

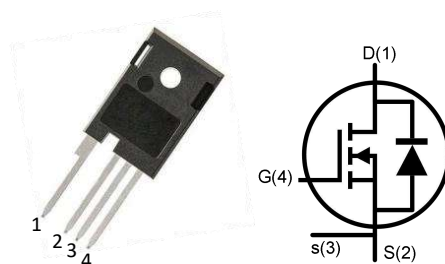
HCM75S12T4K3

1200V 75mΩ 碳化硅功率MOSFET, TO-247-4L

1200V 75mΩ Silicon Carbide Power MOSFET, TO-247-4L

特点 Features

- 第三代SiC MOSFET技术
3rd Generation SiC MOSFET Technology
- 高阻断电压, 低导通电阻
High Blocking Voltage with Low On-Resistance
- 高开关速度, 低寄生电容
High Speed Switching with Low Capacitances
- 易于并联, 驱动简单
Easy to Parallel and Simple to Drive
- 无卤素添加, 符合RoHS标准
Halogen Free, RoHS Compliant



应用 Applications

- 可再生能源
Renewable Energy
- 电动汽车电池充电器
EV Battery Chargers
- 高压DC/DC转换器
High Voltage DC/DC Converters
- 开关电源
Switch Mode Power Supplies

碳化硅功率MOSFET/ SiC Power MOSFET

最大额定值/ Maximum Rated Values ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)

参数 Parameter	符号 Symbol	条件 Condition	数值 Value	单位 Unit
漏极-源极电压 Drain-source voltage	$V_{DS\ max}$	$V_{GS}=0V, I_D=100\mu A$	1200	V
栅极-源极电压 Gate-source voltage	$V_{GS\ max}$	Absolute maximum values	-10/+22	V
	$V_{GS\ op}$	Recommended operational values	-5/+18	V
连续漏极电流 Continuous drain current	I_D	$V_{GS}=18V, T_c=25^{\circ}\text{C}$	42	A
		$V_{GS}=18V, T_c=100^{\circ}\text{C}$	30	
漏极脉冲电流 Pulsed drain current	$I_{D\ pulse}$	Pulse width t_p limited by $T_{vj\ max}$	126	A
耗散功率 Power dissipation	P_D	$T_c=25^{\circ}\text{C}, T_{vj\ max}=175^{\circ}\text{C}$	197	W
工作结温 Operating junction temperature	$T_{vj\ op}$		-55~175	$^{\circ}\text{C}$
存储温度范围 Storage temperature range	T_{stg}		-55~175	$^{\circ}\text{C}$

电特性 Electrical Characteristics ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)

参数 Parameter	符号 Symbol	条件 Condition		数值 Value			单位 Unit
				Min.	Typ.	Max.	
漏极-源极阻断电压 Drain-source breakdown voltage	V _{DSS BR}	V _{GS} =0V, I _D =100μA		1200			V
栅极阈值电压 Gate threshold voltage	V _{GS th}	V _{DS} =V _{GS} , I _D =5mA	T _{vj} =25℃	2.0	3.1	4.0	V
			T _{vj} =175℃		2.2		
零栅压漏极电流 Zero gate voltage drain current	I _{DSS}	V _{DS} =1200V, V _{GS} =0V			1	100	μA
栅极-源极漏电流 Gate-source leakage current	I _{GSS}	V _{GS} =18V, V _{DS} =0V			1	100	nA
漏极-源极导通电阻 Drain-source on-state resistance	R _{DS on}	V _{GS} =18V, I _D =20A	T _{vj} =25℃		69	90	mΩ
			T _{vj} =175℃		111		
跨导 Transconductance	g _{fs}	V _{DS} =20V, I _D =20A	T _{vj} =25℃		13		S
			T _{vj} =175℃		12		
输入电容 Input capacitance	C _{iss}	V _{GS} =0V V _{DS} =1000V f=100kHz V _{AC} =25mV			1185		pF
输出电容 Output capacitance	C _{oss}				65		
反向传输电容 Reverse transfer capacitance	C _{rss}				7		
输出电容存储能量 C _{oss} stored energy	E _{oss}				66		μJ
开通能量 Turn-on switching energy	E _{on}	V _{DS} =800V, V _{GS} =-5/18V I _D =20A, R _{G ext} =2.5Ω, L=250μH	T _{vj} =25℃		212		μJ
关断能量 Turn-off switching energy	E _{off}		T _{vj} =175℃		237		
			T _{vj} =25℃		115		
			T _{vj} =175℃		108		
开通延迟时间 Turn-on delay time	t _{d on}	V _{DS} =800V, V _{GS} =-5/18V I _D =20A, R _{G ext} =2.5Ω, T _{vj} =25℃, L=250μH Timing relative to V _{DS}			8		ns
上升时间 Rise time	t _r				23		
关断延迟时间 Turn-off delay time	t _{d off}				27		
下降时间 Fall time	t _f				8		
栅极内阻 Internal gate resistance	R _{G int}	f=1MHz, V _{AC} =25mV			2		Ω
栅源电荷 Gate to source charge	Q _{GS}	V _{DS} =800V, V _{GS} =-5/18V I _D =20A			13		nC
栅漏电荷 Gate to drain charge	Q _{GD}				23		
栅极总电荷 Total gate charge	Q _G				69		

体二极管特性 Body Diode Characteristics (T_{vj}=25°C unless otherwise noted)

参数 Parameter	符号 Symbol	条件 Condition		数值 Value			单位 Unit
				Min.	Typ.	Max.	
二极管正向电压 Diode forward voltage	V _{SD}	V _{GS} =-5V, I _S =10A	T _{vj} =25°C		4.6		V
			T _{vj} =175°C		4.0		
二极管连续正向电流 Continuous diode forward current	I _S	V _{GS} =-5V, T _C =25°C				37	A
二极管脉冲电流 Diode pulse current	I _{S pulse}	V _{GS} =-5V, Pulse width t _p limited by T _{vj max}				126	A
反向恢复时间 Reverse recovery time	t _{rr}	V _{GS} =-5V I _S =20A R _{G ext} =2.5Ω T _{vj} =175°C V _R =800V			22		ns
反向恢复电荷 Reverse recovery charge	Q _{rr}				288		nC
反向恢复峰值电流 Peak reverse recovery current	I _{RRM}				20		A

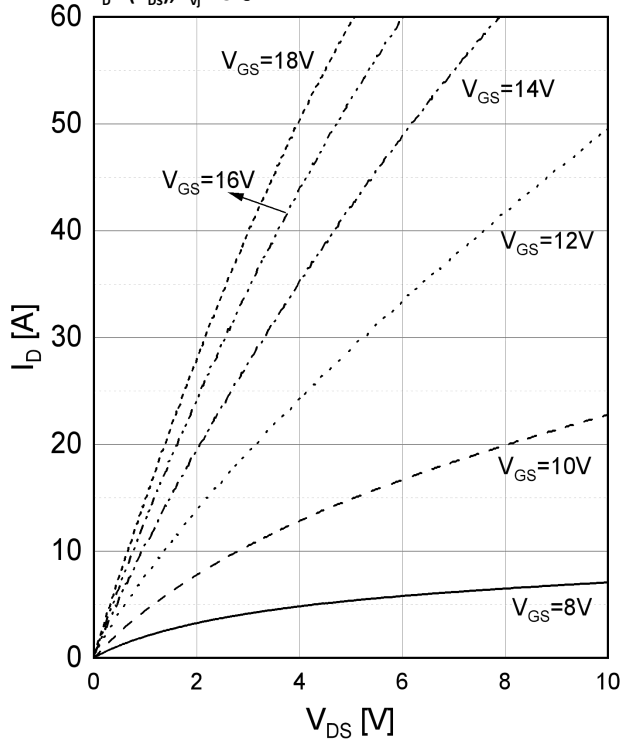
热特性 Thermal Characteristics

参数 Parameter	符号 Symbol	条件 Condition	数值 Value			单位 Unit
			Min.	Typ.	Max.	
结-壳热阻 Thermal resistance: junction to case	R _{th JC}			0.76		K/W

输出特性

Output Characteristics

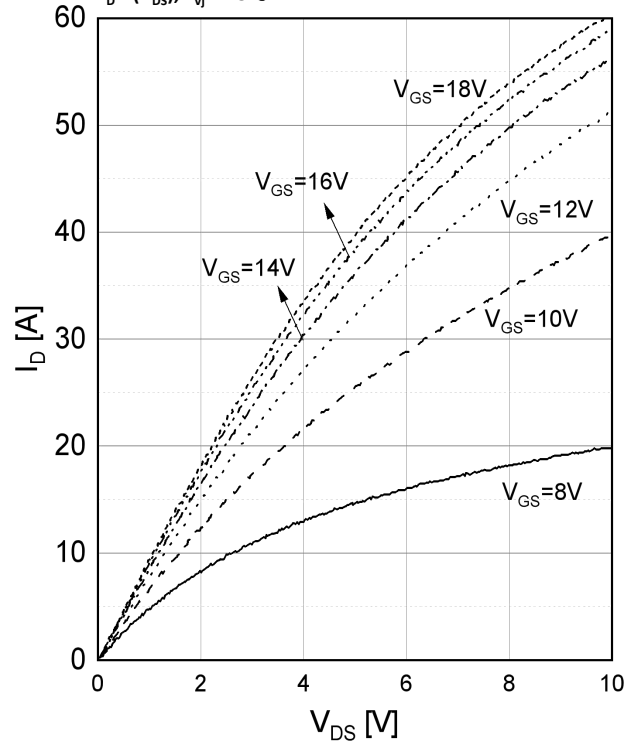
$$I_D = f(V_{DS}), T_{vj} = 25^\circ\text{C}$$



输出特性

Output Characteristics

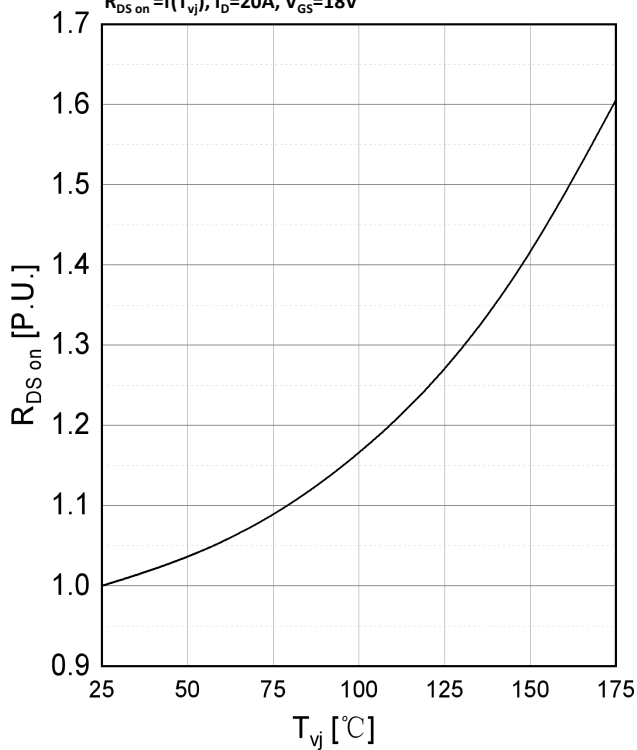
$$I_D = f(V_{DS}), T_{vj} = 175^\circ\text{C}$$



标准化导通电阻

Normalized On-Resistance

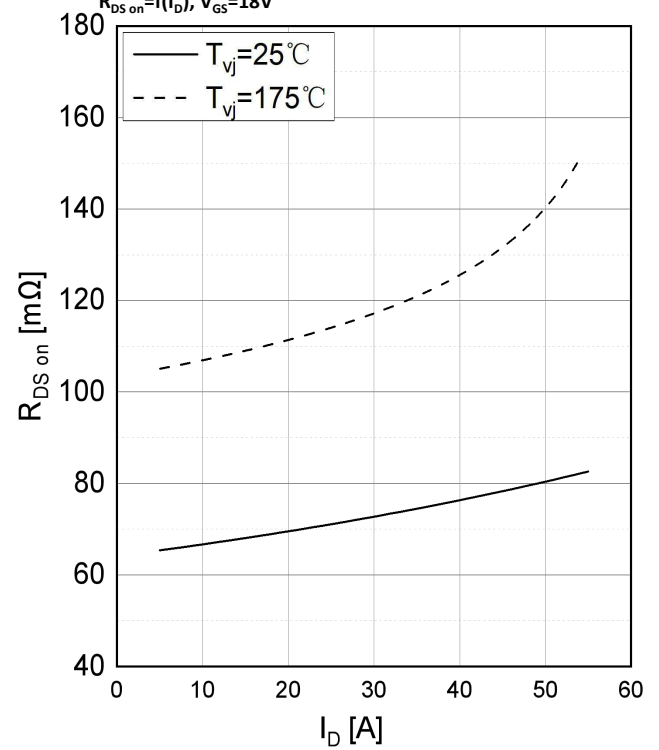
$$R_{DS(on)} = f(T_{vj}), I_D = 20A, V_{GS} = 18V$$



导通电阻

On-Resistance

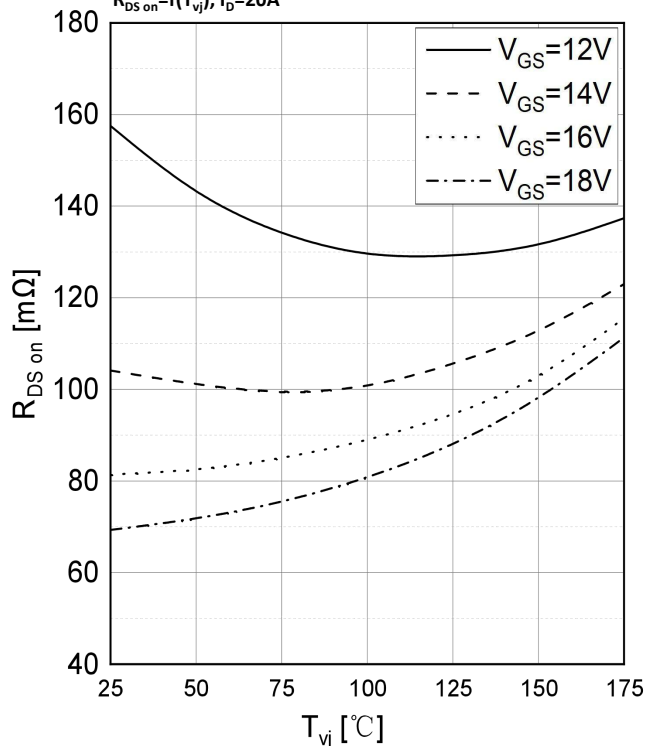
$$R_{DS(on)} = f(I_D), V_{GS} = 18V$$



导通电阻

On-Resistance

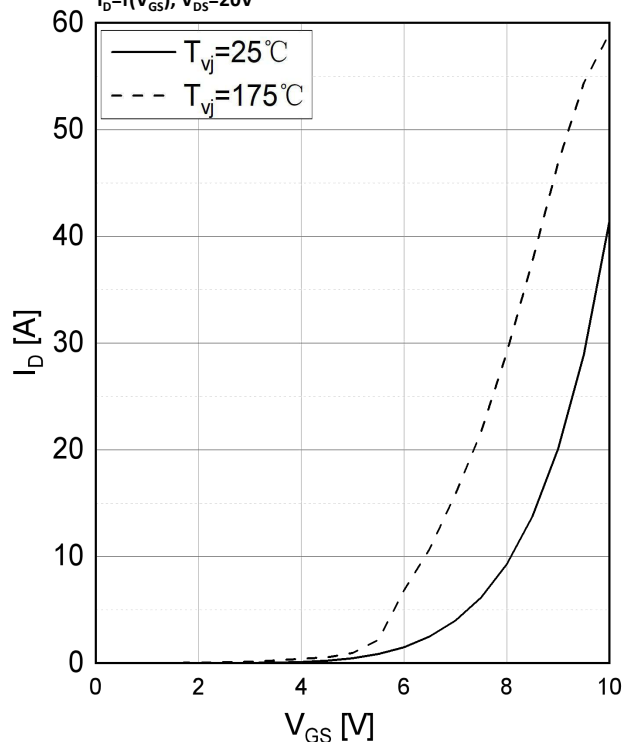
$$R_{DS\ on}=f(T_{vj}), I_D=20A$$



转移特性

Transfer Characteristics

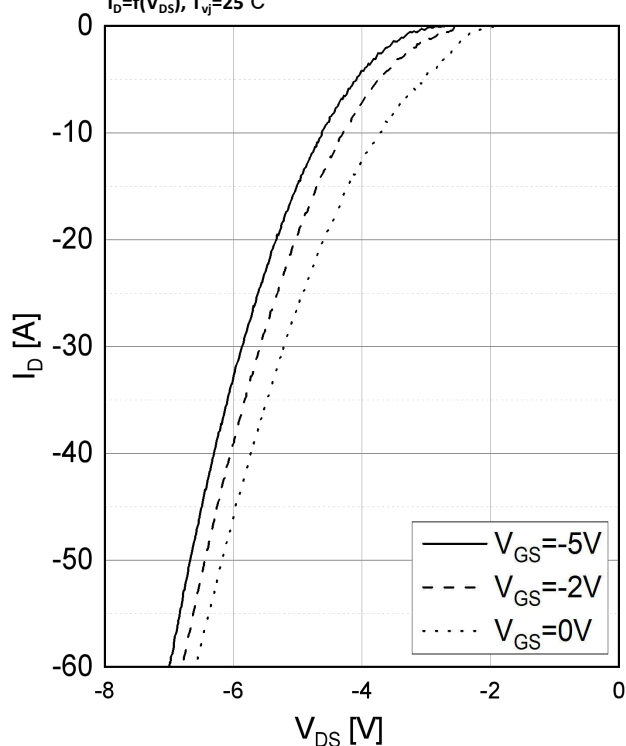
$$I_D=f(V_{GS}), V_{DS}=20V$$



体二极管特性

Body Diode Characteristics

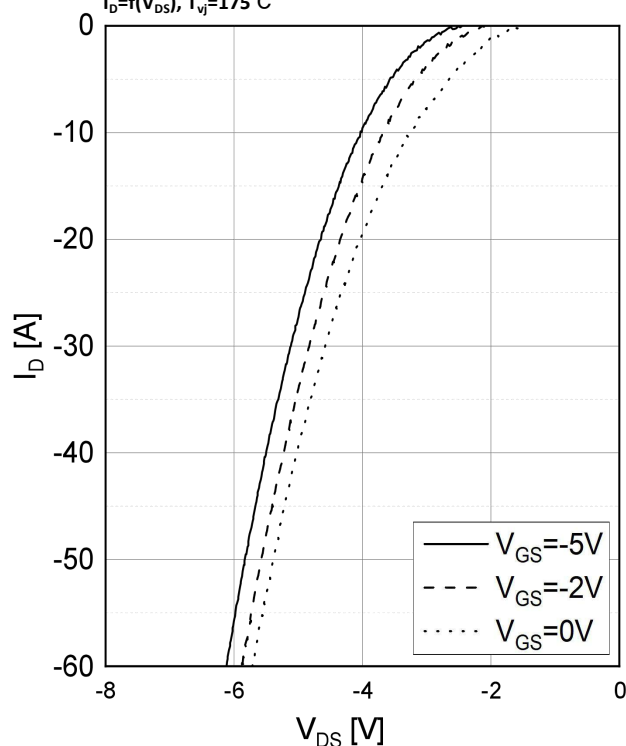
$$I_D=f(V_{DS}), T_{vj}=25^{\circ}C$$



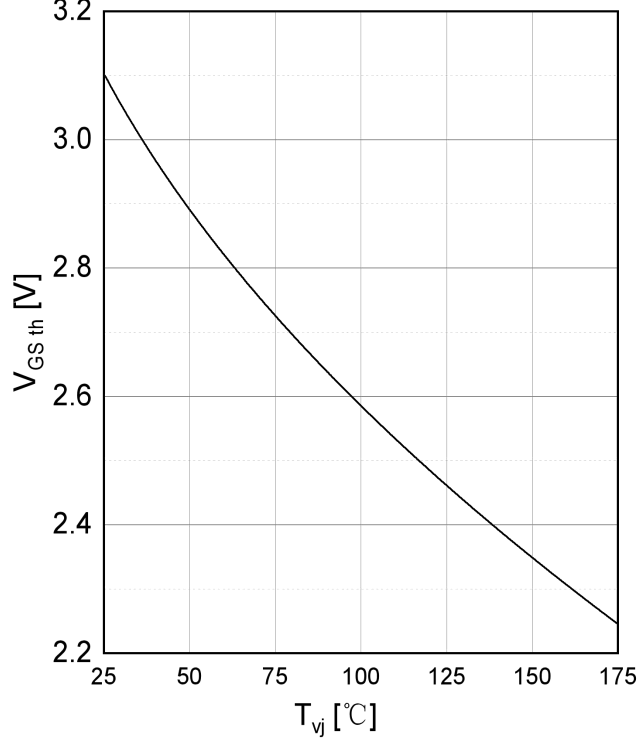
体二极管特性

Body Diode Characteristics

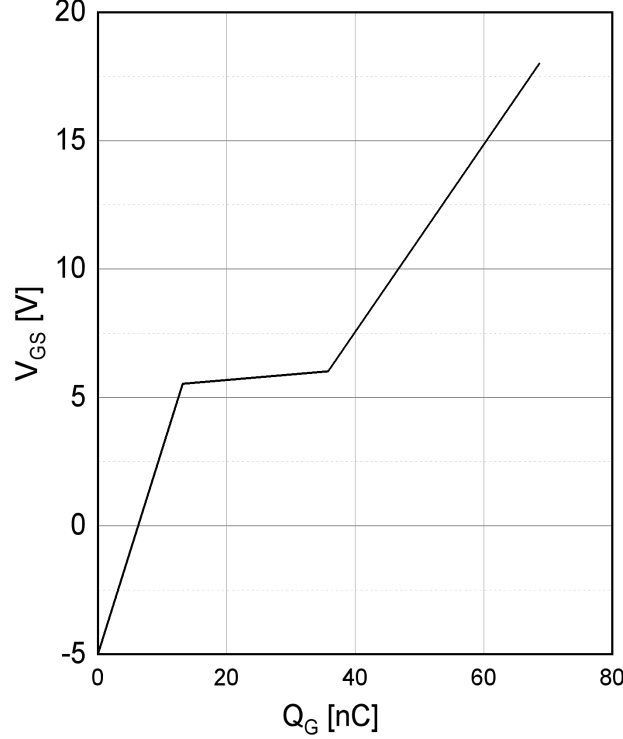
$$I_D=f(V_{DS}), T_{vj}=175^{\circ}C$$



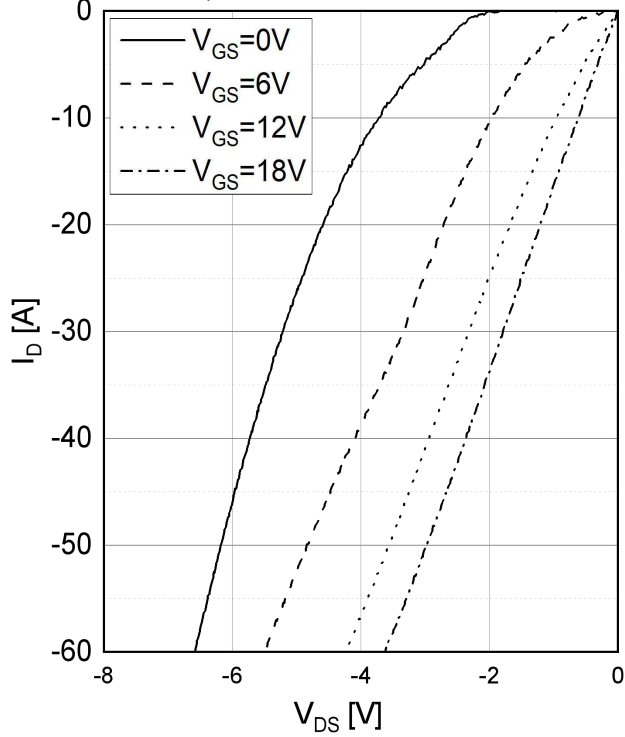
阈值电压
Threshold Voltage
 $V_{GS\ th}=f(T_{vj})$, $V_{GS}=V_{DS}$, $I_D=5mA$



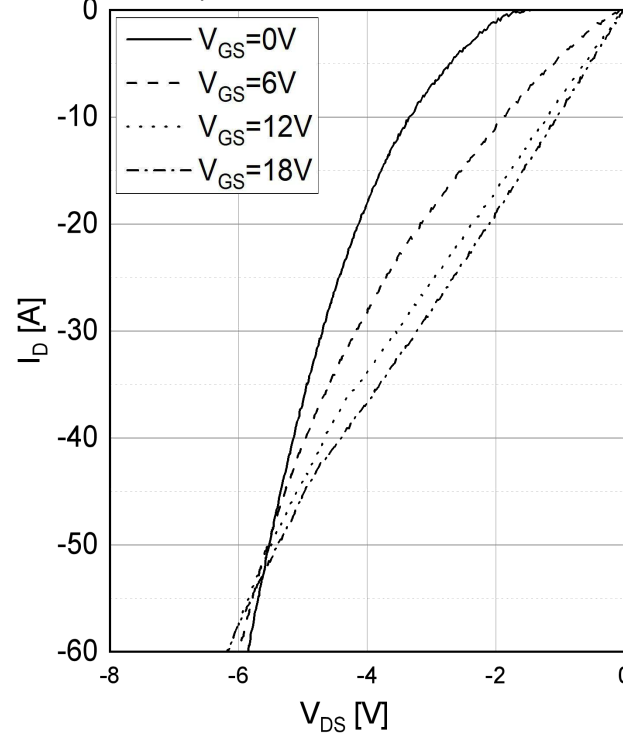
栅极电荷特性
Gate Charge Characteristics
 $V_{GS}=f(Q_g)$, $I_D=20A$, $I_{GS}=50mA$, $V_{DS}=800V$, $T_{vj}=25^\circ C$



第三象限特性
3rd Quadrant Characteristics
 $I_D=f(V_{DS})$, $T_{vj}=25^\circ C$



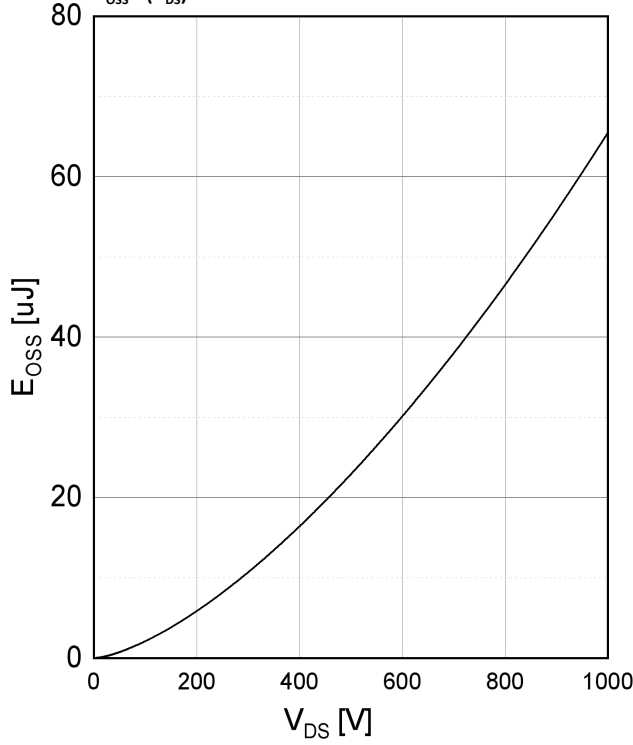
第三象限特性
3rd Quadrant Characteristics
 $I_D=f(V_{DS})$, $T_{vj}=175^\circ C$



输出电容存储能量

Output Capacitor Stored Energy

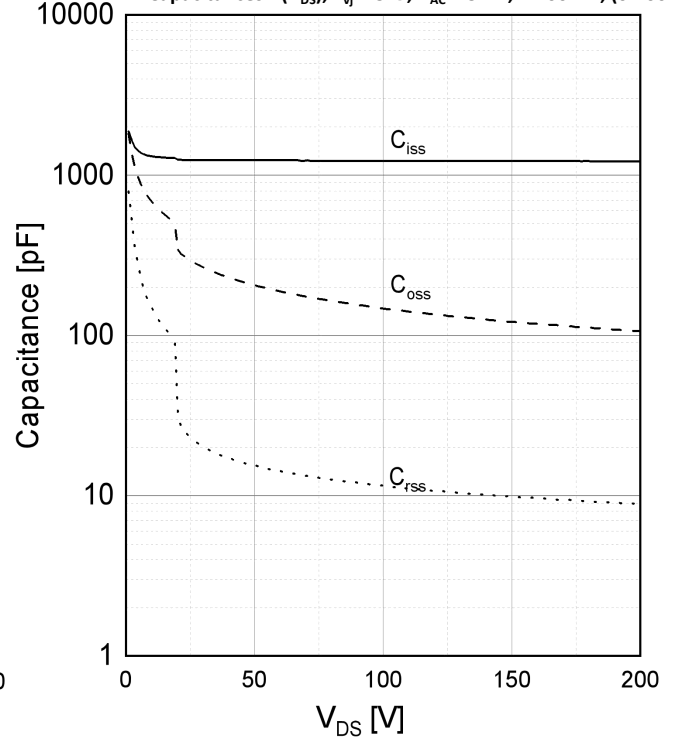
$$E_{OSS}=f(V_{DS})$$



电容

Capacitances

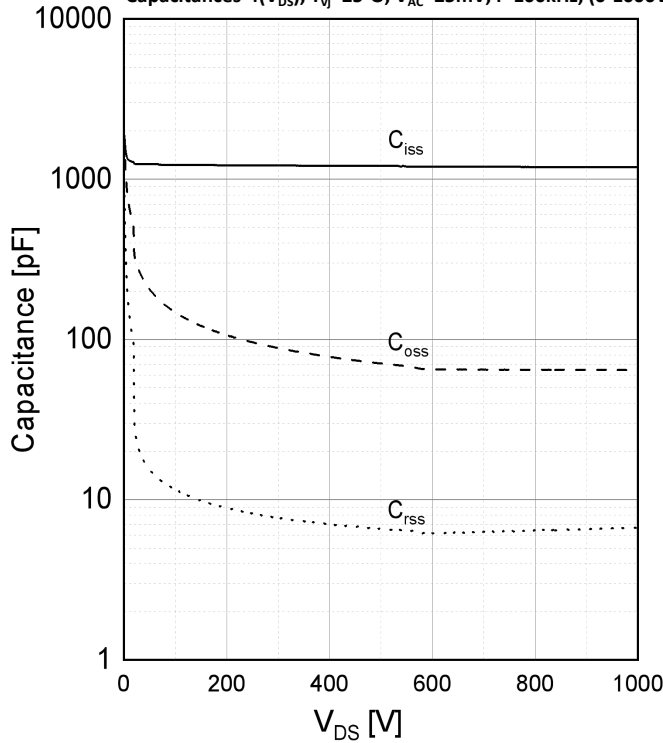
$$\text{Capacitances}=f(V_{DS}), T_{vj}=25^{\circ}\text{C}, V_{AC}=25\text{mV}, f=100\text{kHz}, (0-200\text{V})$$



电容

Capacitances

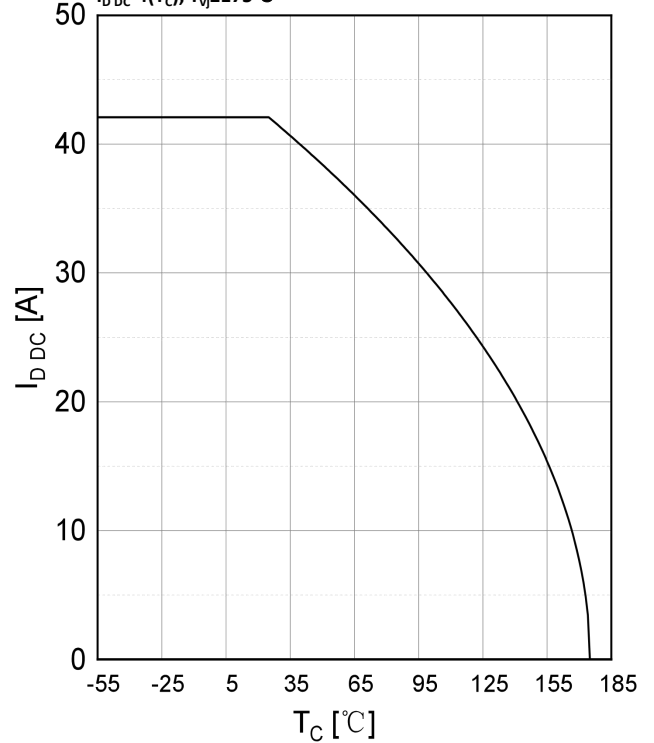
$$\text{Capacitances}=f(V_{DS}), T_{vj}=25^{\circ}\text{C}, V_{AC}=25\text{mV}, f=100\text{kHz}, (0-1000\text{V})$$



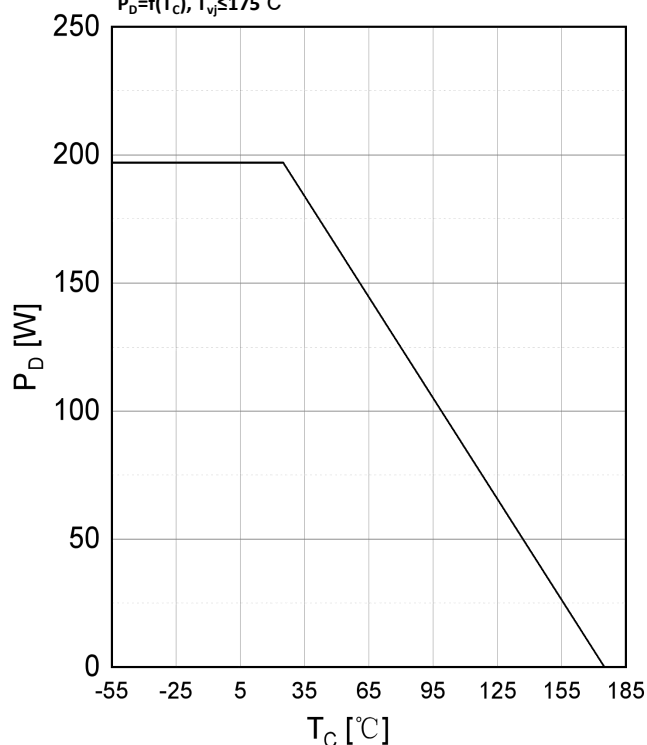
连续漏极电流衰减

Continuous Drain Current Derating

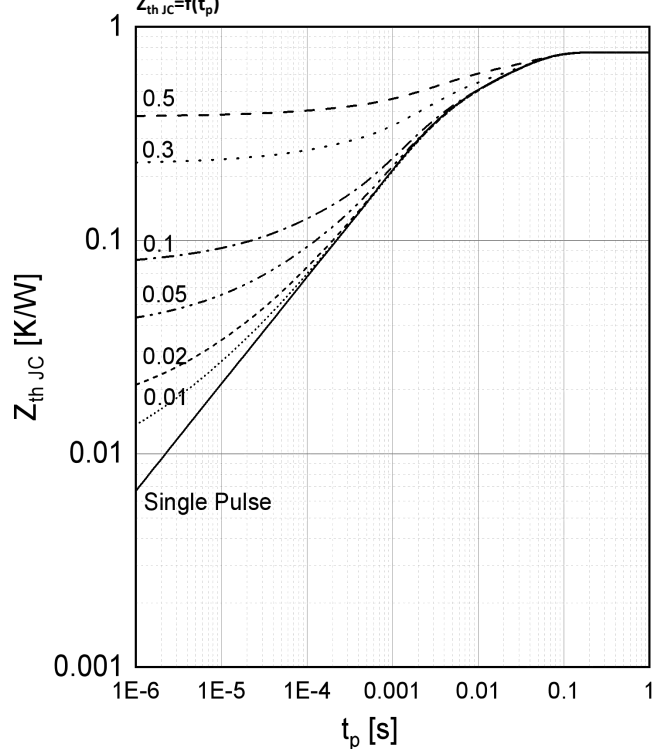
$$I_{D\ DC}=f(T_C), T_{vj}\leq 175^{\circ}\text{C}$$



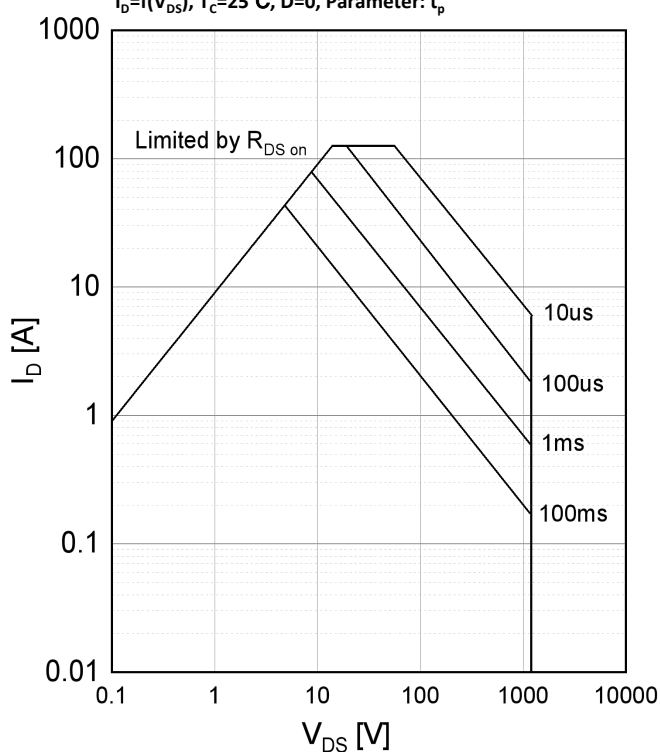
最大功耗衰减
Maximum Power Dissipation Derating
 $P_D = f(T_C), T_{vj} \leq 175^\circ\text{C}$



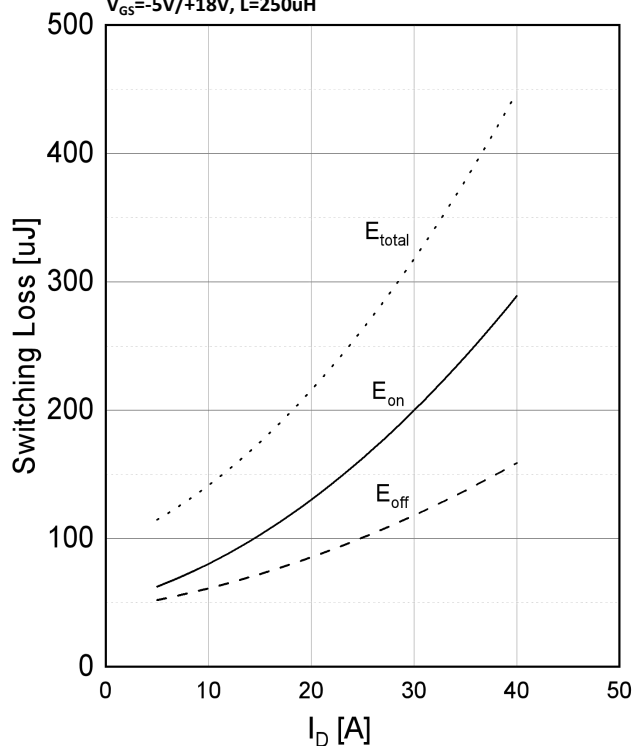
瞬态热阻 (结-壳)
Transient Thermal Impedance (Junction-Case)
 $Z_{thJC} = f(t_p)$



安全工作区
Safe Operating Area
 $I_D = f(V_{DS}), T_C = 25^\circ\text{C}, D = 0$, Parameter: t_p



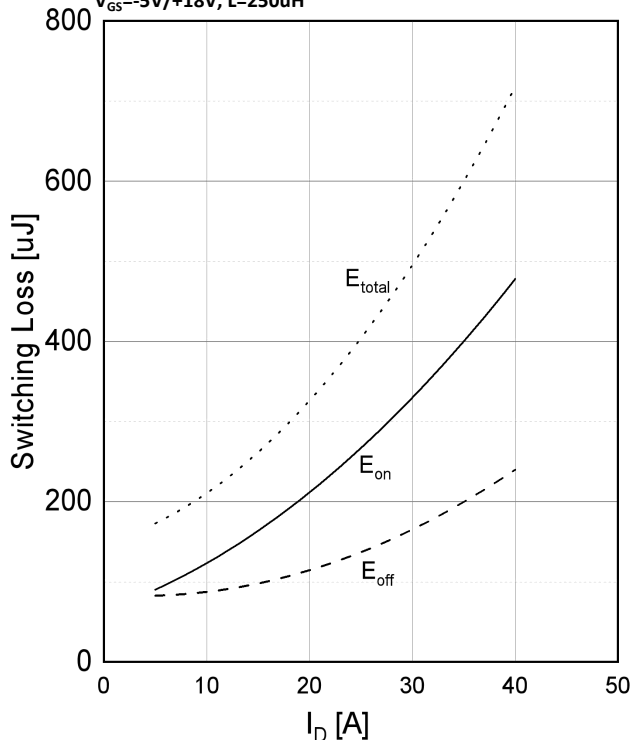
开关能量
Switching Energy
Switching Loss = $f(I_D), T_{vj} = 25^\circ\text{C}, V_{DS} = 600\text{V}, R_{G ext} = 2.5\Omega$,
 $V_{GS} = -5\text{V}/+18\text{V}, L = 250\mu\text{H}$



开关能量

Switching Energy

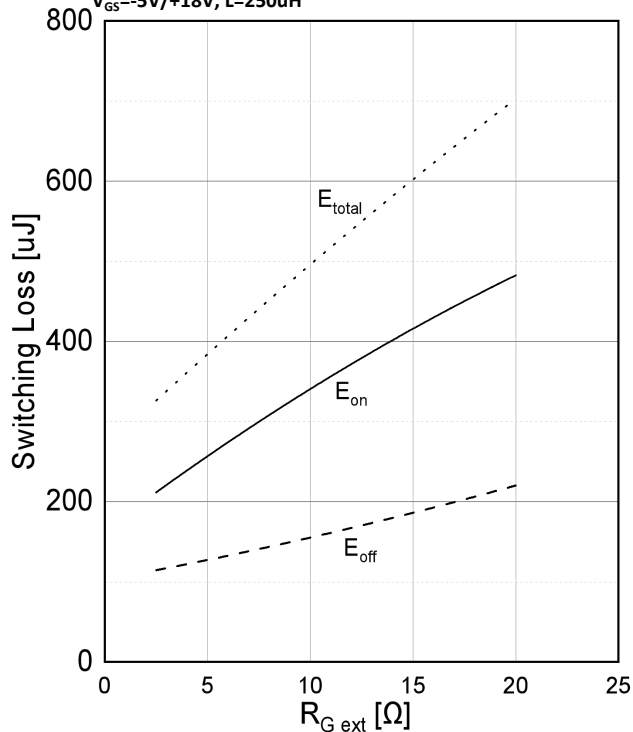
Switching Loss= $f(I_D)$, $T_{vj}=25^{\circ}\text{C}$, $V_{DS}=800\text{V}$, $R_{G\text{ ext}}=2.5\Omega$,
 $V_{GS}=-5\text{V}/+18\text{V}$, $L=250\mu\text{H}$



开关能量

Switching Energy

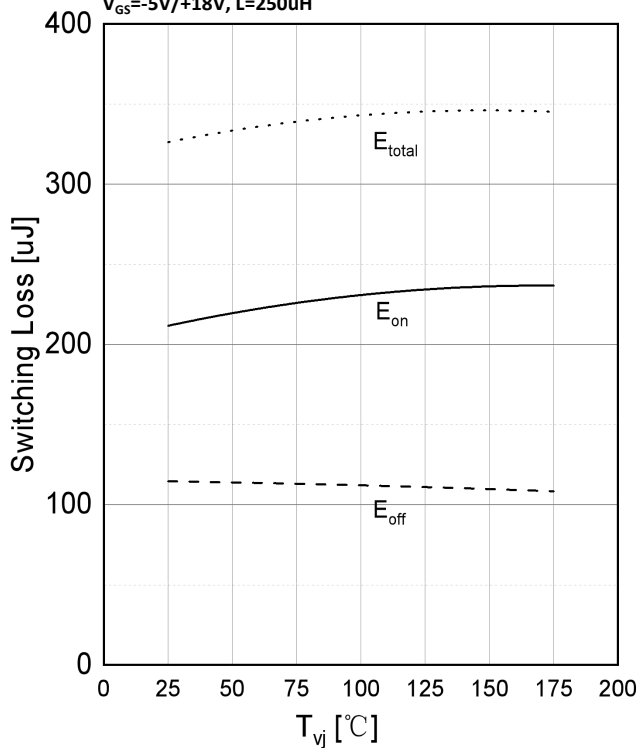
Switching Loss= $f(R_{G\text{ ext}})$, $T_{vj}=25^{\circ}\text{C}$, $V_{DS}=800\text{V}$, $I_D=20\text{A}$,
 $V_{GS}=-5\text{V}/+18\text{V}$, $L=250\mu\text{H}$



开关能量

Switching Energy

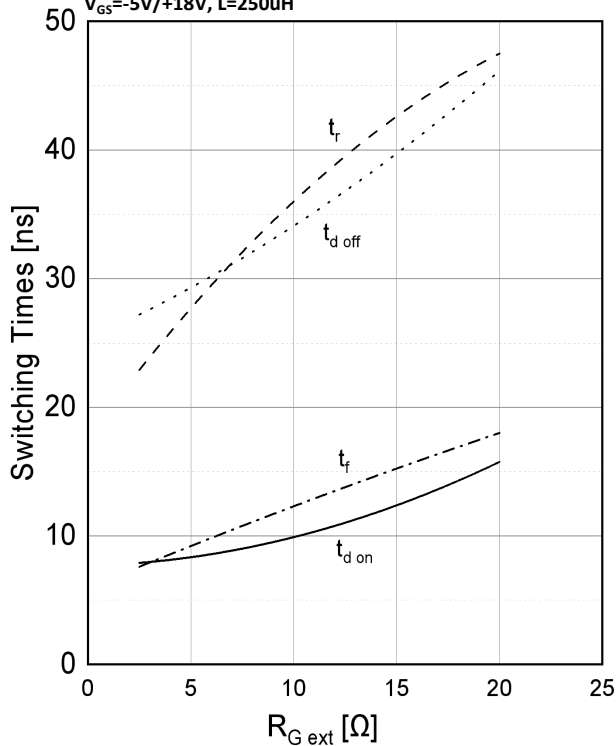
Switching Loss= $f(T_{vj})$, $V_{DS}=800\text{V}$, $I_D=20\text{A}$, $R_{G\text{ ext}}=2.5\Omega$,
 $V_{GS}=-5\text{V}/+18\text{V}$, $L=250\mu\text{H}$



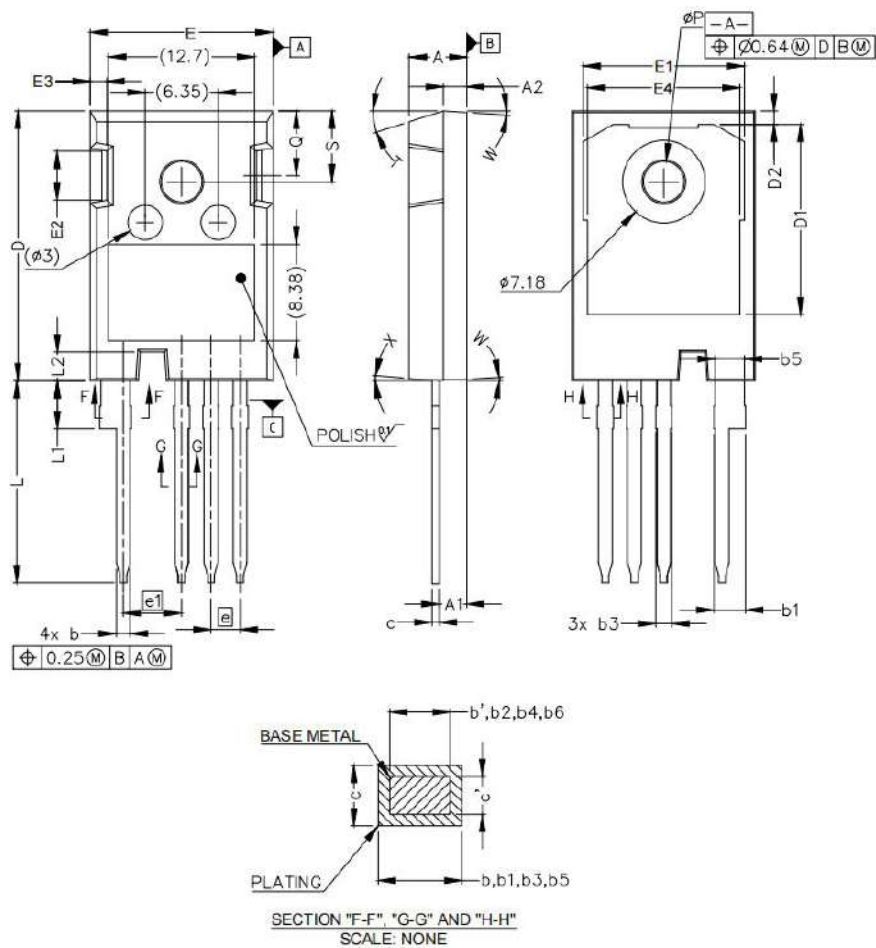
开关时间

Switching Times

Switching Times= $f(R_{G\text{ ext}})$, $T_{vj}=25^{\circ}\text{C}$, $V_{DS}=800\text{V}$, $I_D=20\text{A}$,
 $V_{GS}=-5\text{V}/+18\text{V}$, $L=250\mu\text{H}$



外形尺寸 Outline Drawing



日期 Date	描述 Description
2025-05-22	正式版

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