteristic/输出特性
 $I_C = f(V_{CE})$; $T_J = 175^\circ\text{C}$



Typ. Transfer characteristic/典型传输特性
 $I_C = f(V_{GE})$; $V_{CE} = 20\text{V}$



Typ. Temperature dependence of V_{CEsat} /饱和压降与结温特性
 $V_{CEsat} = f(T_J)$; $V_{GE} = 15\text{V}$

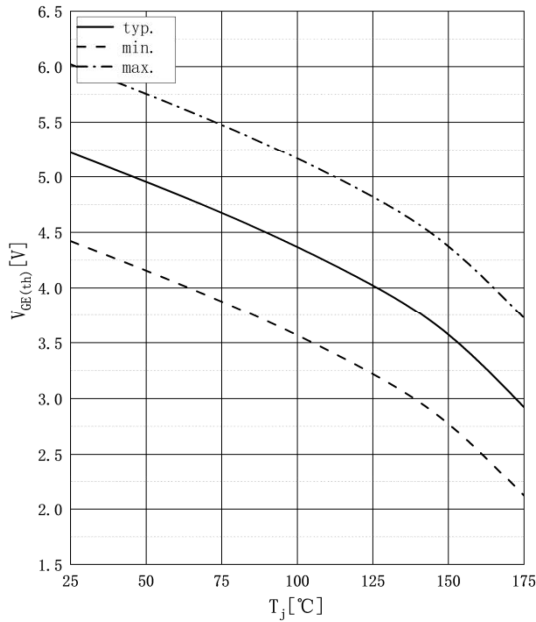


HE15R120H6DHU
High performance field stop IGBT power transistor



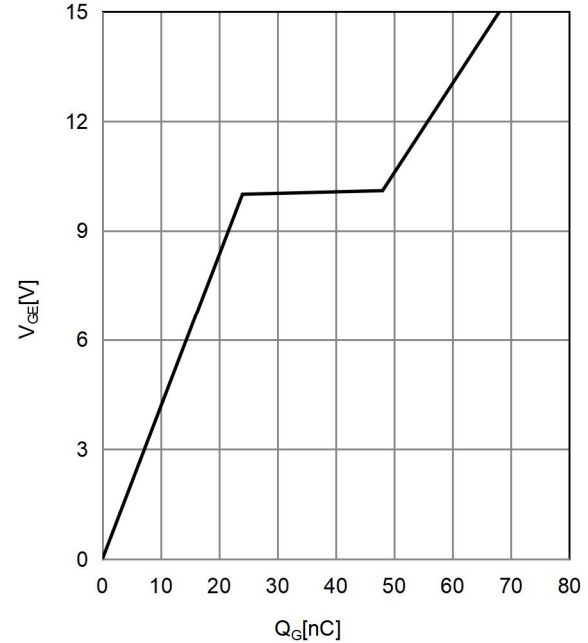
Typ.Gate threshold voltage/门级阈值电压结温特性

$V_{GEth}=f(T_j)$; $I_C=0.5mA$, $V_{GE}=V_{CE}$



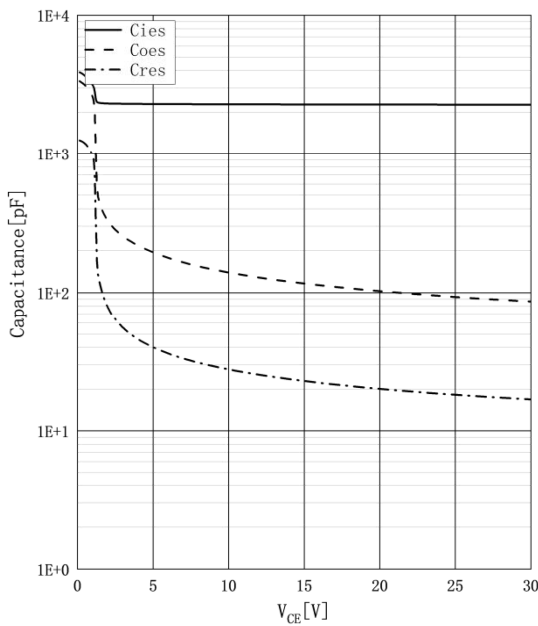
Typ.Gate charge/门级电荷

$V_{GE}=f(Q_G)$; $I_C=15A$, $V_{CC}=960V$



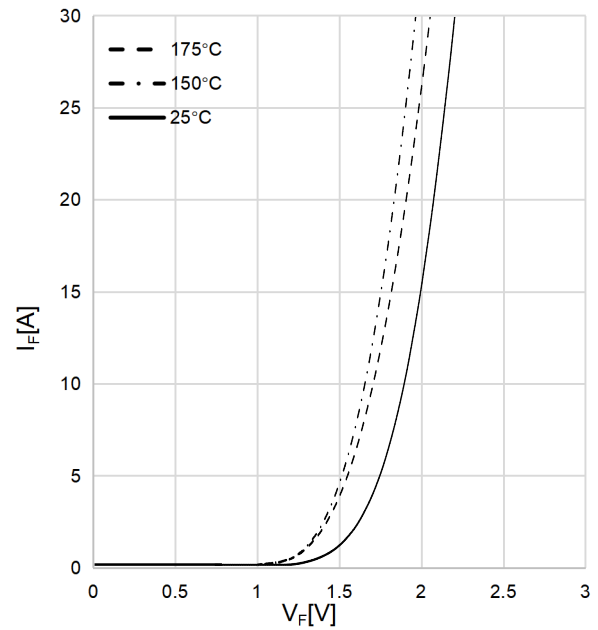
Typ.Capacitances/电容特性

$C=f(V_{CE})$; $f=1MHz$, $V_{GE}=0V$



Typ.Diode forward characteristic curve/二极管正向特性

$I_F=f(V_F)$

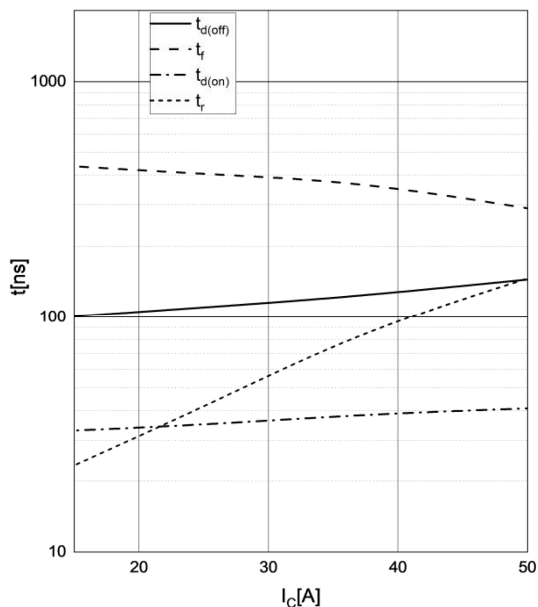


HE15R120H6DHU

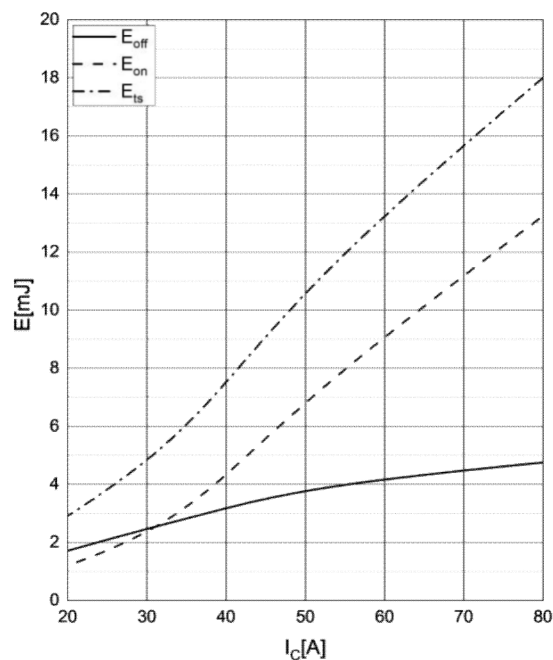
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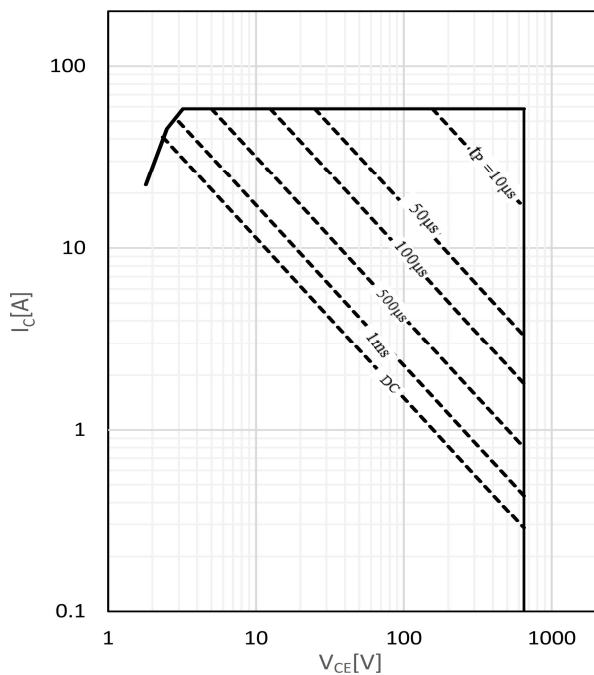
Typ.Switching times vs current/开关时间与电流特性
 $t=f(I_C)$; $V_{GE}=0/15V$, $V_{CC}=400V$, $R_G=5\Omega$, $T_J=150^\circ C$



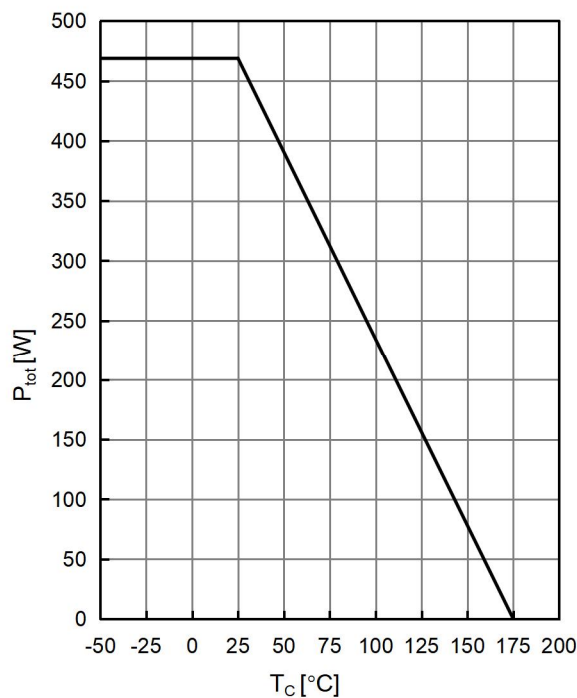
Typ.Switching losses vs current /动态损耗与电流特性
 $E=f(I_C)$; $V_{GE}=0/15V$, $R_G=10\Omega$, $V_{CC}=400V$, $T_J=25^\circ C$



Forward bias safe operating area/安全工作区
 $I_D=f(V_{DS})$; $V_{GE}=15V$, $T_a=25^\circ C$, $T_J \leq 175^\circ C$



Power dissipation/耗散功率
 $P_{tot}=f(T_C)$; @ $R_{th(j-c).MAX}$

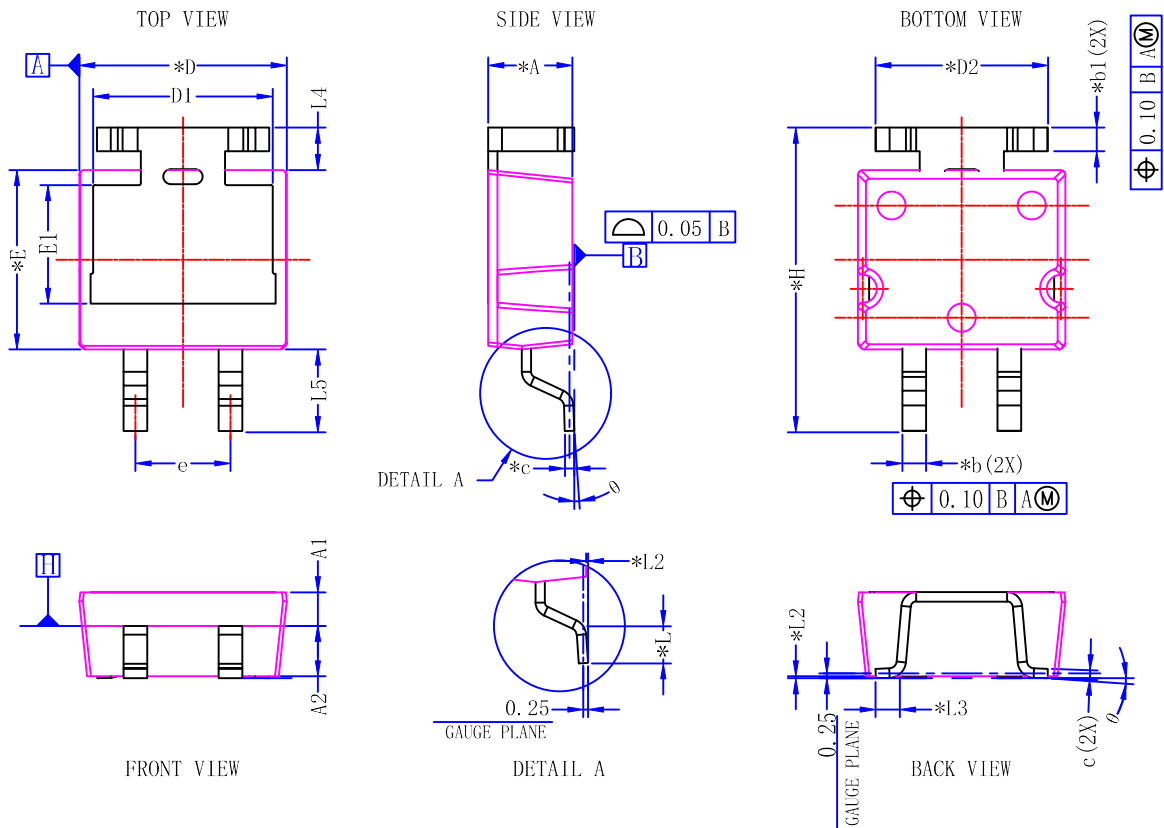




7. Package outline

封装外形

Figure 1. Outline TSC263-4L, dimensions in mm/ TSC263-4L外形尺寸（毫米）



DIM SYMBOL	MIN.	TYP.	MAX.	DIM SYMBOL	MIN.	TYP.	MAX.
*A	4.40	4.50	4.60	*E	9.45	9.60	9.75
A1	1.75	1.80	1.85	E1	6.15	6.35	6.55
A2	2.65	2.70	2.75	e	5.08 BSC		
*b	1.22	1.27	1.32	*H	16.02	16.22	16.42
*b1	1.22	1.27	1.32	*L	1.70	1.90	2.10
*c	0.45	0.50	0.55	*L2	0.05	0.10	0.15
*D	10.95	11.10	11.25	*L3	1.10	1.30	1.50
D1	9.50	9.60	9.70	L4	2.27 REF		
*D2	9.00	9.20	9.40	L5	4.15	4.35	4.55
				Θ	0°	-	8°

NOTES:

- ALL DIMENSIONS ARE IN MILLIMETER. ANGLES ARE IN DEGREE.
- DIMENSION "D" DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS. INTERLEAD FLASH SHALL NOT EXCEED 0.150 MM PER SIDE. DIMENSION "E" DOES NOT INCLUDE MOLD FLASH, GATE BURRS, THE GATE BURRS SHALL NOT EXCEED 0.15MM.
- DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.

注:

- 所有尺寸均以毫米为单位。角度以度为单位。
- 尺寸 D 不包括引脚间飞边或突出物。引脚间飞边在每侧不得超过0.15mm。尺寸 E 不包括模具飞边、浇口残余物，浇口残余物不得超过0.15mm。
- 尺寸 D、E 是在塑胶本体的最外极限确定的，不包括模具飞边、连接条残余、浇口残余和引脚间飞边，但包括塑胶本体顶部和底部之间可能存在的任何不匹配或错位。



8. Revision history
修订历史

Table 7 Date and version number/日期与版本号

Date日期	Revision版本	Changes更改内容
2025-12-15	Rev.G1.0	Target Datasheet (目标规格书)

9. Matters needing attention
注意事项

Important Technical Guidance, Application Policy, and Copyright Notice
重要技术指南、应用规范与版权声明

[Data and Design Guidance]

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<http://www.hmwsemi.com/>