



SYSD040120-R

碳化硅功率场效应晶体管

Silicon Carbide Power MOSFET

N-Channel Enhancement Mode

V_{DS}	=	1200 V
$I_D@25^{\circ}C$	=	70 A
$R_{DS(on)}$	=	40 m Ω

特点 / Features

- 高耐压和低导通电阻 / High blocking voltage with low on-resistance
- 高开关速度和低电容 / High-speed switching with low capacitances
- 低反向恢复电荷的快恢复体二极管 / Fast intrinsic diode with low reverse recovery(Qrr)
- 无卤素，符合RoHS标准 / Halogen free, RoHS compliant

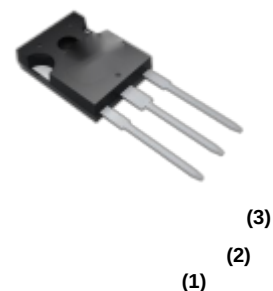
优势 / Benefits

- 低开关损耗且极小的栅极震荡 / Reduce switching losses and minimize gate ringing
- 更高的系统效率 / Higher System Efficiency
- 降低散热要求 / Reduce cooling requirements
- 提升功率密度 / Increase power density
- 提升系统开关频率 / Increase system switching frequency
- 易于并联使用 / Ease of Paralleling

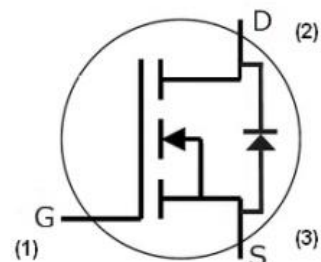
应用领域 / Applications

- 太阳能逆变器 / Solar inverters
- 电动汽车电机驱动 / EV motor drive
- 高压直流变换器 / High voltage DC/DC converters
- 开关电源 / Switched mode power supplies

封装 / Package



TO-247-3L



Part Number	Package	Marking
SYSD040120-R	TO-247-3L	SYSD040120R



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

符号 Symbol	参数 Parameter	值 Value	单位 Unit	测试条件 Test Conditions	备注 Note
V_{DSmax}	漏源电压 Drain - source voltage	1200	V	$V_{GS}=0\text{ V}$, $I_D=100\text{ }\mu\text{A}$	
V_{GSmax}	栅源电压(动态) Gate - source Voltage (dynamic)	-10/+22	V	AC ($f > 1\text{Hz}$)	
V_{GSmax}	栅源电压(静态) Gate - source Voltage (static)	-5/+20	V	Static	
I_D	不间断漏极电流 Continuous Drain Current	70	A	$V_{GS}=20\text{ V}$, $T_C=25^{\circ}\text{C}$	
		50		$V_{GS}=20\text{ V}$, $T_C=100^{\circ}\text{C}$	
$I_{D(pulse)}$	漏极脉冲电流 Non-Repetitive Forward Surge Current	100	A	Pulse width t_p limited by T_{jmax}	
P_D	耗散功率 Power Dissipation	394	W	$T_C=25^{\circ}\text{C}$, $T_J=175^{\circ}\text{C}$	Fig.12
T_J , T_{stg}	工作和存储温度 Operating Junction and Storage Temperature	-55 to +175	$^{\circ}\text{C}$		

电气参数 / Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise specified)

符号 Symbol	参数 Parameter	值 / Value			单位 Unit	测试条件 Test Conditions	备注 Note
		Min.	Typ.	Max.			
$V_{(BR)DSS}$	漏源击穿电压 Drain-Source Breakdown Voltage	1200			V	$V_{GS}=0\text{ V}$, $I_D=100\text{ }\mu\text{A}$	
$V_{GS(th)}$	阈值电压 Gate Threshold Voltage	2	3	4	V	$V_{DS}=V_{GS}$, $I_D=10\text{ mA}$	Fig.7
			2.1			$V_{DS}=V_{GS}$, $I_D=10\text{ mA}$, $T_J=175^{\circ}\text{C}$	
I_{DSS}	零偏漏极漏电流 Reverse Current		1	100	μA	$V_R=1200\text{V}$, $V_{GS}=0\text{V}$	
I_{GSS}	栅源漏电流 Gate-Source Leakage Current		10	250	nA	$V_{GS}=20\text{V}$, $V_{DS}=0\text{V}$	
$R_{DS(on)}$	漏源导通电阻 Drain-Source On-State Resistance		40	53.5	m Ω	$V_{GS}=20\text{V}$, $I_D=20\text{A}$	Fig.3,4
			81			$V_{GS}=20\text{V}$, $I_D=20\text{A}$, $T_J=175^{\circ}\text{C}$	
g_{fs}	跨导 Transconductance		23		S	$V_{DS}=20\text{ V}$, $I_D=20\text{ A}$	Fig.5
E_{AS}	单次雪崩能量 Avalanche Energy		1		J	$I_D=20\text{A}$, $V_{DD}=50\text{V}$, $L=5\text{mH}$	
C_{iss}	输入电容 Input Capacitance		2440		pF	$V_{DS}=1000\text{ V}$, $f=100\text{kHz}$, $V_{AC}=25\text{ mV}$	Fig.11
C_{oss}	输出电容 Output Capacitance		90		pF		

C_{RSS}	转移电容 Reverse Transfer Capacitance		5		pF		
E_{OSS}	输出电容存储能量 C_{OSS} Stored Energy		60		μJ		Fig.10
E_{ON}	开启能量(体二极管续流) Turn-On Switching Energy (Body Diode FWD)		1711		μJ	$V_{DS}=800V, V_{GS}=-5V/+20V, I_D=20A, L=100\mu H, T_J=175^\circ C$	Fig.17
E_{OFF}	关断能量(体二极管续流) Turn-Off Switching Energy (Body Diode FWD)		302				
$t_{d(on)}$	开启延迟时间 Turn-on Delay Time		16		ns	$V_{DS}=800V, V_{GS}=-5V/+20V, R_{G(ext)}=2.5\Omega, I_D=20A, L=100\mu H$	Fig.18
t_r	上升时间 Rise Time		68				
t_d	关断延迟时间 Turn-Off Delay Time		27				
t_f	下降时间 Fall Time		16				
$R_{G(int)}$	栅极内阻 Internal Gate Resistance		3.6		Ω	$f=1MHz, V_{AC}=25mV$	
Q_{gs}	栅源电荷 Gate to Source Charge		33		nC	$V_{DS}=800V, V_{GS}=-4V/15V, I_D=20A$	Fig.8
Q_{gd}	栅漏电荷 Gate to Drain Charge		31				
Q_g	栅极总电荷 Total Gate Charge		125				

反向二极管特性 / Reverse Diode Characteristics ($T_C=25^\circ C$ unless otherwise specified)

符号 Symbol	参数 Parameter	值 / Value		单位 Unit	测试条件 Test Conditions	备注 Note
		Typ.	Max.			
V_{SD}	二极管正向压降 Diode Forward Voltage	5	6	V	$V_{GS}=0V, I_{SD}=20A, T_J=25^\circ C$	Fig.6
		4.5	6	V	$V_{GS}=0V, I_{SD}=20A, T_J=175^\circ C$	
I_S	二极管正向持续电流 Continuous Diode Forward Current		59	A	$V_{GS}=0V, T_C=25^\circ C$	
$I_{S,pulse}$	二极管脉冲电流 Diode Pulse Current		100	A	$V_{GS}=0V, \text{Pulse width } t_p \text{ limited by } T_{Jmax}$	
t_{rr}	反向恢复时间 Reverse Recover time	50		ns	$V_{GS}=-5V, I_{SD}=20A, V_R=800V, \text{dif/dt}=900A/\mu s, T_J=175^\circ C$	
Q_{rr}	反向恢复电荷 Reverse Recover Charge	710		nC		



I_{rrm}	反向恢复峰值电流 Peak Reverse Recovery Current	20		A		
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热阻 / Thermal Characteristics

符号 Symbol	参数 Parameter	值 Value	单位 Unit	备注 Note
$R_{\theta JC}$	结壳热阻 Thermal Resistance(Junction to Case)	0.38	°C/W	Fig.13
$R_{\theta JA}$	结到环境热阻 Thermal Resistance(Junction to Ambient)	40	°C/W	

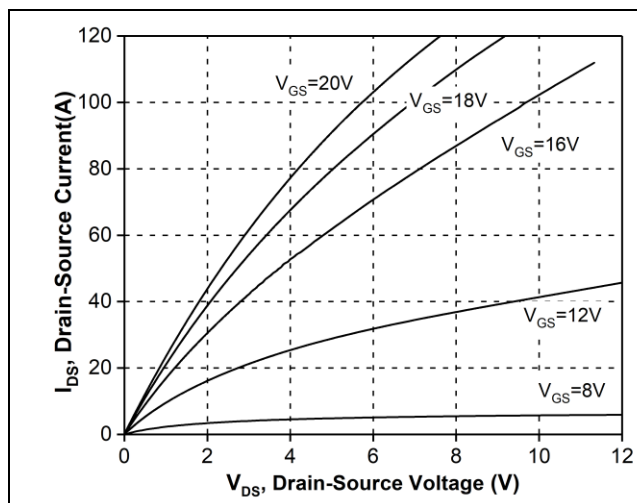


Figure 1. Output Characteristics $T_J=25\text{ }^{\circ}\text{C}$

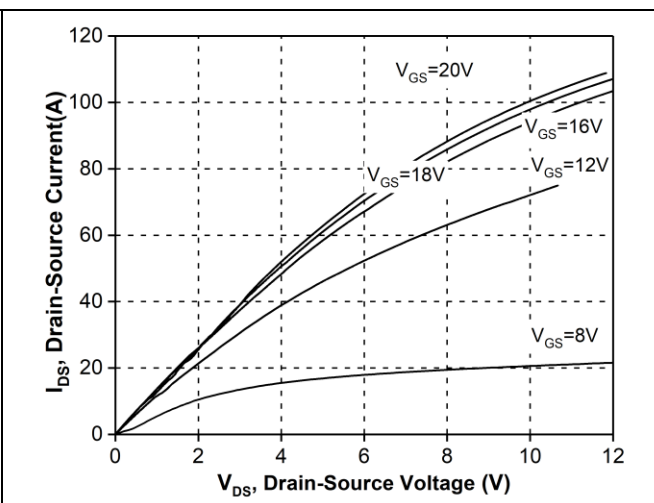


Figure 2. Output Characteristics $T_J=175\text{ }^{\circ}\text{C}$

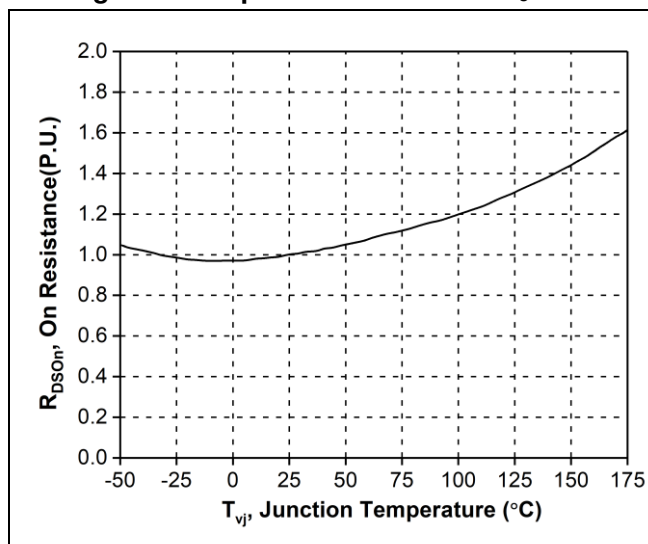


Figure 3. Normalized On-resistance vs. Temperature

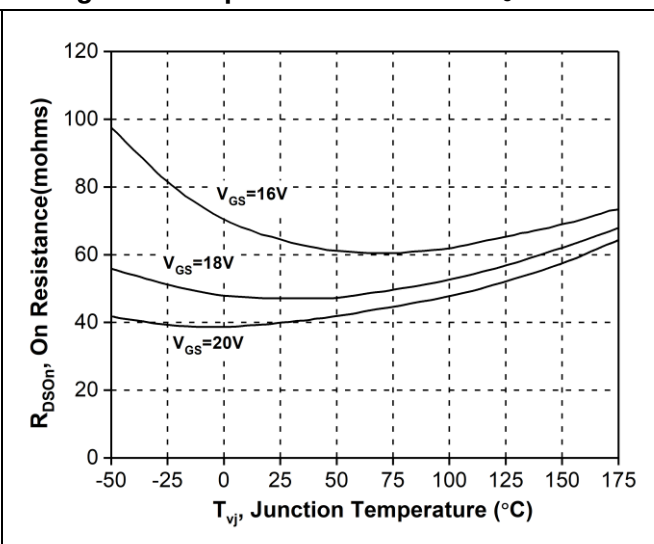


Figure 4. On-Resistance vs. Temperature For Various Gate Voltage

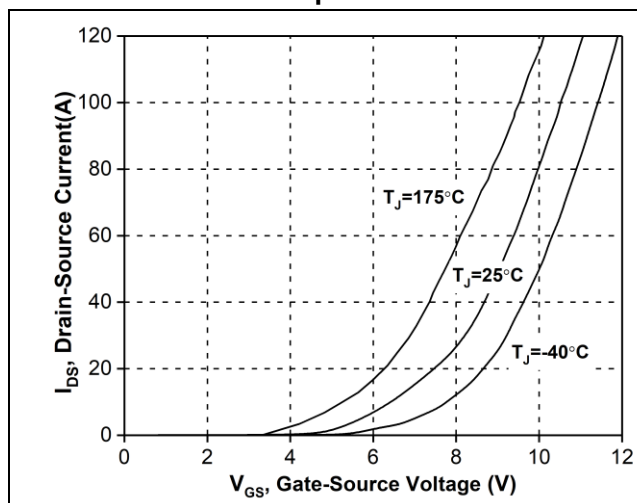


Figure 5. Transfer Characteristic for Various Junction Temperatures

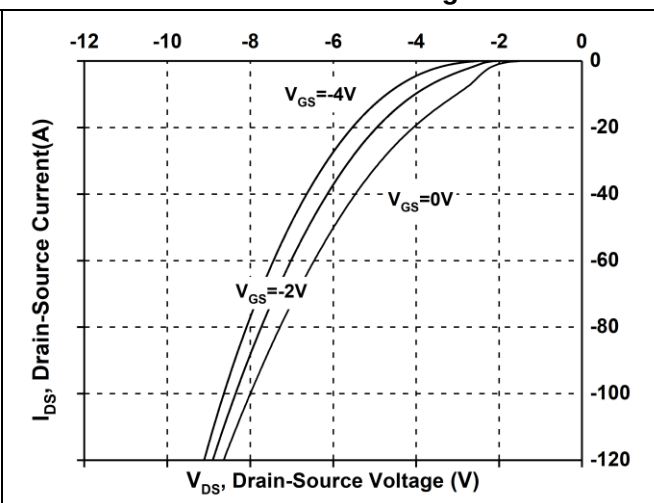


Figure 6. Body Diode Characteristic at $25\text{ }^{\circ}\text{C}$

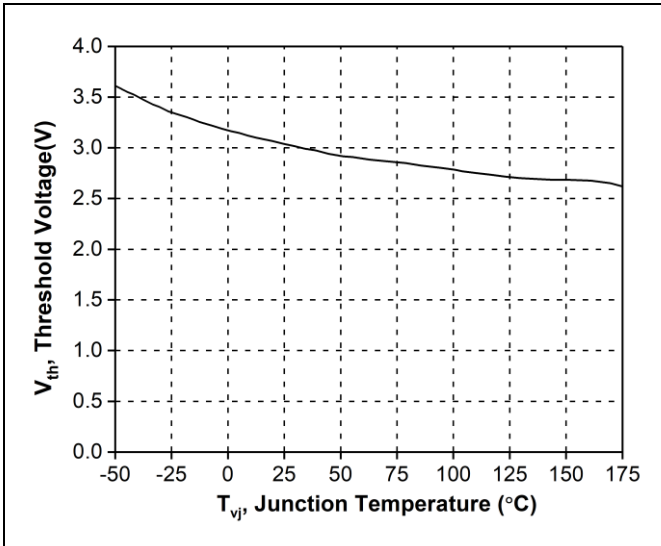


Figure 7. Threshold Voltage vs. Temperature

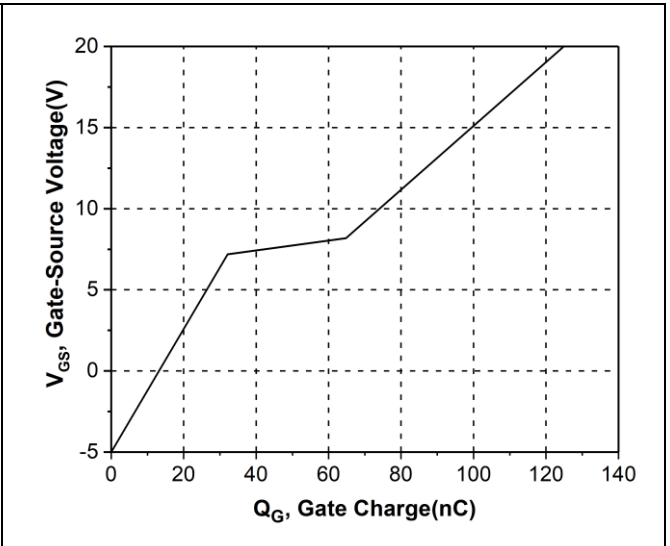


Figure 8. Gate Charge Characteristics

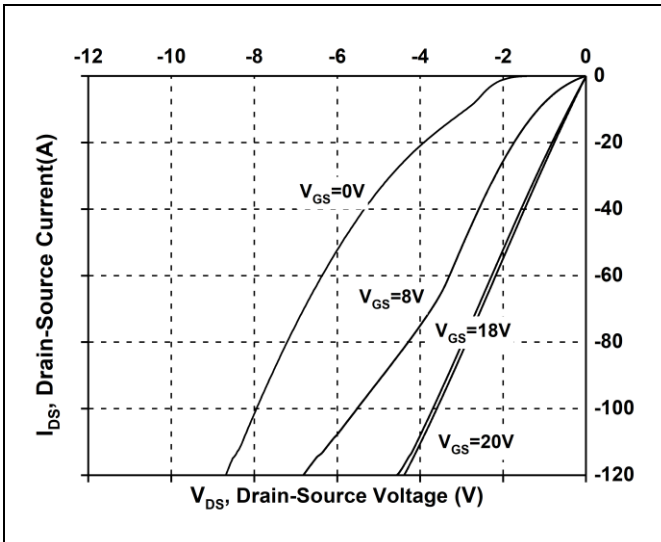


Figure 9. 3rd Quadrant Characteristic at 25°C

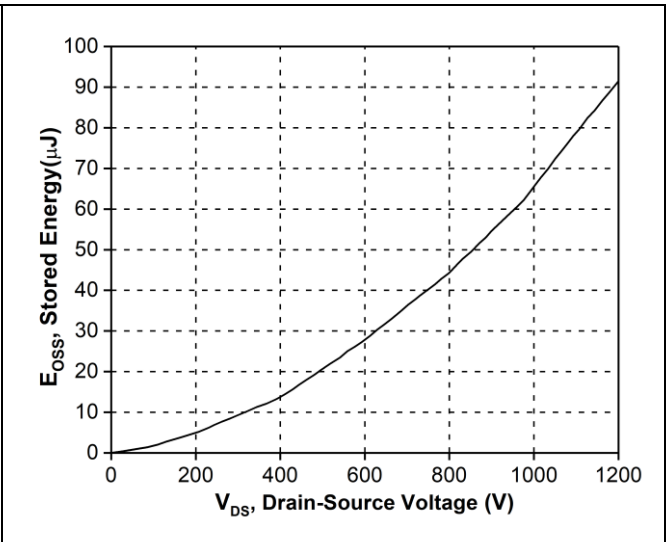


Figure 10. Output Capacitor Stored Energy

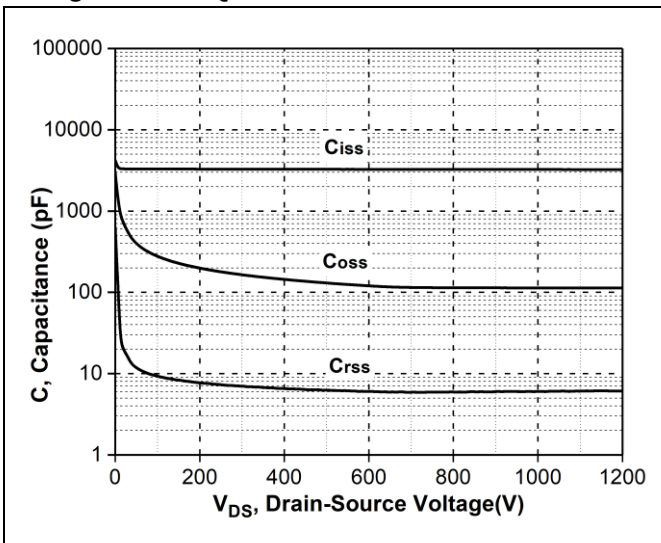


Figure 11. Capacitances vs. Drain-Source Voltage (0 - 1200V)

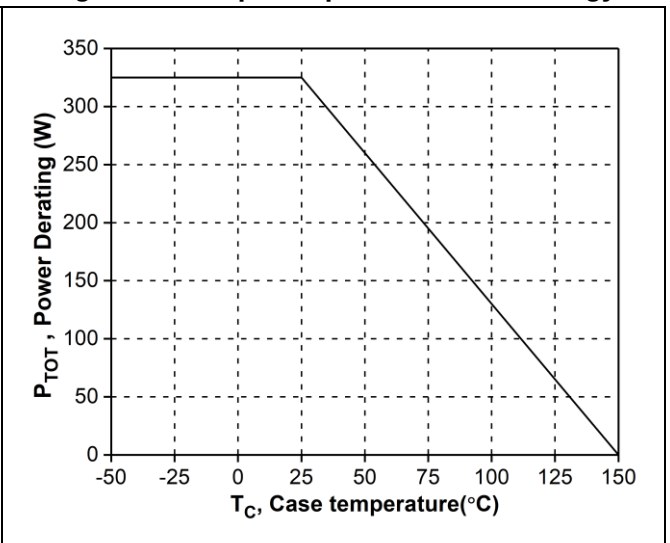


Figure 12. Maximum Power Dissipation Derating vs. Case Temperature

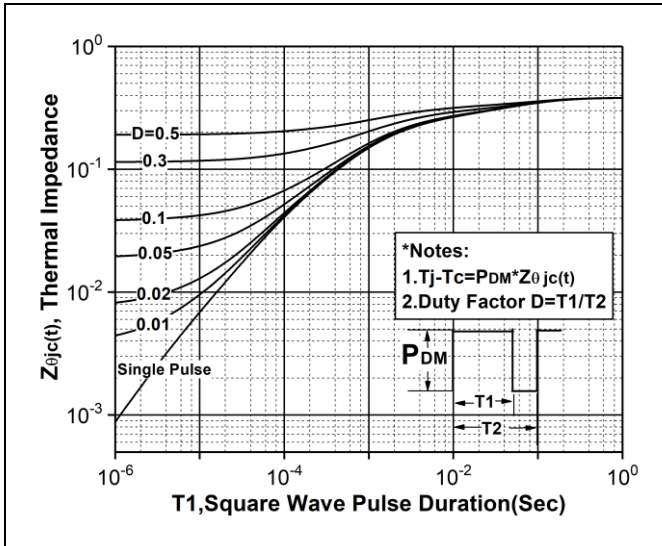


Figure 13. Transient Thermal Impedance (Junction - Case)

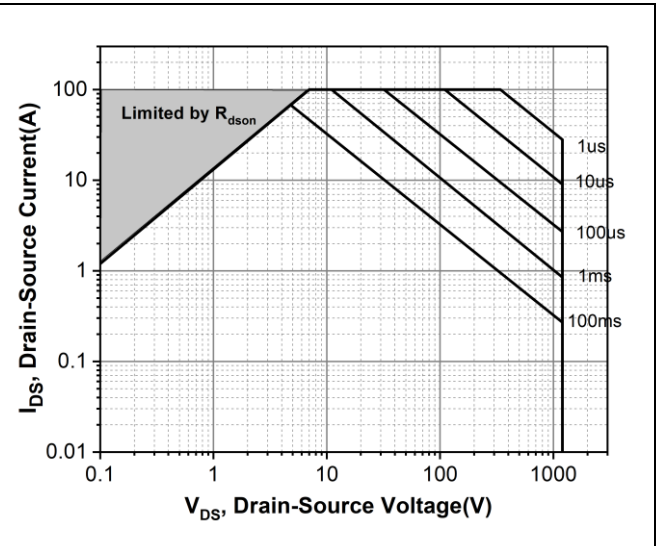


Figure 14. Safe Operating Area

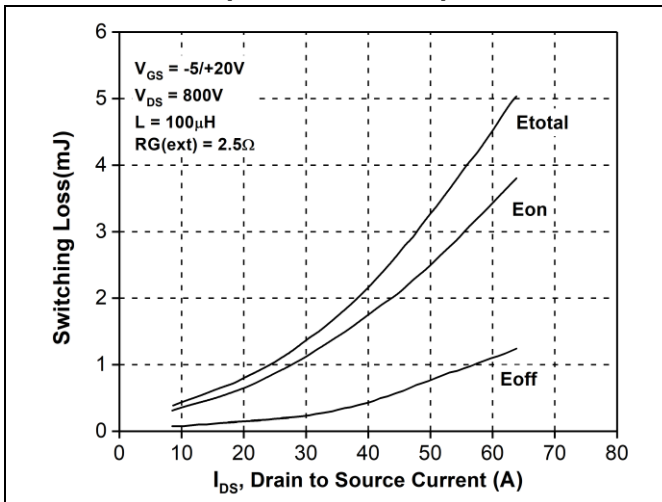


Figure 15. Clamped inductive Switching Energy vs. Drain Current ($V_{DD} = 800V$)

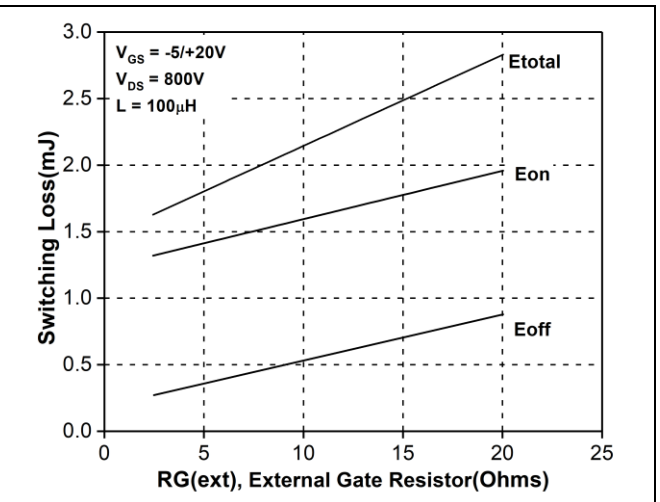


Figure 16. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

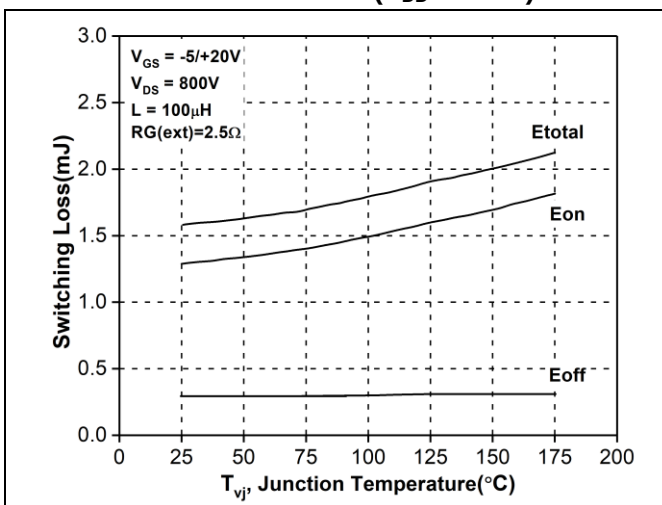


Figure 17. Clamped Inductive Switching Energy vs. Temperature

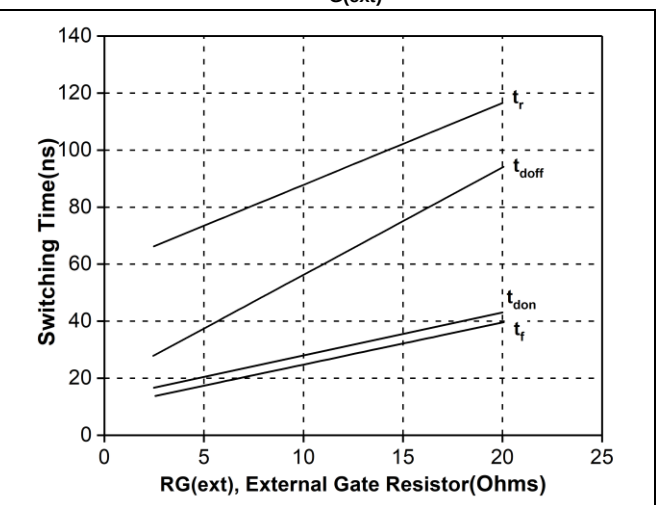
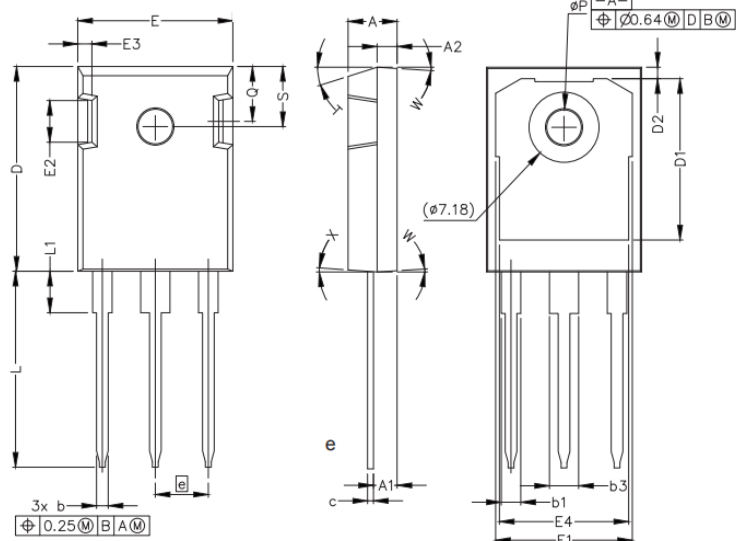
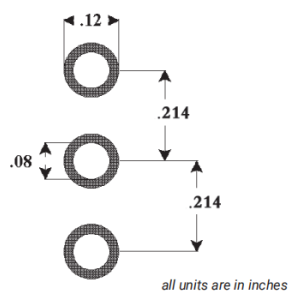


Figure 18. Switching Times vs. $R_{G(ext)}$

Package TO-247-3L



参考焊盘图 / Recommended Solder Pad Layout



TO-247-3L