

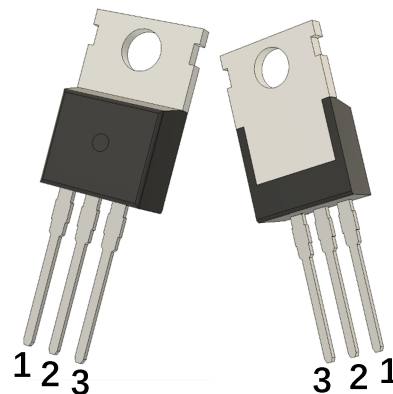


HE20R065Q2DFS

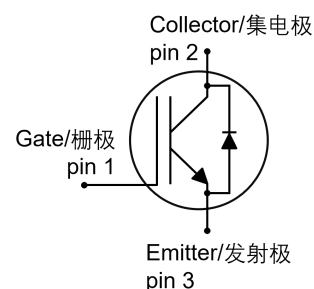
High Performance Field Stop IGBT Power Transistor

Product features/产品特点

- Internal Electrical Isolation
内部电气隔离
- Eliminates the need for external isolation hardware (mica/silicone pads)
无需外部绝缘垫片与绝缘粒, 简化系统装配工艺
- Advanced Trench+FS IGBT technology
先进的沟槽栅+场截止技术
- Low conduction loss
低传导损耗
- Short circuit rated, $t_{sc} \leq 5\mu s$
额定短路能力, $t_{sc} \leq 5\mu s$
- Fast switching
快速开关
- Maximum junction temperature: $T_{vj,MAX} = 175^\circ C$
最高结温 $T_{vj,MAX} = 175^\circ C$
- Halogen free, RoHS compliant
无卤, 符合RoHS



Fully isolated package TO220IS-3L



Applications/应用领域

- UPS (Uninterruptible Power Supplies)
不间断电源 (UPS)
- Inverter
变频器
- Motor Drives
电机驱动

Key performance parameters/关键性能参数

Parameter/参数	Value/值	Unit/单位
V_{CE}	650	V
I_C	20	A
$V_{CEsat,typ}$	1.55	V



Package Parameters/封装信息

Type/型号	Package/封装	Marking/标识	Packaging method/包装方式
HE20R065Q2DFS	TO220IS-3L(内绝缘)	HE20R065DFS	Tube/管装

HE20R065Q2DFS

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

最大额定值 默认 $T_{vj}=25^{\circ}\text{C}$ 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}	$T_{vj}\geq 25^{\circ}\text{C}$	650	V
DC Collector current 集电极连续直流电流	I_C^1	$T_C=25^{\circ}\text{C}$	40	A
		$T_C=100^{\circ}\text{C}$	20	
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	$V_{CE}\leq 650\text{V}, T_{vj}\leq 175^{\circ}\text{C}$	60	A
Diode continuous forward current 二极管连续直流电流	I_F^1	$T_C=25^{\circ}\text{C}$	40	A
		$T_C=100^{\circ}\text{C}$	20	
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}	$V_{GE}=15\text{V}, V_{CC}\leq 400\text{V}$	5	μs
Power dissipation 总耗散功率	P_{tot}	$T_C=25^{\circ}\text{C}$	71	W
		$T_C=100^{\circ}\text{C}$	36	

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

2. Pulse width t_p limited by $T_{vj}(\text{max})$ /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_{vj}		-40		175	°C
Storage Temperature Range 储存温度	T_{stg}		-55		175	°C
Soldering temperature 焊接温度	T_{sold}				260	°C
IGBT thermal resistance, junction-to-case IGBT 芯片到壳热阻	$R_{th(j-C)}$				2.11	°C/W
Diode thermal resistance, junction-to-case 二极管芯片到壳热阻	$R_{th-(j-C)}$				2.6	°C/W
Thermal resistance, junction-to-ambient 结到环境热阻	$R_{th(j-A)}$				41	°C/W

HE20R065Q2DFS

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

静态电气特性 默认 $T_{vj}=25^{\circ}\text{C}$ 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	$V_{(BR)CES}$	$V_{GE}=0V, I_C=0.25mA$	650			V
Collector-Emitter Saturation voltage 集电极-发射极饱和压降	V_{CEsat}	$V_{GE}=15V, I_C=20A$		1.55	1.66	V
Gate threshold voltage 门极开启阈值电压	V_{GEth}	$V_{GE}=V_{CE}, I_C=1mA$	5.0	6.1	7.0	V
Diode Forward Voltage 二极管正向导通压降	V_F	$V_{GE}=0V, I_F=20A$		1.6		V
		$T_{vj}=175^{\circ}\text{C}$		1.25		
Gate to Emitter Leakage current 门极-发射极漏电流	I_{GES}	$V_{GE}=30V, V_{CE}=0V$			200	nA
		$V_{GE}=-30V, V_{CE}=0V$			-200	
Zero gate voltage collector current 集电极-发射极漏电流	I_{CES}	$V_{CE}=650V, V_{GE}=0V$			100	μA

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

动态电气特性 默认 $T_{vj}=25^{\circ}\text{C}$ 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}	$V_{GE}=0V, V_{CE}=25V,$ $f=1MHz$		1130		pF
Output capacitance 输出电容	C_{oes}			44		
Reverse transfer capacitance 反向传输电容	C_{res}			9		
Total gate charge 门极电荷	Q_g	$V_{GE}=15V,$ $I_C=20A, V_{CC}=520V$		54		nC



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

开关特性感性负载 默认 $T_{vj}=25^{\circ}\text{C}$ 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} =0/15V V _{CC} =400V I _C =20A R _{G(on)} =10Ω R _{G(off)} =10Ω	T _{vj} =25°C		25		ns
			T _{vj} =175°C		24		
Rise time 上升时间	t _r		T _{vj} =25°C		14		ns
			T _{vj} =175°C		14		
Turn-off delay time 关闭延迟时间	t _{d(off)}		T _{vj} =25°C		117		ns
			T _{vj} =175°C		152		
Fall time 下降时间	t _f		T _{vj} =25°C		33		ns
			T _{vj} =175°C		69		
Turn-on switch loss 单次开启损耗	E _{on}		T _{vj} =25°C		0.30		mJ
			T _{vj} =175°C		0.36		
Turn-off switch loss 单次关闭损耗	E _{off}		T _{vj} =25°C		0.41		mJ
			T _{vj} =175°C		0.60		
Total switching energy 总开关损耗	E _{ts}		T _{vj} =25°C		0.71		mJ
			T _{vj} =175°C		0.96		

Table 6 Diode Characteristic values/二极管特征值

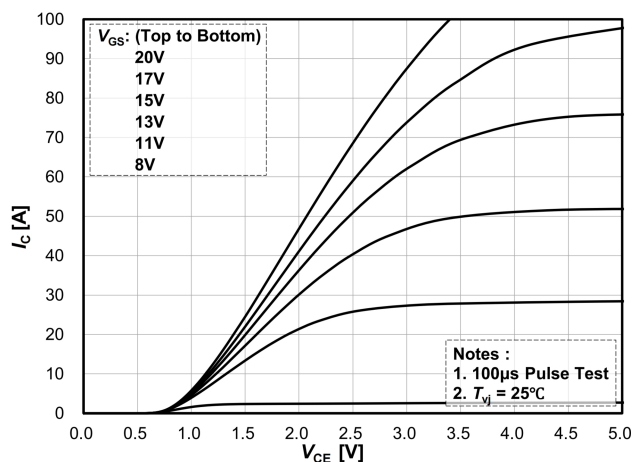
Parameter 参数	Symbol 符号	Test condition 测试条件		Value/值			Units 单位
				Min.	Typ.	Max.	
Diode Reverse Recovery Time 二极管反向恢复时间	t _{rr}	V _R =400V I _F =20A di _F /dt=-500A/μs	T _{vj} =25°C		62		ns
			T _{vj} =175°C		90		
Diode Reverse Recovery Charge 二极管反向恢复电量	Q _{rr}		T _{vj} =25°C		472		nC
			T _{vj} =175°C		1130		
Peak reverse recovery current 反向恢复峰值电流	I _{rrm}		T _{vj} =25°C		12		A
			T _{vj} =175°C		19		



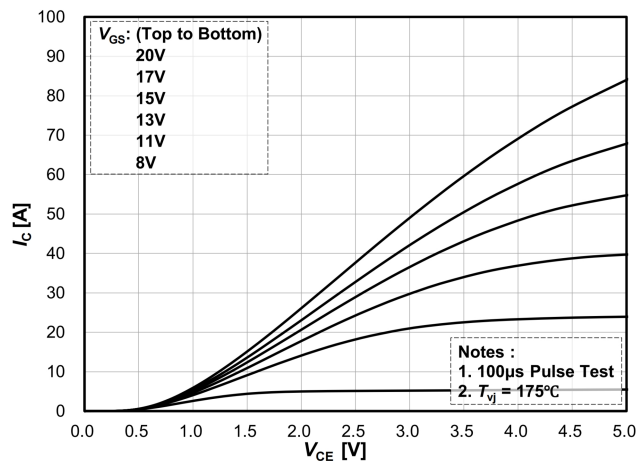
6. Characteristics diagrams

特性曲线

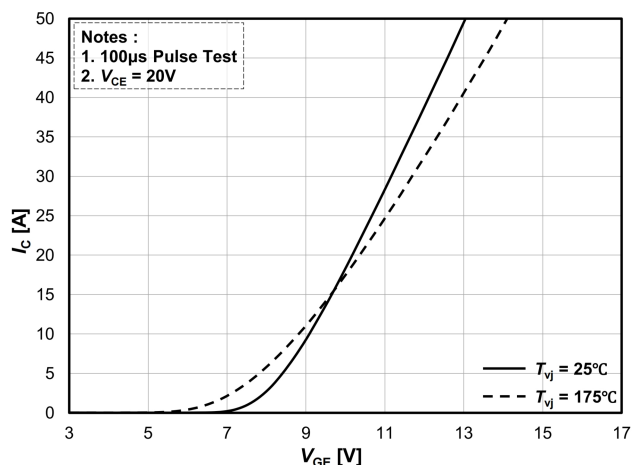
Typ. Output characteristic/输出特性



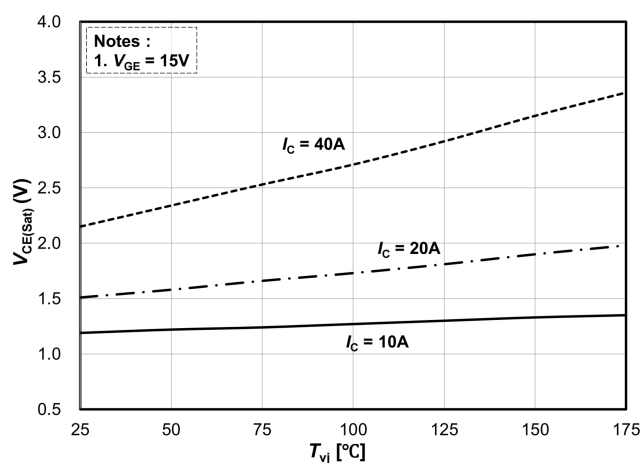
Typ. Output characteristic/输出特性



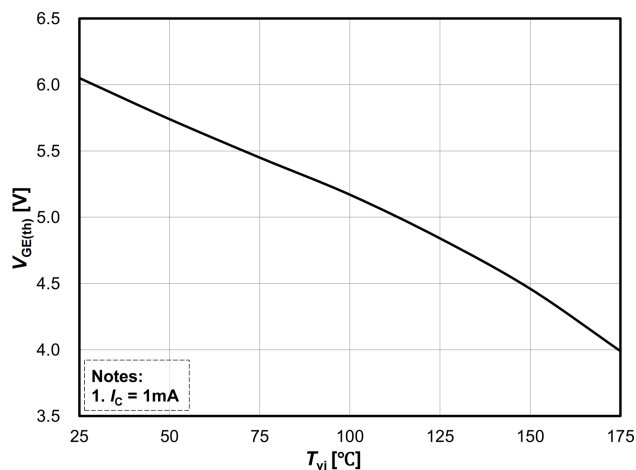
Typ. Transfer characteristic/典型传输特性



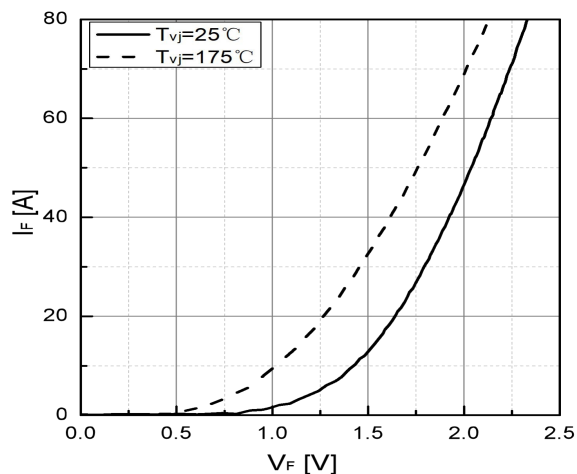
Typ. Temperature dependence of V_{CEsat} /饱和压降与结温特性



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



Typ. Temperature dependence of V_F /二极管压降与结温特性

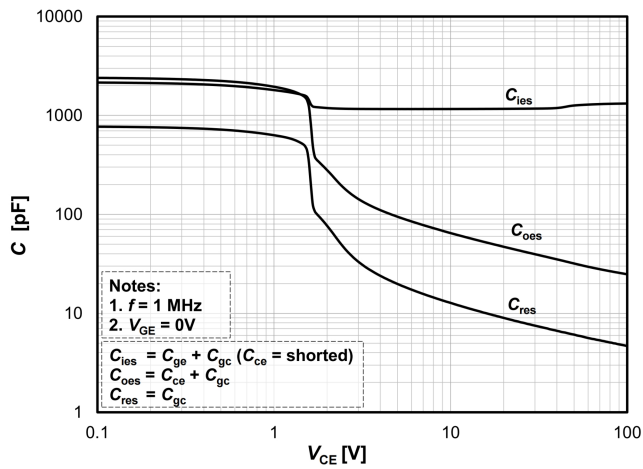


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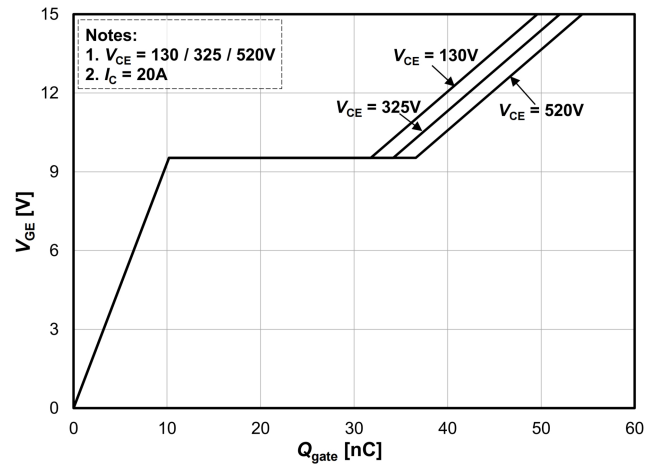
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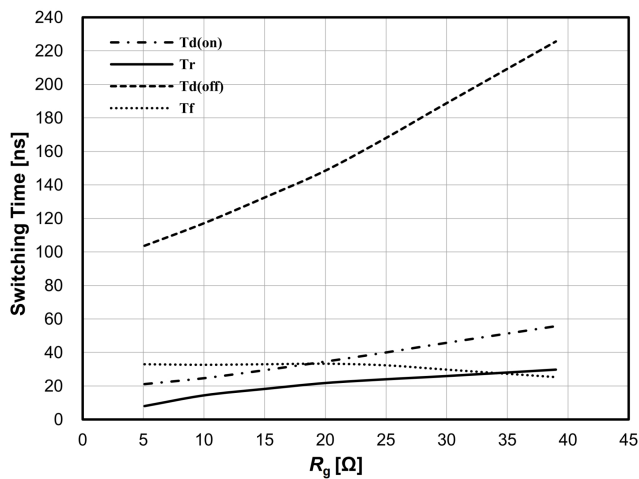
Typ.Capacitances/电容特性



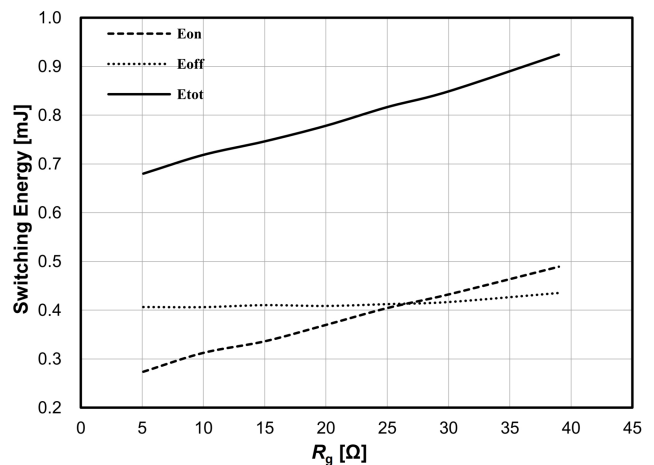
Typ.Gate charge/门级电荷



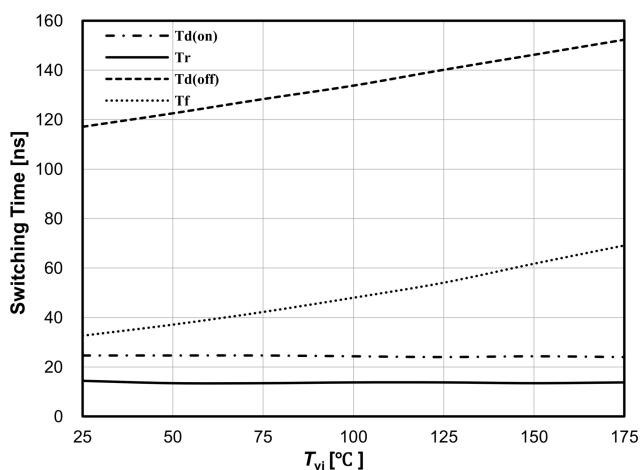
Typ.Switching times vs resistance/开关时间与门级电阻特性



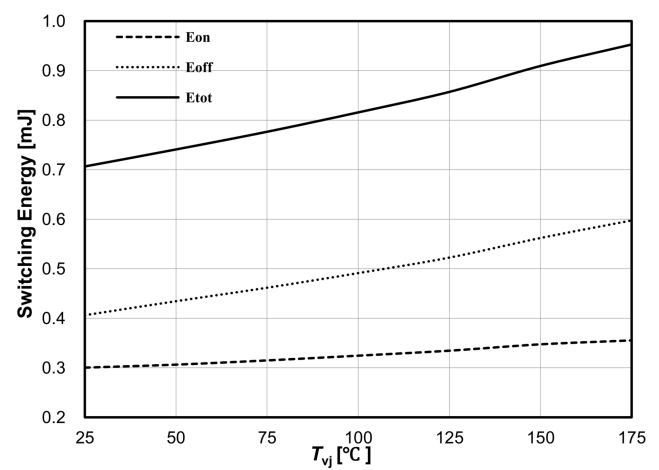
Typ.Switching losses vs resistance/动态损耗与门级电阻特性



Typ.Switching times vs temperature/开关时间与结温特性



Typ.Switching losses vs temperature/动态损耗与结温特性

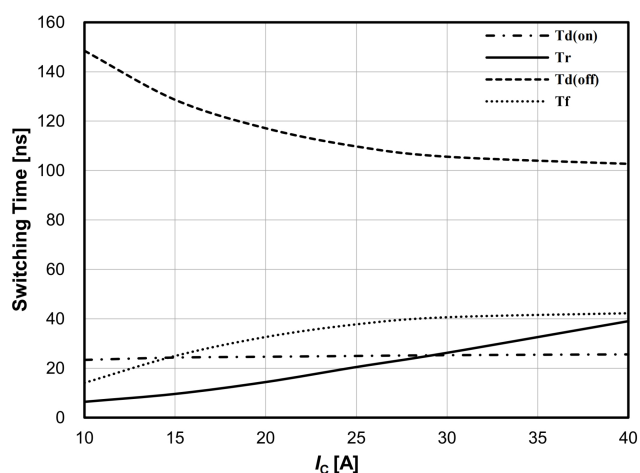


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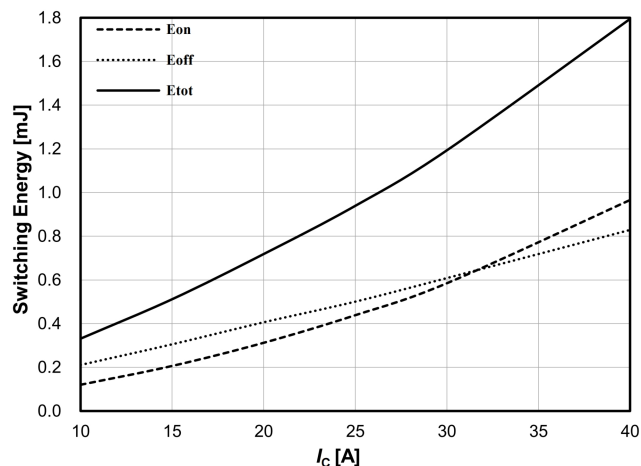
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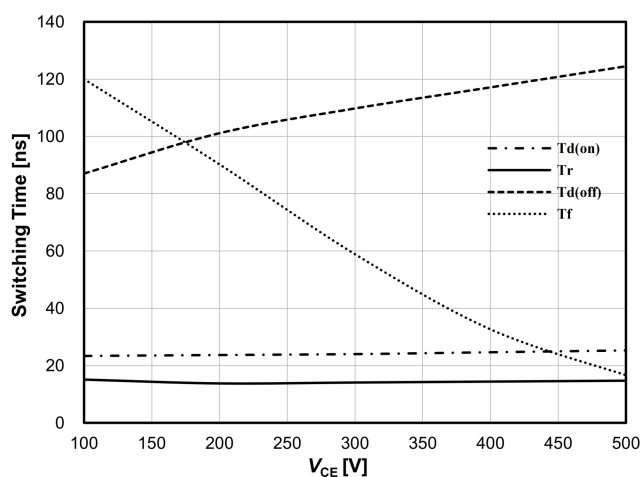
Typ.Switching times vs current/开关时间与电流特性



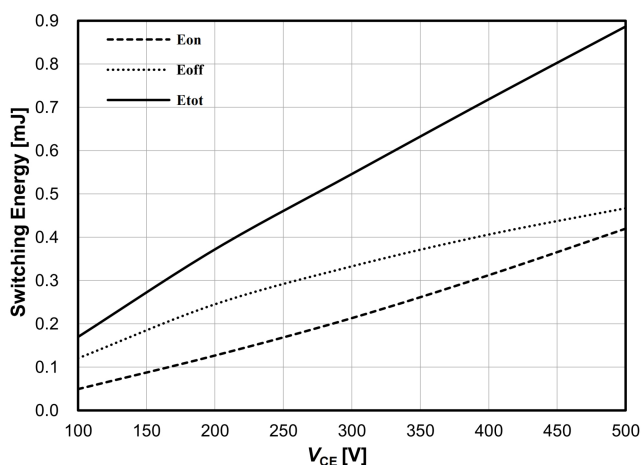
Typ.Switching losses vs current/动态损耗与电流特性



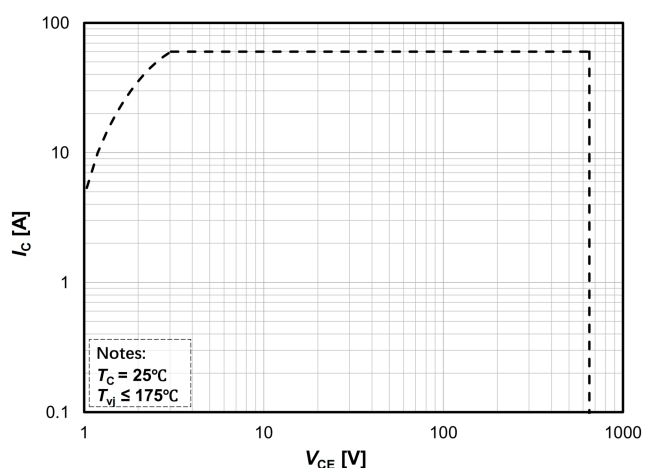
Typ.Switching times vs voltage/开关时间与电压特性



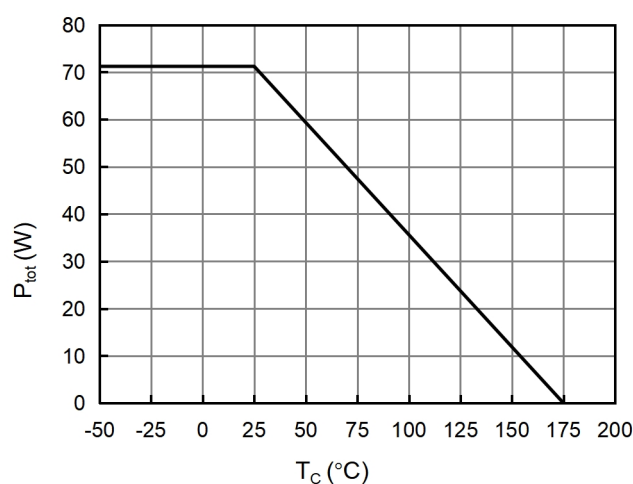
Typ.Switching losses vs voltage/动态损耗与电压特性



Reverse bias safe operating area/反偏安全工作区



Power dissipation/耗散功率

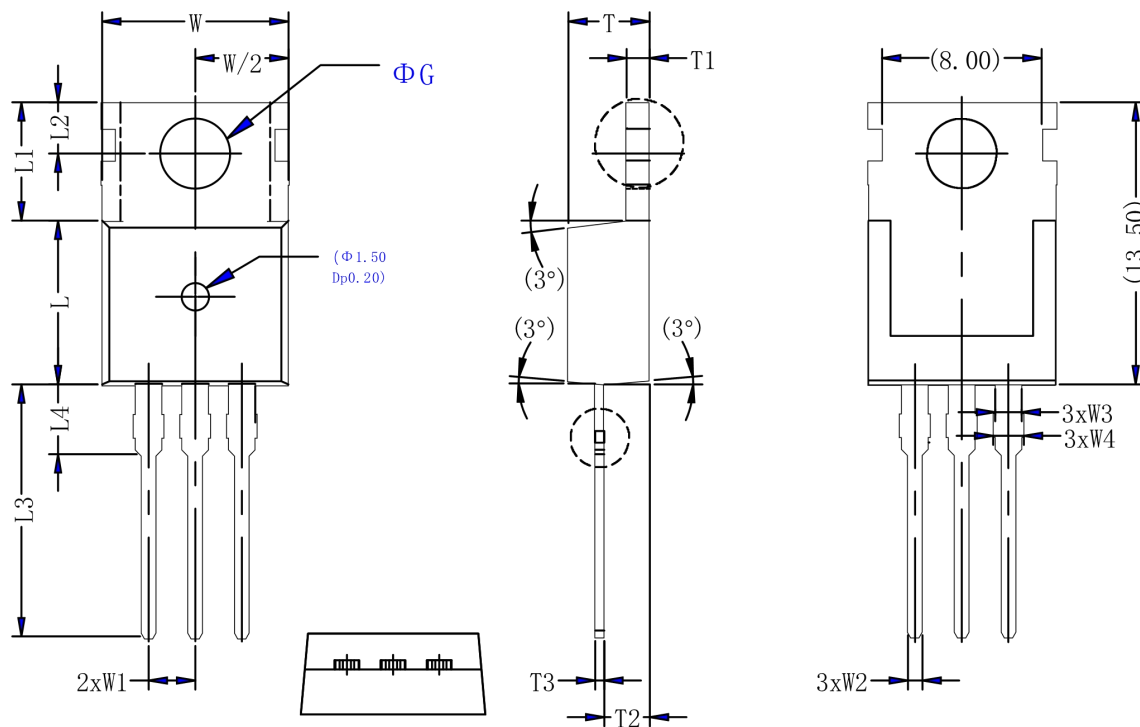




7. Package outline

封装外形

Figure 1. Outline TO220IS-3L, dimensions in mm/TO220IS-3L外形尺寸 (毫米)



SYMBOL	MIN.	MAX.
W	9.70	10.30
W1	2.54(typ)	
W2	0.60	0.90
W3	1.17	1.37
W4	1.32	1.72
L	9.00	9.40
L1	6.40	6.80
L2	2.70	3.00
L3	12.80	14.00
L4	2.79	3.30
T	4.30	4.70
T1	1.25	1.40
T2	2.20	2.60
T3	0.45	0.60
G (Φ)	3.55	3.70

注:()内数值为参考值。尺寸不包含毛刺及模具溢料。

Note: The values in () are reference values. The size does not include burrs and mold overflow.



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
2026-06-08	Rev.G1.0	Target Datasheet (目标规格书)

9. Matters needing attention
注意事项

Table 8 Important Technical Guidance, Application Policy, and Copyright Notice/重要技术指南、应用规范与版权声明

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