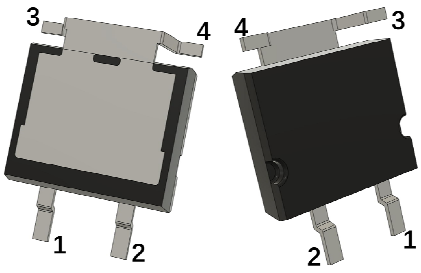
DATA SHEET

海明微半导体
HIMINGWAY

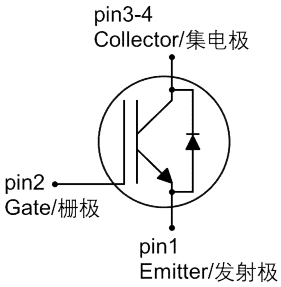
HE40R065H6DHU

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
- Short-Circuit Withstand Time,t_{SC}≤7μs
  短路承受时间t_{SC}≤7μs
- Maximum junction temperature: $T_{vj.MAX}$=175 °C
  最高结温$T_{vj.MAX}$=175 °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）
- General purpose inverters
  通用变频器
- Motor Drives
  电机驱动
- Converter with high switching frequency
  高开关频率转换器

Key performance parameters/关键性能参数

Parameter/参数	Value/值	Unit/单位
V_{CE}	650	V
I_C	40	A
$V_{CEsat.typ}$	1.8	V

Package parameters/封装信息

Type/型号	Package/封装	Marking/标识	Packaging method/包装方式
HE40R065H6DHU	TSC263-4L	HE40R065DHU	Tape and Reel/卷带包装

1. Maximum ratings at T_{vj}=25°C, unless otherwise specified.
最大额定值 默认T_{vj}=25°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_{vj}≥25°C	650	V
DC Collector current 集电极连续直流电流	I_C[1]	T_C=25°C	80	A
		T_C=100°C	40	
Pulsed Collector current 集电极脉冲电流	I_{Cpuls}[2]		160	A
Turn off safe operating area 关断安全工作区	—[2]	V_{CE}≤650V,T_{vj}≤175°C	160	A
Diode continuous forward current 二极管连续直流电流	I_F[1]	T_C=25°C	80	A
		T_C=100°C	40	
Diode pulsed current 二极管脉冲电流	I_{Fpuls}[2]		160	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≤10μs,D<0.01	±30	V
Short circuit withstand time 短路耐量	t_{sc}	V_{GE}=15V,V_{CC}≤400V	7	μs
Power dissipation 总耗散功率	P_{tot}	T_C=25°C	517	W
		T_C=100°C	259	

1. Limited by T_{vj}(max)/受限于最高结温
2. Pulse width t_p limited by T_{vj}(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_{vj}		-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	$R_{th(j-C)}$				0.29	K/W
Diode thermal resistance, junction-to-case 二极管芯片到壳热阻	$R_{th-(j-C)}$				0.61	K/W
Thermal resistance,junction-to-ambient 结到环境热阻	$R_{th(j-A)}$				61	K/W

3. Static electrical characteristic at T_{vj}=25°C, unless otherwise specified.
静态电气特性 默认T_{vj}=25°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 Min.	Value/值 Typ.	Value/值 Max.	Units 单位
Collector - Emitter breakdown voltage 集电极-发射极击穿电压	$V_{(BR)CES}$	V_{GE}=0V,I_C=0.25mA		650			V
Collector-Emitter Saturation voltage 集电极-发射极饱和压降	V_{CEsat}	V_{GE}=15V,I_C=40A	T_{vj}=25°C		1.8	2.2	V
			T_{vj}=175°C		2.2		
Gate threshold voltage 门极开启阀值电压	V_{GEth}	V_{GE}=V_{CE},I_C=0.25mA		4.0	5.0	6.0	V
Diode Forward Voltage 二极管正向导通压降	V_F	V_{GE}=0V,I_F=40A	T_{vj}=25°C		1.35		V
			T_{vj}=175°C		1.11		
Gate to Emitter Leakage current 门极-发射极漏电流	I_{GES}	V_{GE}=20V,V_{CE}=0V				100	nA
		V_{GE}=-20V,V_{CE}=0V				-100	
Zero gate voltage collector current 集电极-发射极漏电	I_{CES}	V_{CE}=650V,V_{GE}=0V				40	μA
Transconductance 跨导	g_{fs}	V_{CE}=20V,I_C=40A			20		S

4. Dynamic electrical characteristic at T_{vj}=25°C, unless otherwise specified.
动态电气特性 默认T_{vj}=25°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 Min.	Value/值 Typ.	Value/值 Max.	Units 单位
Input capacitance 输入电容	C_{ies}	V_{GE}=0V,V_{CE}=30V, f=1MHz		2100		pF
Output capacitance 输出电容	C_{oes}			100		
Reverse transfer capacitance 反向传输电容	C_{res}			40		
Total gate charge 门极电荷	Q_g	V_{GE}=15V, I_C=40A,V_{CC}=520V		90		nC

5. Switching characteristic inductive load at T_{vj}=25°C, unless otherwise specified.
开关特性感性负载 默认T_{vj}=25°C除非另有说明

Table 5 IGBT Characteristic values/IGBT特征值

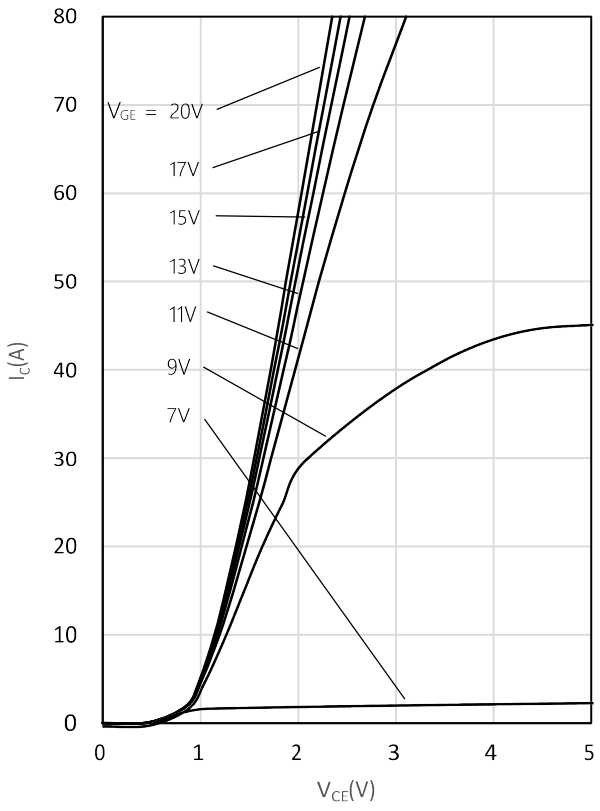
Parameter 参数	Symbol 符号	Test condition 测试条件		Value/值			Units 单位
				Min.	Typ.	Max.	
Turn-on delay time 开启延迟时间	$t_{d(on)}$	V_{GE}=0/15V V_{CC}=400V I_C=40A $R_{G(on)}$=20Ω $R_{G(off)}$=20Ω	T_j=25°C		45		ns
			T_j=150°C		55		
Rise time 上升时间	t_r		T_j=25°C		80		ns
			T_j=150°C		95		
Turn-off delay time 关闭延迟时间	$t_{d(off)}$		T_j=25°C		120		ns
			T_j=150°C		135		
Fall time 下降时间	t_f		T_j=25°C		75		ns
			T_j=150°C		120		
Turn-on switch loss 单次开启损耗	E_{on}		T_j=25°C		2.0		mJ
			T_j=150°C		2.7		
Turn-off switch loss 单次关闭损耗	E_{off}		T_j=25°C		0.4		mJ
			T_j=150°C		0.7		
Total switching energy 总开关损耗	E_{ts}		T_j=25°C		2.4		mJ
			T_j=150°C		3.4		

Table 6 Diode Characteristic values/二极管特征值

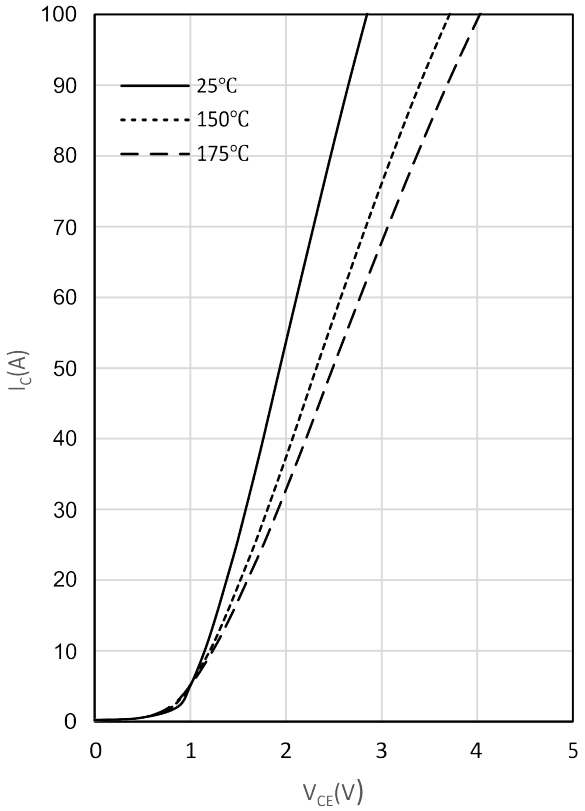
Parameter 参数	Symbol 符号	Test condition 测试条件		Value/值			Units 单位
				Min.	Typ.	Max.	
Diode Reverse Recovery Time 二极管反向恢复时间	t_{rr}	V_R=400V I_F=40A di_F/dt=-550A/μs	T_j=25°C		62		ns
			T_j=150°C		67		
Diode Reverse Recovery Charge 二极管反向恢复电量	Q_{rr}		T_j=25°C		268		nC
			T_j=150°C		364		
Peak reverse recovery current 反向恢复峰值电流	I_{rrm}		T_j=25°C		8.5		A
			T_j=150°C		8.8		

6. Characteristics diagrams
特性曲线

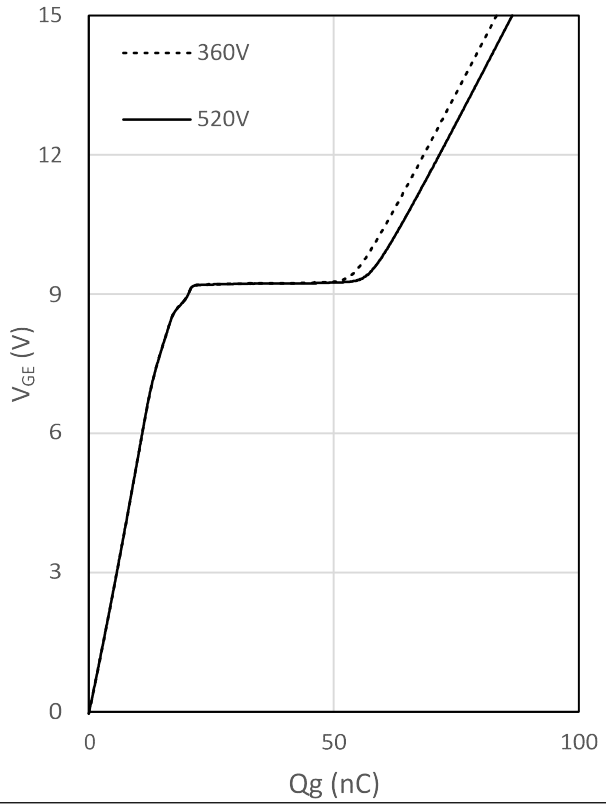
Typ.Output characteristic/输出特性
$I_C=f(V_{CE})$; $T_{vj}=25°C$



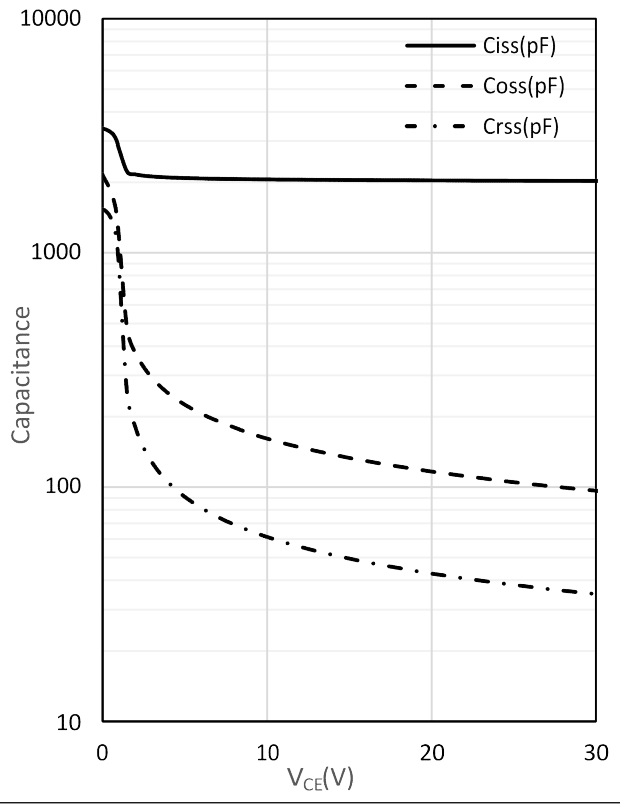
Typ.Transfer characteristic/典型传输特性
$V_{CE}=f(I_C)$; $V_{GE}=15V$



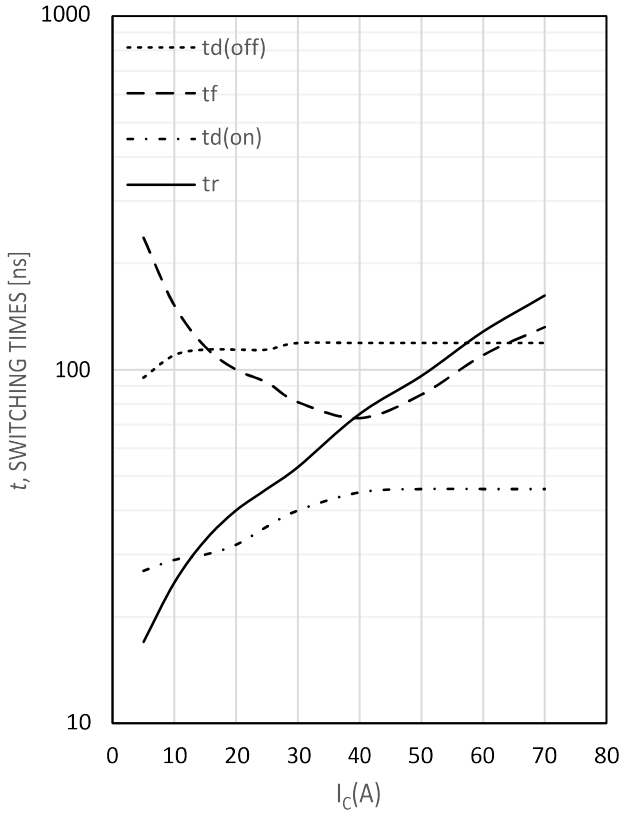
Typ.Gate charge/门级电荷
$V_{GE}=f(Q_G)$; $I_C=40A$



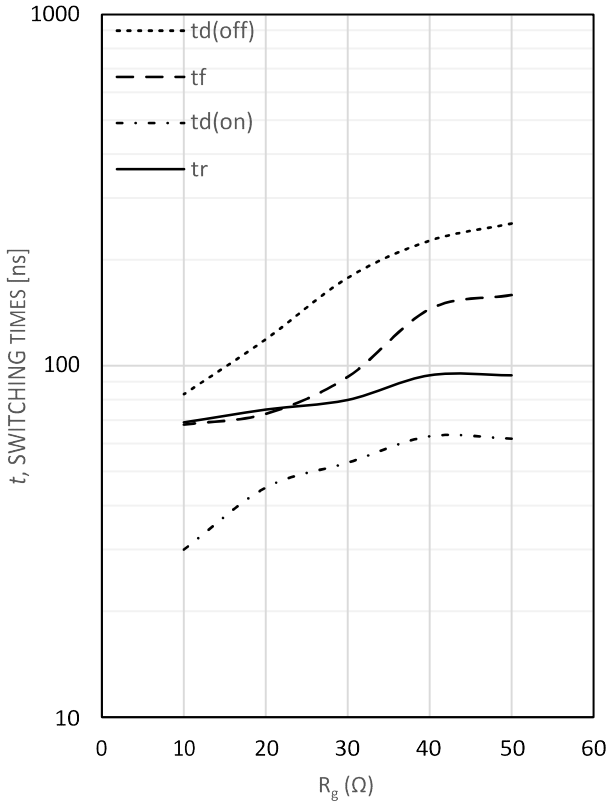
Typ.Capacitances/电容特性
$C=f(V_{CE})$; f=1MHz,V_{GE}=0V



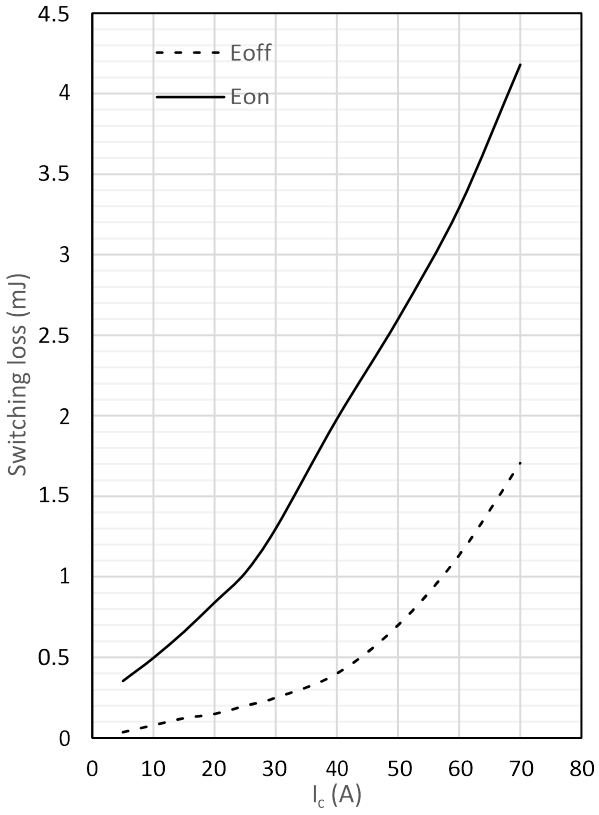
Typ.Switching times vs current/开关时间与电流特性
$t=f(I_C)$; V_{GE}=0/15V,V_{CC}=400V, R_G=20Ω,T_{vj}=25°C



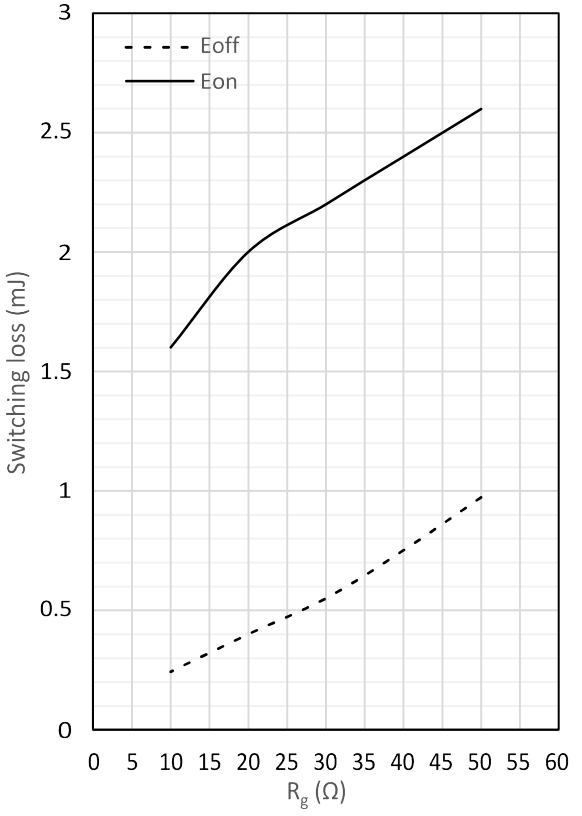
Typ.Switching times vs resistance/开关时间与门级电阻特性
$t=f(R_G)$; V_{GE}=0/15V,V_{CC}=400V,I_C=40A,T_{vj}=25°C



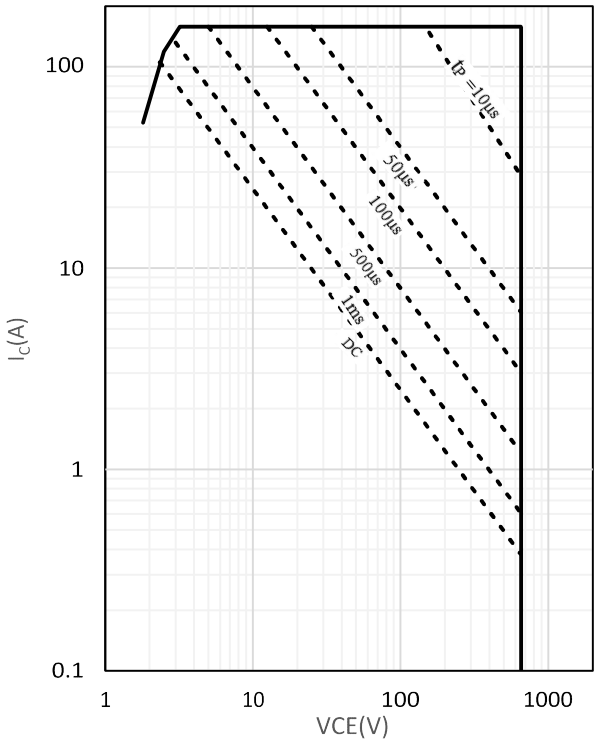
Typ.Switching losses vs current /动态损耗与电流特性
$E=f(I_C)$; V_{GE}=0/15V,R_G=20Ω,V_{CC}=400V,T_{vj}=25°C



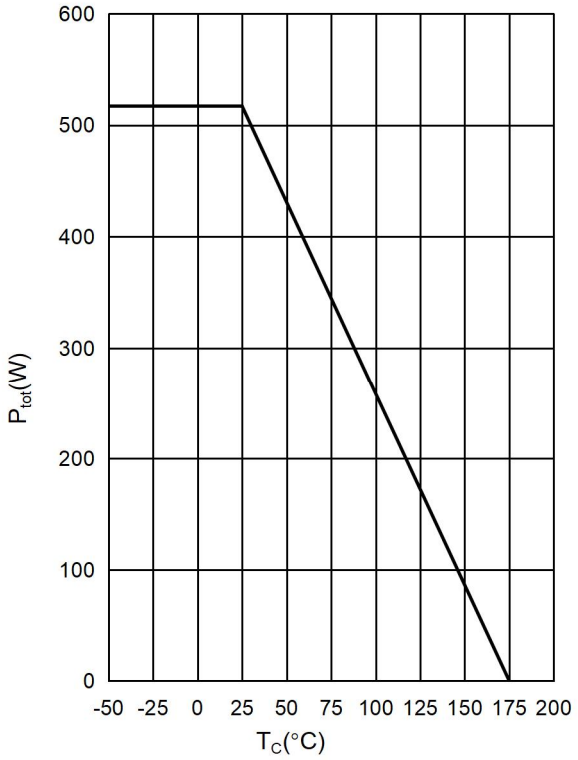
Typ.Switching losses vs resistance/动态损耗与门级电阻特性
$E=f(R_G)$; V_{GE}=0/15V,V_{CC}=400V,I_C=40A,T_{vj}=25°C



Forward bias safe operating area/安全工作区
$I_D=f(V_{DS})$; V_{GE}=15V,T_a=25℃,T_{vj}≤175°C

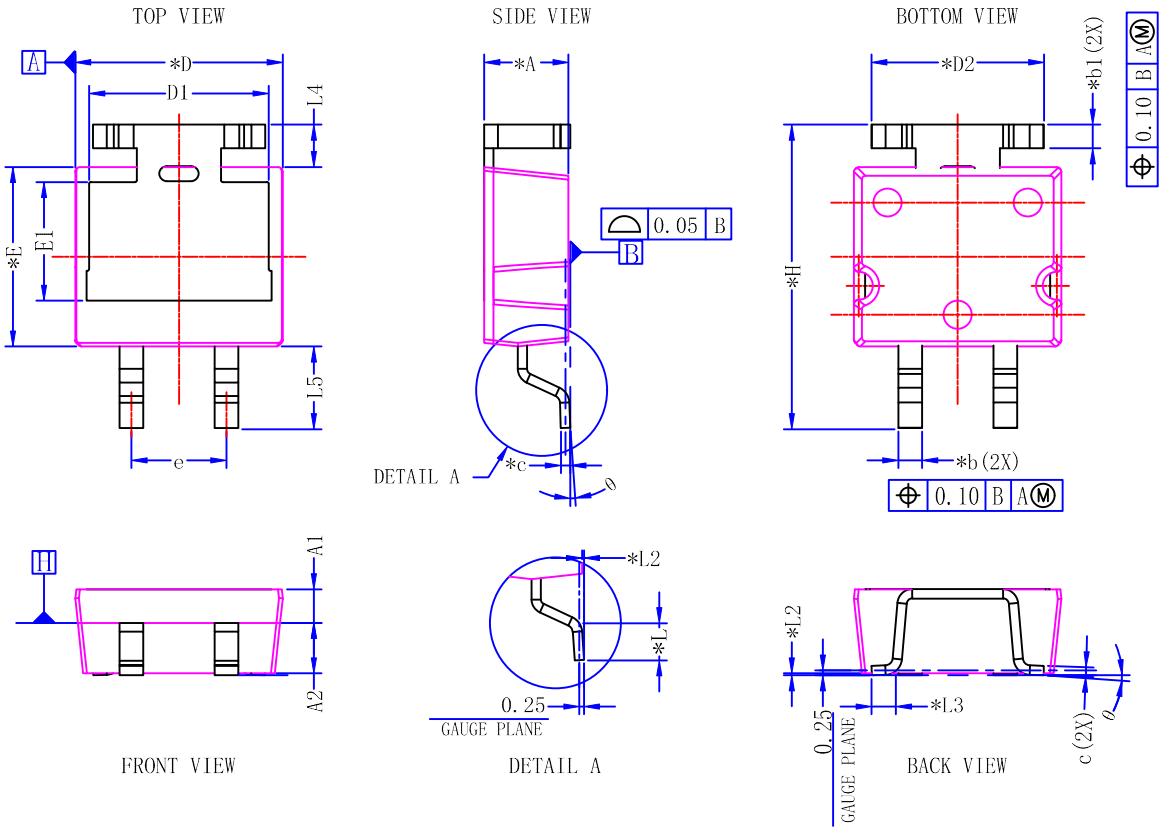


Power dissipation/耗散功率
$P_{tot}=f(T_C)$; @$R_{th(j-C).MAX}$



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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