KM040120-R

碳化硅功率场效应晶体管

Silicon Carbide Power MOSFET

N-Channel Enhancement Mode

V_{DS}	=	1200 V
$I_{D@25℃}$	=	70 A
$R_{DS(on)}$	=	40 mΩ

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

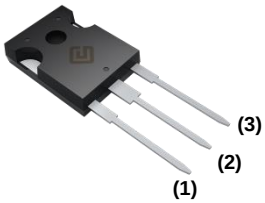
优势 / Benefits

- 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

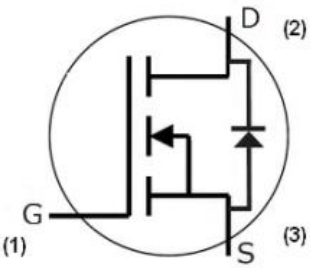
应用领域 / Applications

- 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
KM040120-R	TO-247-3L	KM040120R

最大额定值 / Maximum Rated Values（T_C=25°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 V, I_D=100 μA	
V_{GSmax}	栅源电压(动态) Gate - source Voltage (dynamic)	-10/+22	V	AC (f >1Hz)	
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 V, T_C=25°C	
		50		V_{GS}=20 V, T_C=100°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˚C, T_J=175 °C	Fig.12
T_J，T_{stg}	工作和存储温度 Operating Junction and Storage Temperature	-55 to +175	˚C		

电气参数 / Electrical Characteristics（T_J=25°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 V, I_D=100 μA	
$V_{GS(th)}$	阈值电压 Gate Threshold Voltage	2	3	4	V	V_{DS}=V_{GS}, I_D=10 mA	Fig.7
			2.1			V_{DS}=V_{GS}, I_D=10 mA, T_J=175°C	
I_{DSS}	零偏漏极漏电流 Reverse Current		1	100	μA	V_R=1200V, V_{GS}=0V	
I_{GSS}	栅源漏电流 Gate-Source Leakage Current		10	250	nA	V_{GS}=20V, V_{DS}=0V	
$R_{DS(on)}$	漏源导通电阻 Drain-Source On-State Resistance		40	53.5	mΩ	V_{GS}=20V, I_D=20A	Fig.3,4
			81			V_{GS}=20V, I_D=20A, T_J=175°C	
g_{fs}	跨导 Transconductance		23		S	V_{DS}=20 V, I_D=20 A	Fig.5
E_{AS}	单次雪崩能量 Avalanche Energy		1		J	I_D=20A, V_{DD}=50V, L=5mH	
C_{iss}	输入电容 Input Capacitance		2440		pF	V_{DS}=1000 V，f=100kHZ，V_{AC}=25 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=20 A, L=100μH, Tj=175°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, $R_{G(ext)}$=2.5Ω, I_D=20A, L=100μH	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}=25 mV	
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°C unless otherwise specified)

符号 Symbol	参数 Parameter	值 / Value Typ.	 Max.	单位 Unit	测试条件 Test Conditions	备注 Note
V_{SD}	二极管正向压降 Diode Forward Voltage	5	6	V	V_{GS}=0 V, I_{SD}=20 A, T_J=25°C	Fig.6
		4.5	6	V	V_{GS}=0 V, I_{SD}=20 A, T_J=175°C	
I_S	二极管正向持续电流 Continuous Diode Forward Current		59	A	V_{GS}=0V, T_C=25°C	
$I_{S,pulse}$	二极管脉冲电流 Diode Pulse Current		100	A	V_{GS}=0V, Pulse width t_p 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 dif/dt=900A/μs, T_J=175°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		

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	

特性曲线 / Typical Performance

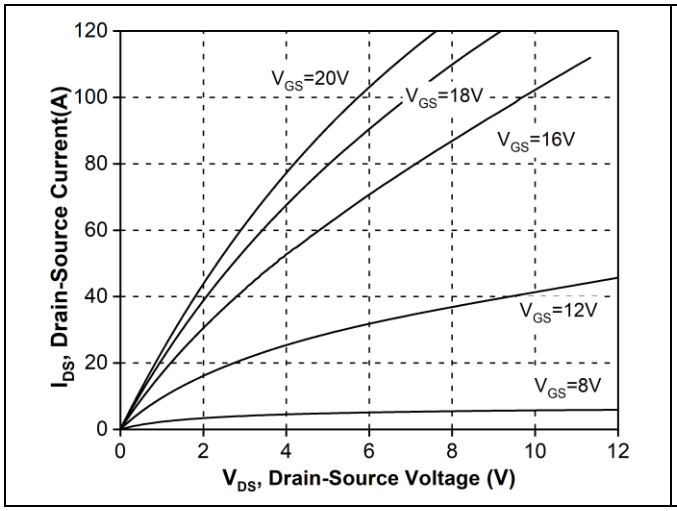


Figure 1. Output Characteristics T_J=25 °C

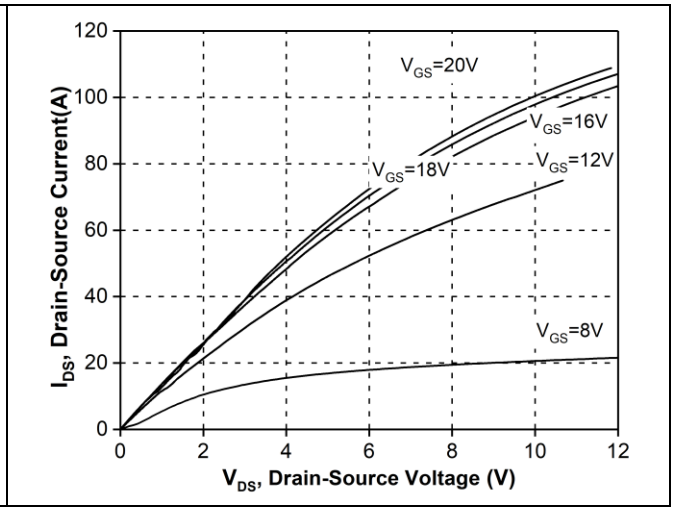


Figure 2. Output Characteristics T_J=175 °C

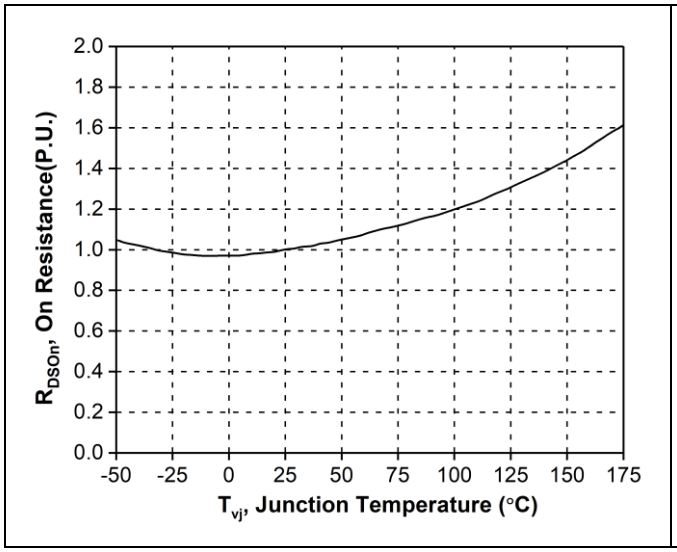


Figure 3. Normalized On-resistance vs. Temperature

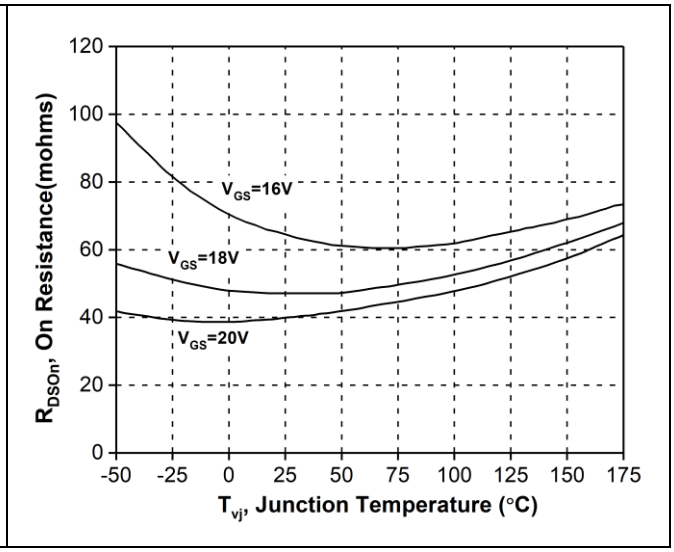


Figure 4. On-Resistance vs. Temperature For Various Gate Voltage

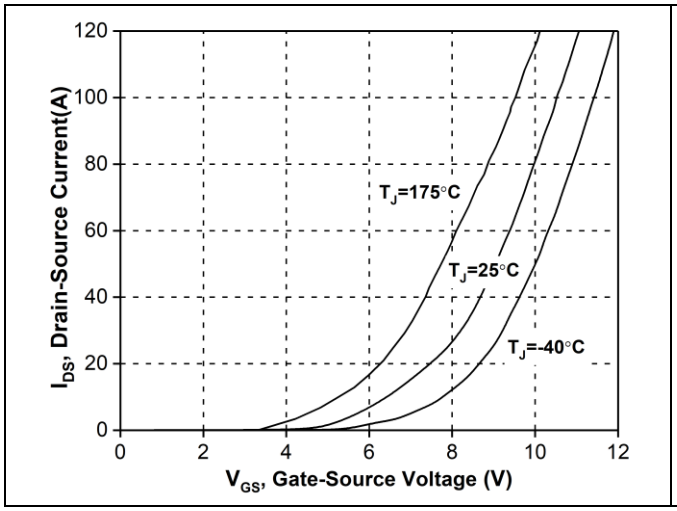


Figure 5. Transfer Characteristic for Various Junction Temperatures

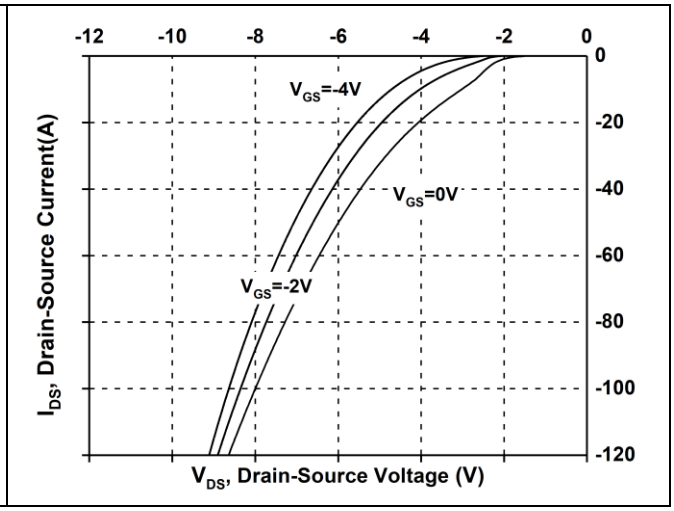


Figure 6. Body Diode Characteristic at 25 °C

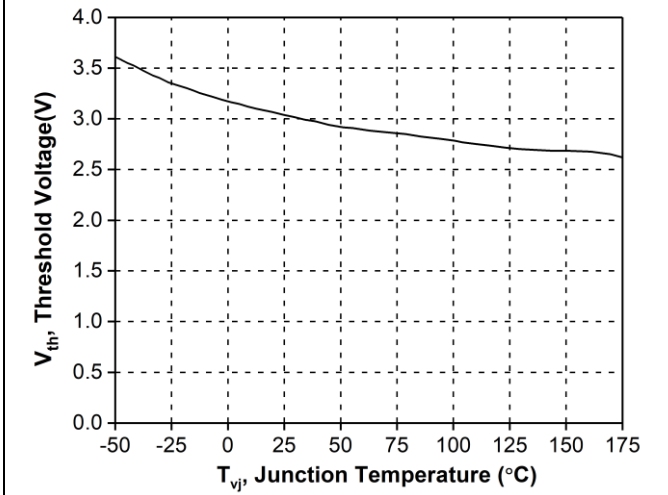


Figure 7. Threshold Voltage vs. Temperature

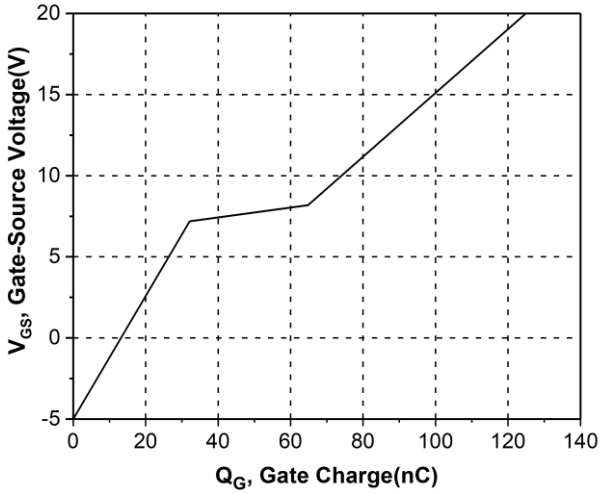


Figure 8. Gate Charge Characteristics

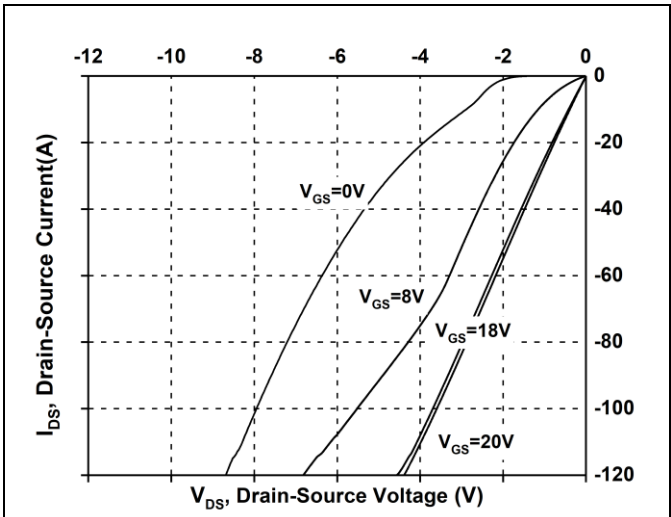


Figure 9. 3rd Quadrant Characteristic at 25°C

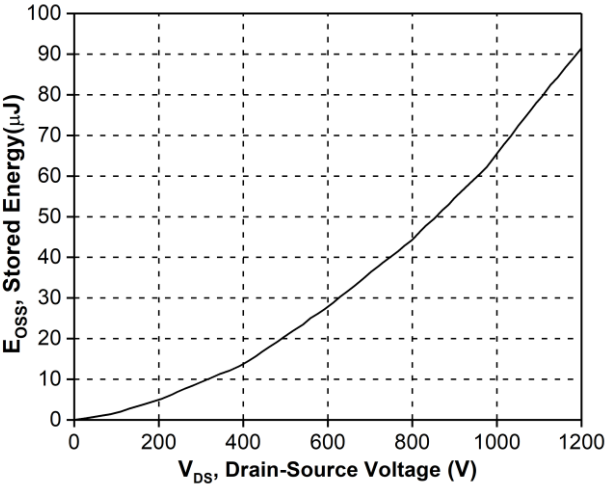


Figure 10. Output Capacitor Stored Energy

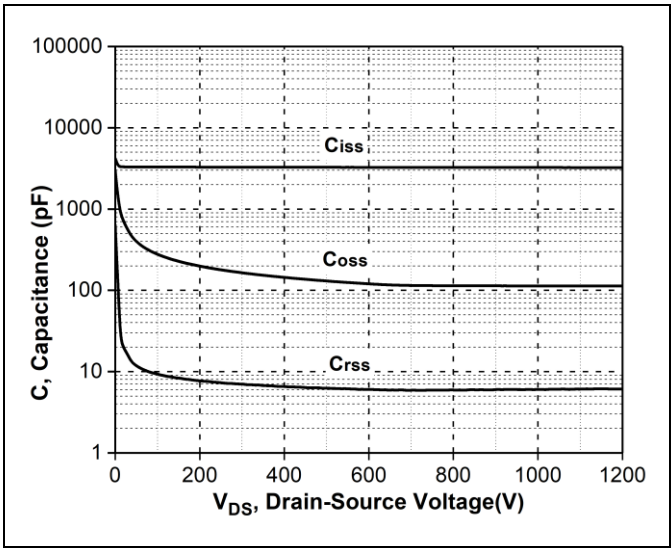


Figure 11. Capacitances vs. Drain-Source Voltage (0 - 1200V)

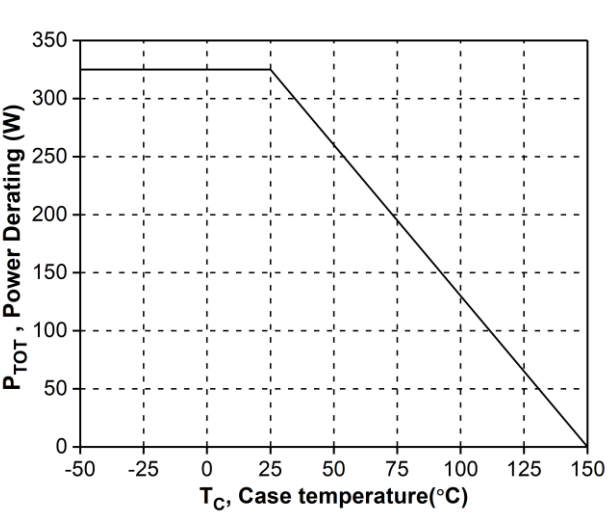


Figure 12. Maximum Power Dissipation Derating vs. Case Temperature

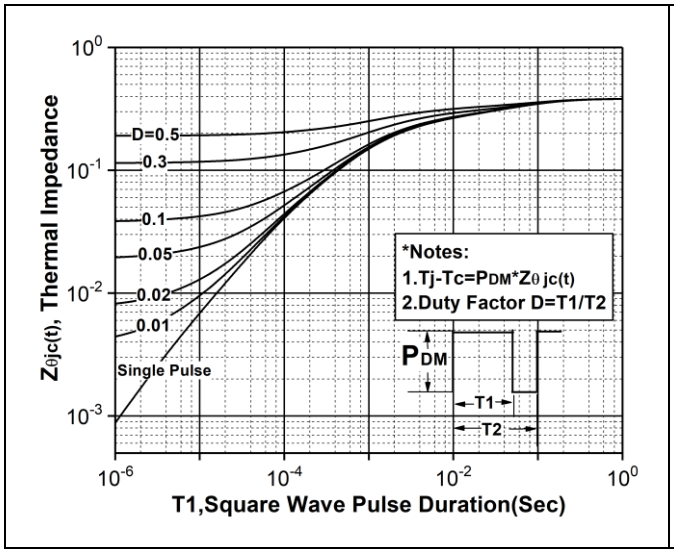


Figure 13. Transient Thermal Impedance (Junction - Case)

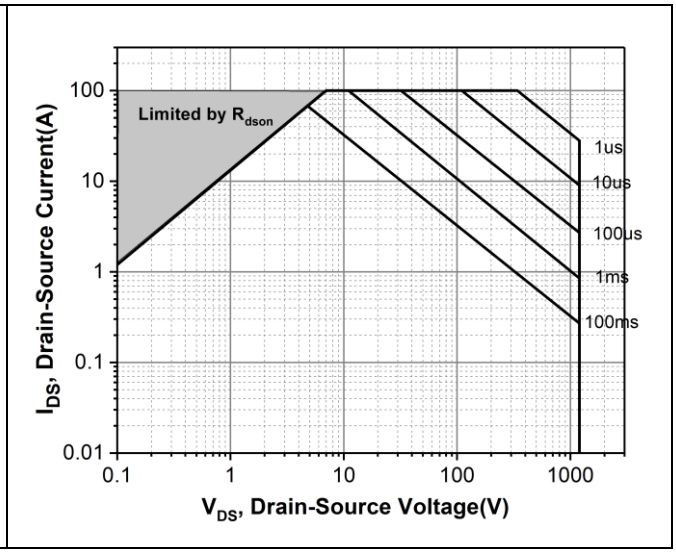


Figure 14. Safe Operating Area

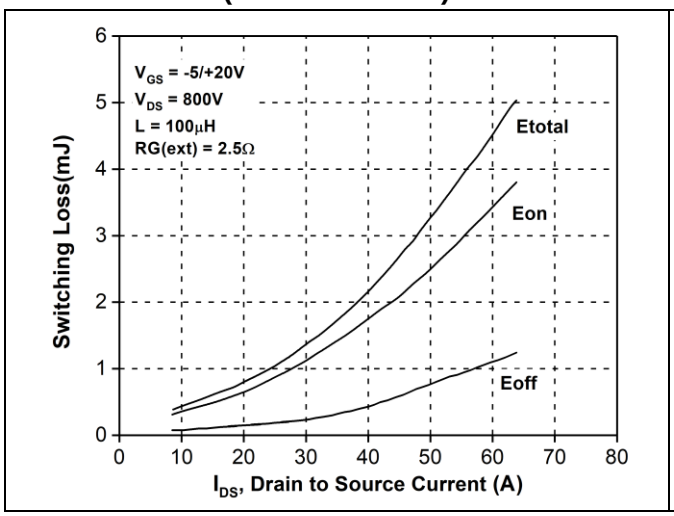


Figure 15. Clamped inductive Switching Energy vs. Drain Current (V_{DD} = 800V)

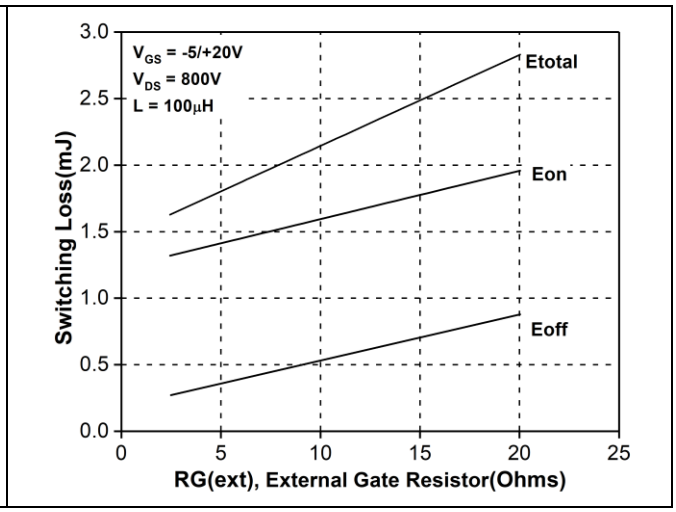


Figure 16. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

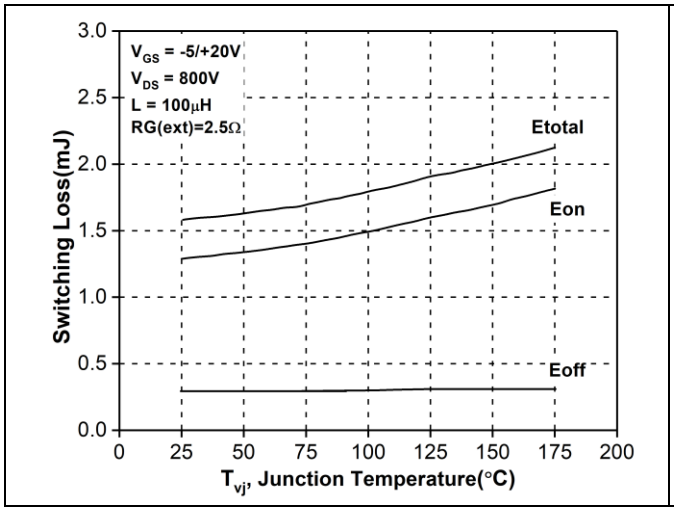


Figure 17. Clamped Inductive Switching Energy vs. Temperature

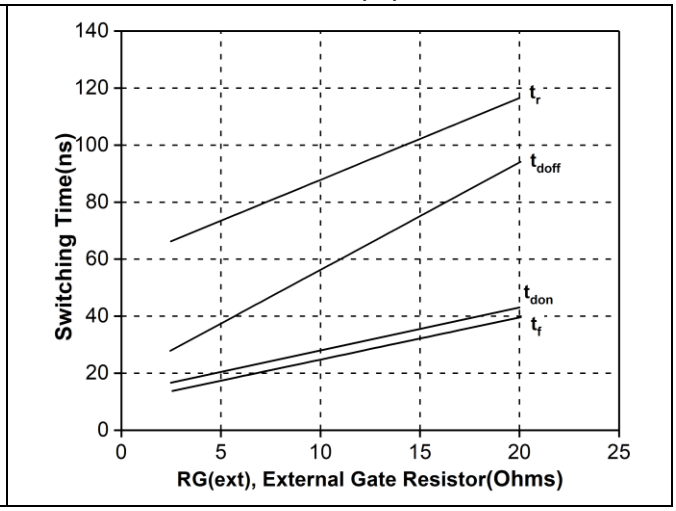
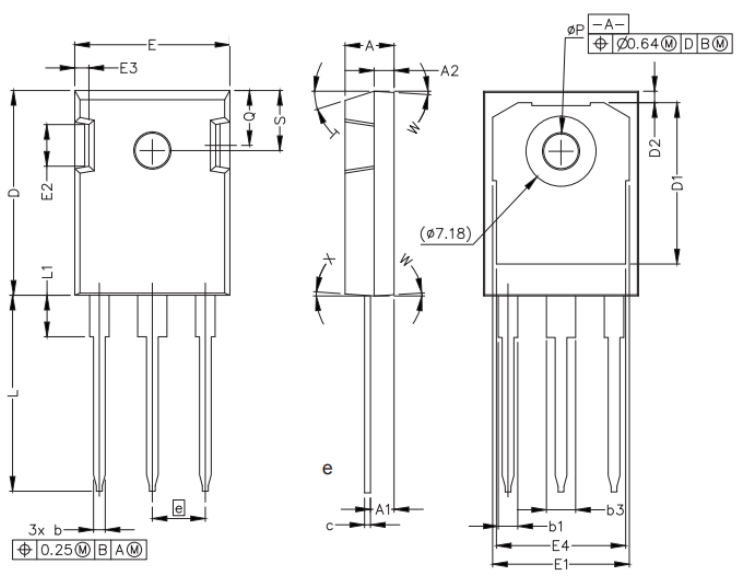


Figure 18. Switching Times vs. $R_{G(ext)}$

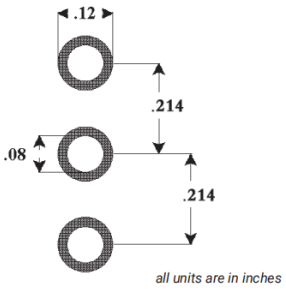
封装尺寸 / Package Dimensions

Package TO-247-3L



POS	Inches		Millimeters	
	Min	Max	Min	Max
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.042	.052	1.07	1.33
b1	.075	.095	1.91	2.41
b3	.113	.133	2.87	3.38
c	.022	.027	0.55	0.68
D	.819	.831	20.80	21.10
D1	.640	.695	16.25	17.65
D2	.037	.049	0.95	1.25
E	.620	.635	15.75	16.13
E1	.516	.557	13.10	14.15
E2	.145	.201	3.68	5.10
E3	.039	.075	1.00	1.90
E4	.487	.529	12.38	13.43
e	.214 BSC		5.44 BSC	
L	.780	.800	19.81	20.32
L1	.161	.173	4.10	4.40
N	3			
ØP	.138	.144	3.51	3.65
Q	.216	.236	5.49	6.00
S	.238	.248	6.04	6.30
T	17.5° REF			
W	3.5° REF			
X	4° REF			

参考焊盘图 / Recommended Solder Pad Layout



TO-247-3L

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