

HE50R065H6DHU

High Performance Field Stop IGBT Power Transistor

Product features/产品特点

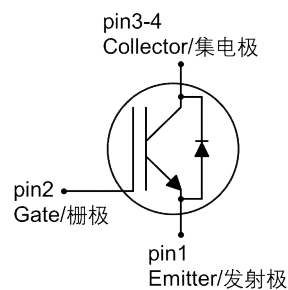
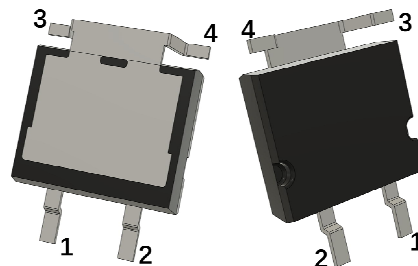
- Top side cooling technology
顶部散热技术
- Advanced Trench+FS IGBT technology
先进的沟槽栅+场截止技术
- Low gate charge
低栅极电荷
- Short-Circuit Withstand Time, $t_{SC} \leq 7\mu s$
短路承受时间 $t_{SC} \leq 7\mu s$
- Maximum junction temperature: $T_{j,MAX} = 175^\circ C$
最高结温 $T_{j,MAX} = 175^\circ C$
- $V_{CE(sat)}$ with 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}	650	V
I_C	50	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
HE50R065H6DHU	TSC263-4L	HE50R065DHU	Tape and Reel/卷带包装

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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}	$T_j \geq 25^{\circ}\text{C}$	650	V
DC Collector current 集电极连续直流电流	I_C^1	$T_C = 25^{\circ}\text{C}$	100	A
		$T_C = 100^{\circ}\text{C}$	50	
Pulsed Collector current 集电极脉冲电流	I_{Cpuls}^2		200	A
Turn off safe operating area 关断安全工作区	— ²	$V_{CE} \leq 650\text{V}, T_j \leq 175^{\circ}\text{C}$	200	A
Diode continuous forward current 二极管连续直流电流	I_F^1	$T_C = 25^{\circ}\text{C}$	100	A
		$T_C = 100^{\circ}\text{C}$	50	
Diode pulsed current 二极管脉冲电流	I_{Fpuls}^2		200	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}	$V_{GE} = 15\text{V}, V_{CC} \leq 400\text{V}$	7	μs
Power dissipation 总耗散功率	P_{tot}	$T_C = 25^{\circ}\text{C}$	682	W
		$T_C = 100^{\circ}\text{C}$	341	

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	$R_{th(j-C)}$				0.22	K/W
Diode thermal resistance, junction-to-case 二极管芯片到壳热阻	$R_{th(j-C)}$				0.32	K/W
Thermal resistance, junction-to-ambient 结到环境热阻	$R_{th(j-A)}$				61	K/W

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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	$V_{(BR)CES}$	$V_{GE}=0V, I_C=0.25mA$	650			V
Collector-Emitter Saturation voltage 集电极-发射极饱和压降	V_{CEsat}	$V_{GE}=15V, I_C=50A$		1.45	2.1	V
		$T_j=175^{\circ}\text{C}$		1.85		
Gate threshold voltage 门极开启阈值电压	V_{GEth}	$V_{GE}=V_{CE}, I_C=0.25mA$	4.0	4.8	5.6	V
Diode Forward Voltage 二极管正向导通压降	V_F	$V_{GE}=0V, I_F=50A$		1.35		V
		$T_j=175^{\circ}\text{C}$		1.20		
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-发射极漏电流	I_{CES}	$V_{CE}=650V, V_{GE}=0V$			50	μA
		$T_j=175^{\circ}\text{C}$			500	
Transconductance 跨导	g_{fs}	$V_{CE}=20V, I_C=50A$		58		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}	$V_{GE}=0V, V_{CE}=30V,$ $f=1MHz$		11.1		nF
Output capacitance 输出电容	C_{oes}			157		pF
Reverse transfer capacitance 反向传输电容	C_{res}			65		
Total gate charge 门极电荷	Q_g	$V_{GE}=15V,$ $I_C=50A, V_{CC}=520V$		432		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} =0/15V V _{CC} =400V I _C =50A R _{G(on)} =10Ω R _{G(off)} =10Ω	T _J =25°C		56		ns
			T _J =150°C		62		
Rise time 上升时间	t _r		T _J =25°C		132		ns
			T _J =150°C		140		
Turn-off delay time 关闭延迟时间	t _{d(off)}		T _J =25°C		487		ns
			T _J =150°C		513		
Fall time 下降时间	t _f		T _J =25°C		125		ns
			T _J =150°C		132		
Turn-on switch loss 单次开启损耗	E _{on}		T _J =25°C		2.75		mJ
			T _J =150°C		2.94		
Turn-off switch loss 单次关闭损耗	E _{off}		T _J =25°C		1.6		mJ
			T _J =150°C		1.75		
Total switching energy 总开关损耗	E _{ts}		T _J =25°C		4.35		mJ
			T _J =150°C		4.60		

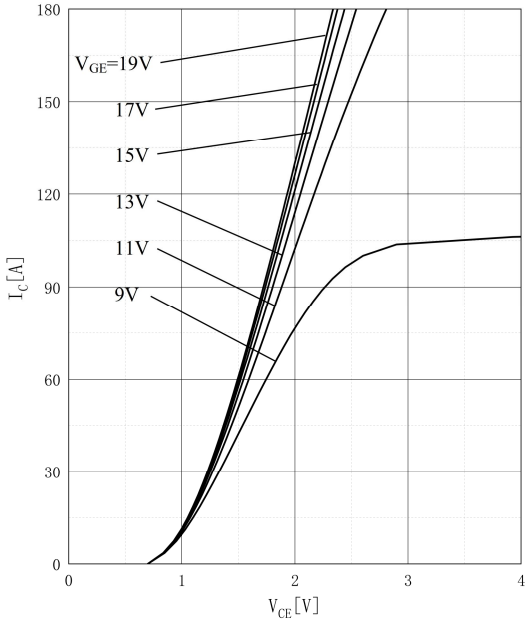
Table 6 Diode Characteristic values/二极管特征值

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 =50A 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		

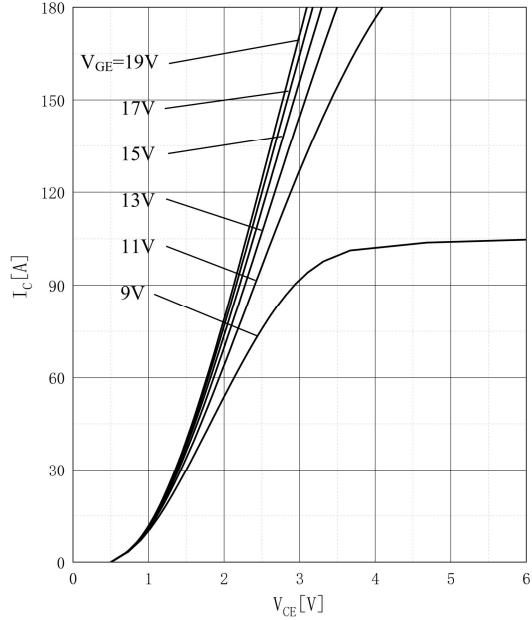


6. Characteristics diagrams
特性曲线

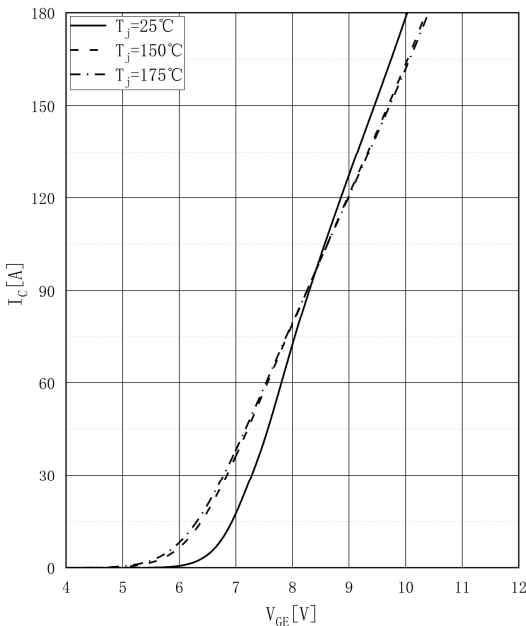
Typ. Output characteristic/输出特性
 $I_C = f(V_{CE})$; $T_J = 25^\circ\text{C}$



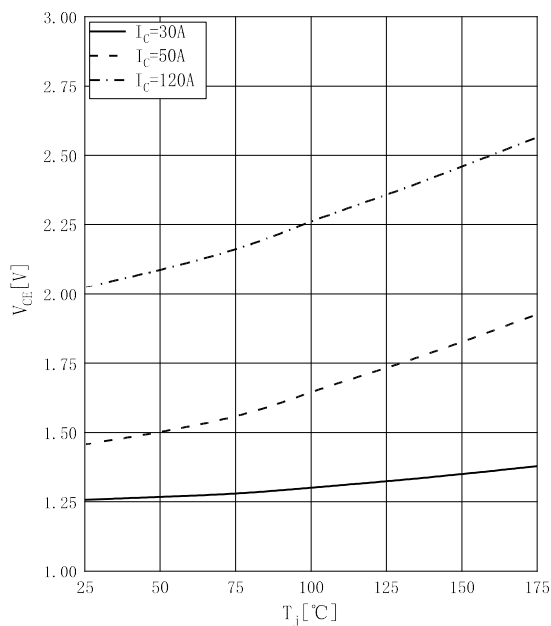
Typ. Output characteristic/输出特性
 $I_C = f(V_{CE})$; $T_J = 175^\circ\text{C}$



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
 $V_{CEsat} = f(T_J)$; $V_{GE} = 15\text{V}$

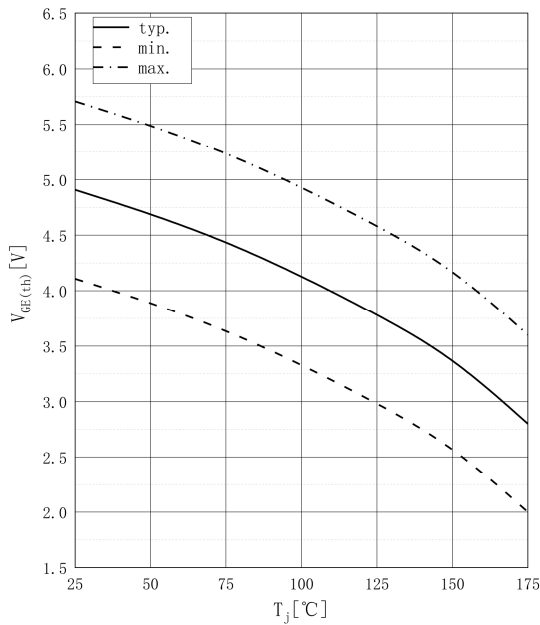


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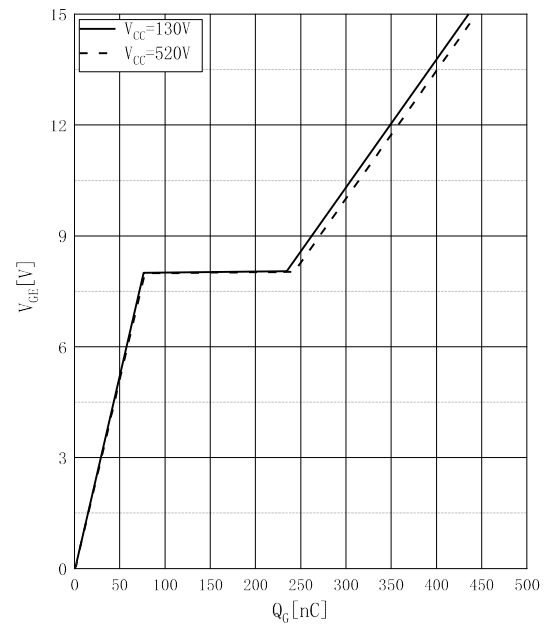
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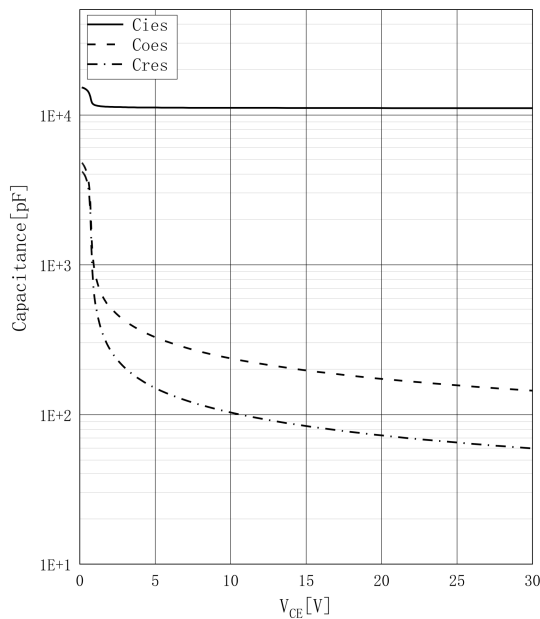
Typ.Gate threshold voltage/门级阈值电压结温特性
 $V_{GEth}=f(T_j)$; $I_C=0.5mA, V_{GE}=V_{CE}$



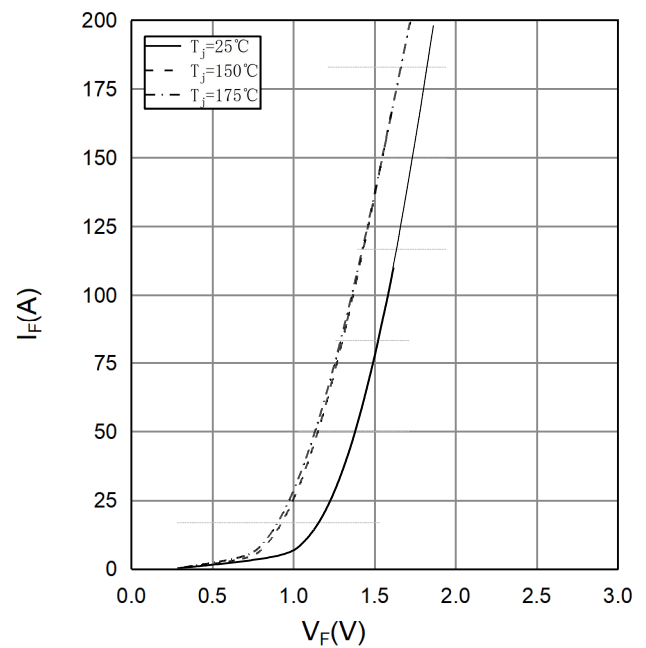
Typ.Gate charge/门级电荷
 $V_{GE}=f(Q_G)$; $I_C=50A$



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
 $I_F=f(V_F)$

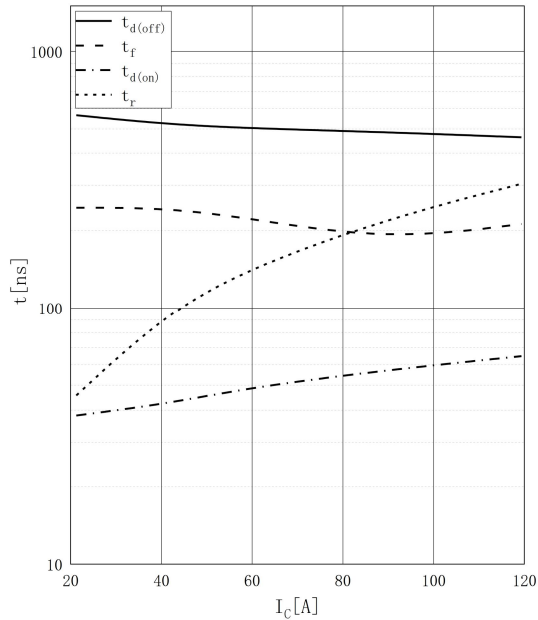


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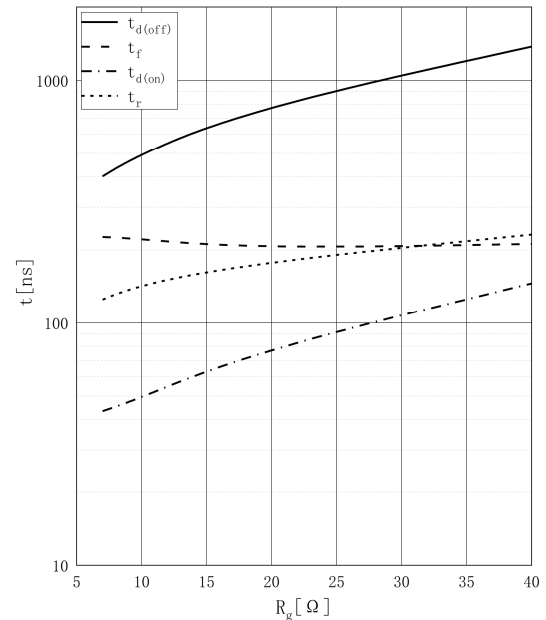
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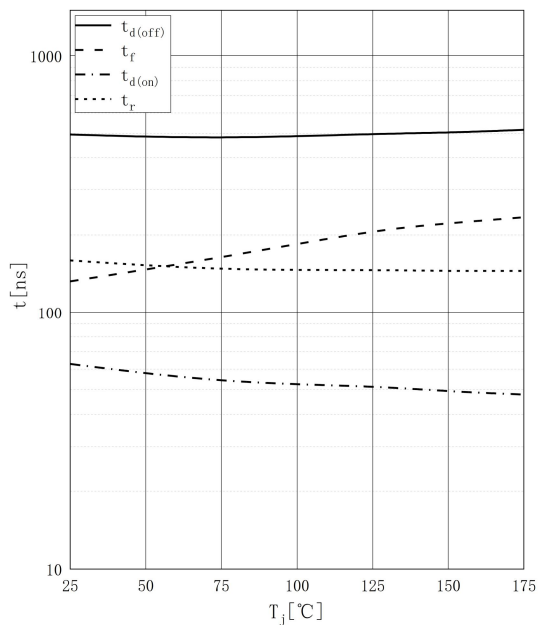
Typ.Switching times vs current/开关时间与电流特性
 $t=f(I_C)$; $V_{GE}=0/15V$, $V_{CC}=400V$, $R_G=10\Omega$, $T_J=25^\circ C$



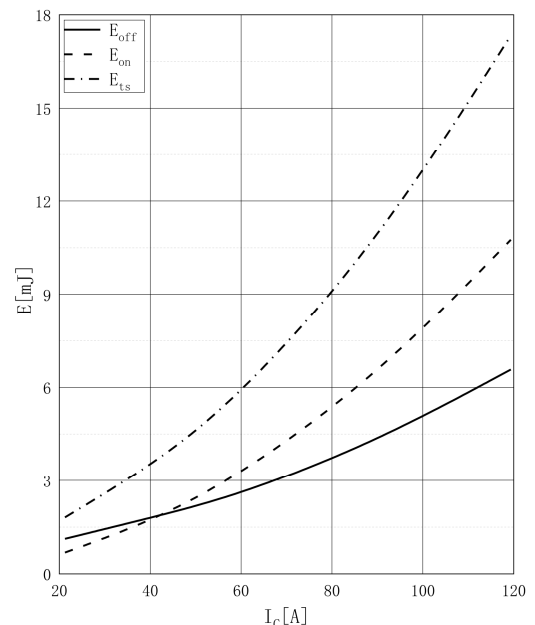
Typ.Switching times vs resistance/开关时间与门级电阻特性
 $t=f(R_G)$; $V_{GE}=0/15V$, $V_{CC}=400V$, $I_C=60A$, $T_J=25^\circ C$



Typ.Switching times vs T_J /开关时间与结温特性
 $t=f(R_G)$; $V_{GE}=0/15V$, $V_{CC}=400V$, $I_C=60A$, $R_G=10\Omega$



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

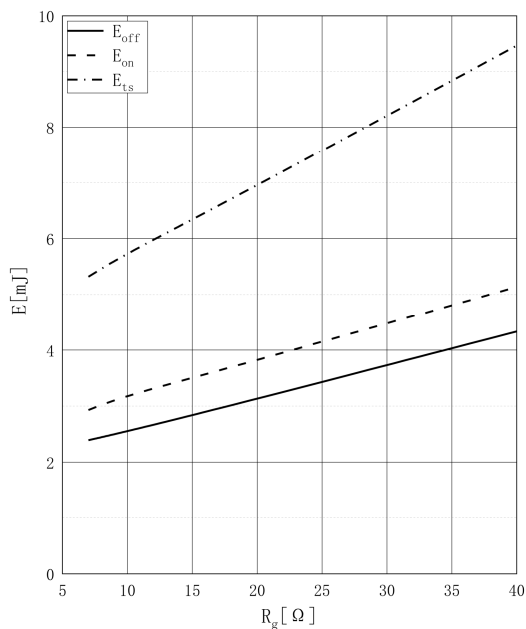


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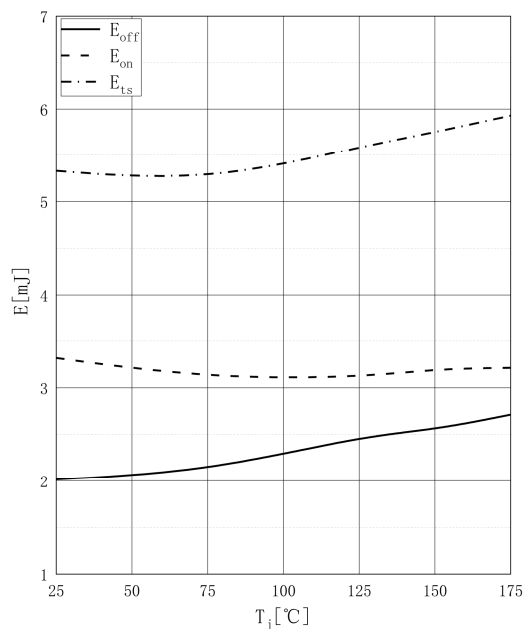
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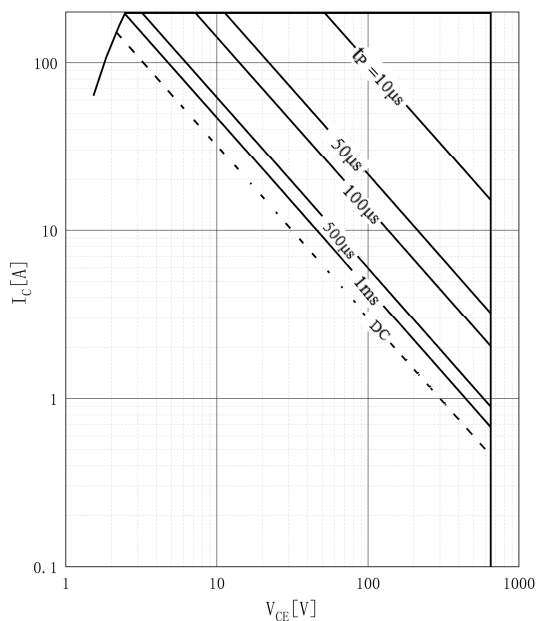
Typ.Switching losses vs resistance/动态损耗与门级电阻特性
 $E=f(R_g)$; $V_{GE}=0/15V, V_{CC}=400V, I_c=60A, T_j=25^\circ C$



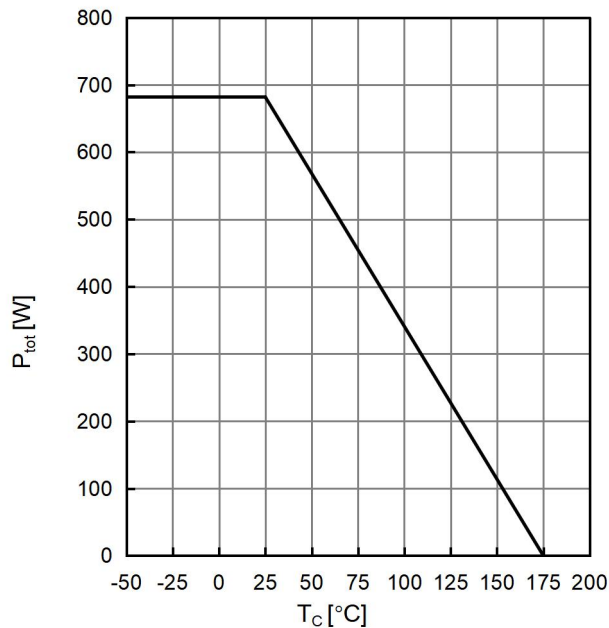
Typ.Switching losses vs T_j /动态损耗与结温特性
 $E=f(T_j)$; $V_{GE}=0/15V, V_{CC}=400V, I_c=60A, R_g=10\Omega$



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



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





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

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