

KM040120-J

碳化硅功率场效应晶体管

Silicon Carbide Power MOSFET

N-Channel Enhancement Mode

V_{DS}	=	1200 V
$I_D@25^{\circ}C$	=	60 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
- 带有单独驱动源引脚的优化封装 / Optimized package with separate driver source pin
- 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

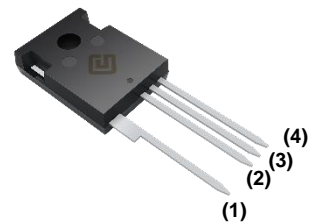
- 低开关损耗且极小的栅极震荡 / Reduce switching losses and minimize gate ringing
- 更高的系统效率 / Higher System Efficiency
- 降低散热要求 / Reduce cooling requirements
- 提升功率密度 / Increase power density
- 提升系统开关频率 / Increase system switching frequency
- 易于并联使用且易于驱动 / Ease of Paralleling and Simple to Drive

应用领域 / Applications

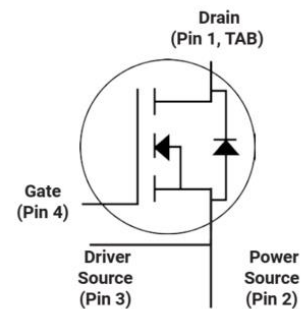
- 太阳能逆变器 / Solar inverters
- 电动汽车电机驱动 / EV motor drive
- 高压直流变换器 / High voltage DC/DC converters
- 开关电源 / Switched mode power supplies

Part Number	Package	Marking
KM040120-J	TO-247-4L	KM040120J

封装 / Package



TO-247-4L



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	60	A	V _{GS} =20 V, T _C =25°C	
		48		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	325	W	T _C =25°C, T _J =150°C	Fig.12
T _J , T _{stg}	工作和存储温度 Operating Junction and Storage Temperature	-55 to +150	°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
			2.7			V _{DS} =V _{GS} , I _D =10 mA, T _J =150°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
			72			V _{GS} =20V, I _D =20A, T _J =150°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		3250		pF	V _{DS} =1000 V, f=100kHz, V _{AC} =25 mV	Fig.11
C _{oss}	输出电容 Output Capacitance		113		pF		

C_{rSS}	转移电容 Reverse Transfer Capacitance		6		pF		
E_{OSS}	输出电容存储能量 C_{OSS} Stored Energy		60		μ J		Fig.10
E_{ON}	开启能量(体二极管续流) Turn-On Switching Energy (Body Diode FWD)		612		μ J	$V_{DS}=800V, V_{GS}=-5V/+20V, I_D=20A, L=100\mu H, T_J=150^\circ C$	Fig.17
E_{OFF}	关断能量(体二极管续流) Turn-Off Switching Energy (Body Diode FWD)		104				
$t_{d(on)}$	开启延迟时间 Turn-on Delay Time		14		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		18				
t_d	关断延迟时间 Turn-Off Delay Time		23				
t_f	下降时间 Fall Time		9				
$R_{G(int)}$	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}	二极管开启电压 Diode Forward Voltage	5	6	V	$V_{GS}=0V, I_{SD}=20A, T_J=25^\circ C$	Fig.6
		4.5	6	V	$V_{GS}=0V, I_{SD}=20A, T_J=150^\circ C$	
I_S	二极管正向持续电流 Continuous Diode Forward Current		55	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	$V_{GS}=-5V, I_{SD}=20A, V_R=800V, dif/dt=900A/\mu s, T_J=175^\circ C$	
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	

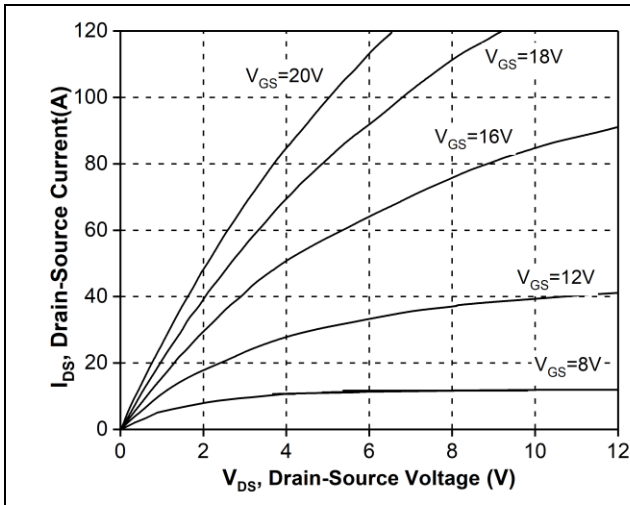


Figure 1. Output Characteristics $T_J=25^\circ\text{C}$

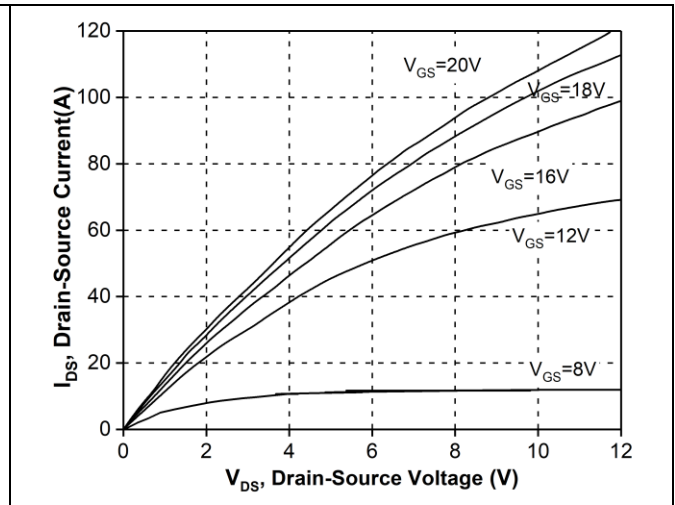


Figure 2. Output Characteristics $T_J=150^\circ\text{C}$

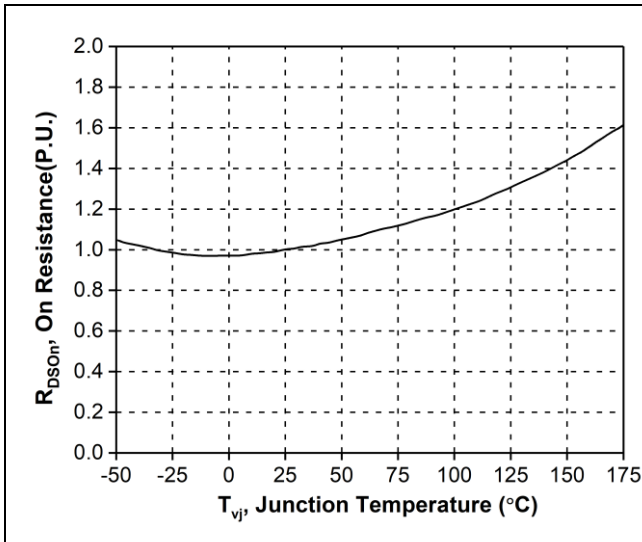


Figure 3. Normalized On-resistance vs. Temperature

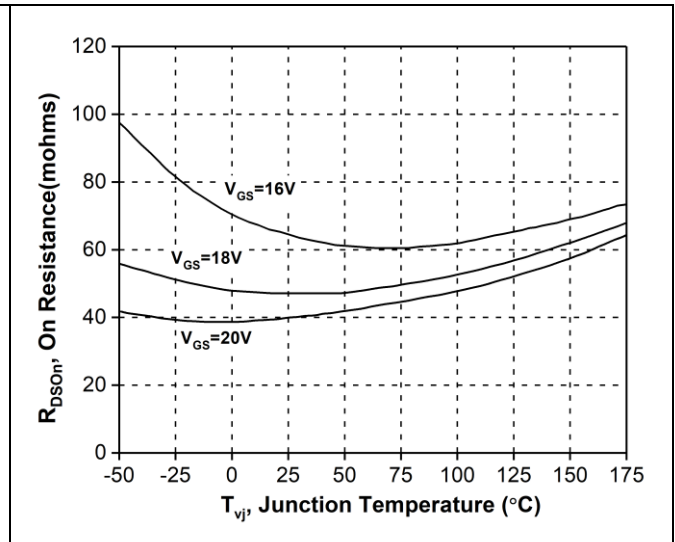


Figure 4. On-Resistance vs. Temperature For Various Gate Voltage

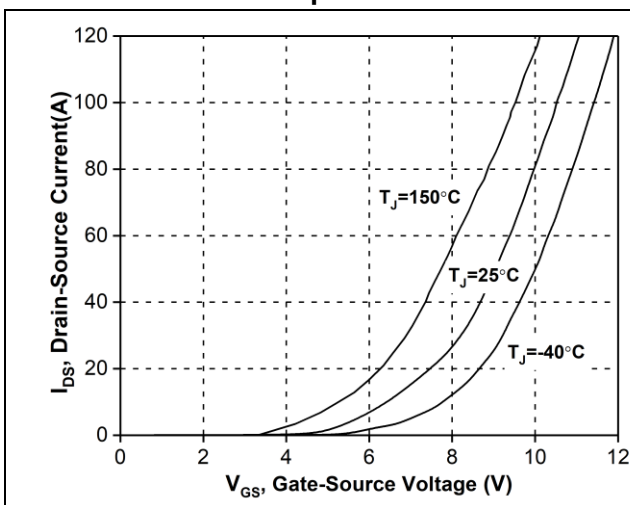


Figure 5. Transfer Characteristic for Various Junction Temperatures

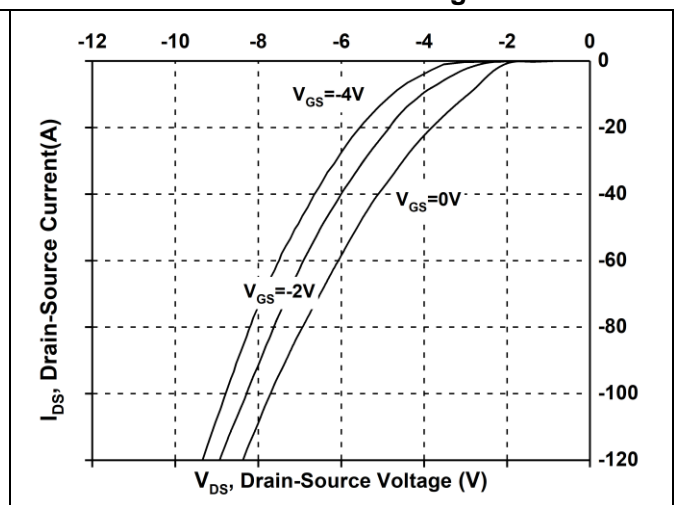


Figure 6. Body Diode Characteristic at 25°C

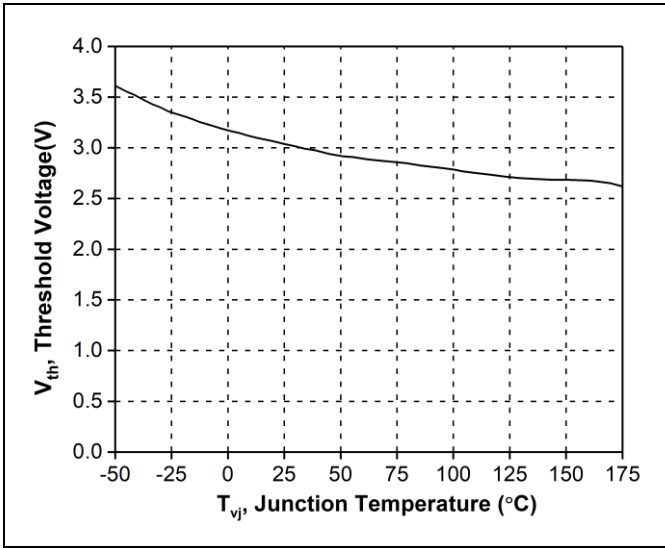


Figure 7. Threshold Voltage vs. Temperature

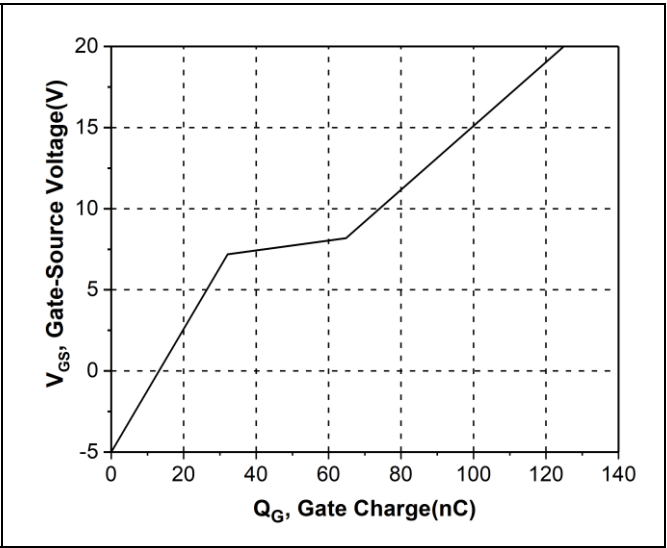


Figure 8. Gate Charge Characteristics

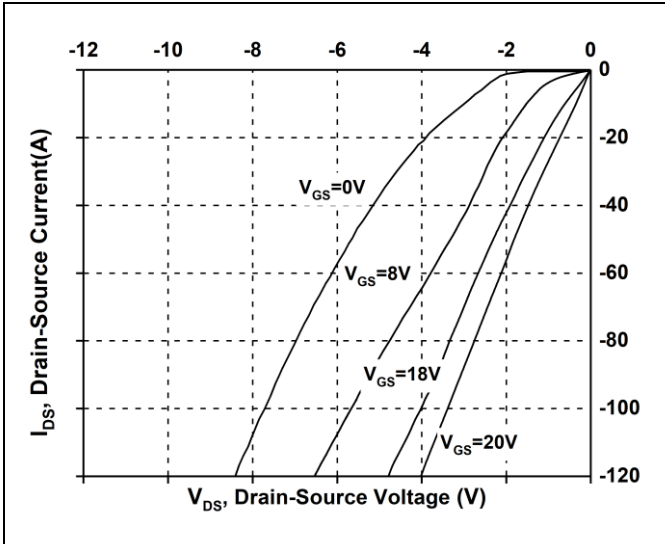


Figure 9. 3rd Quadrant Characteristic at 25°C

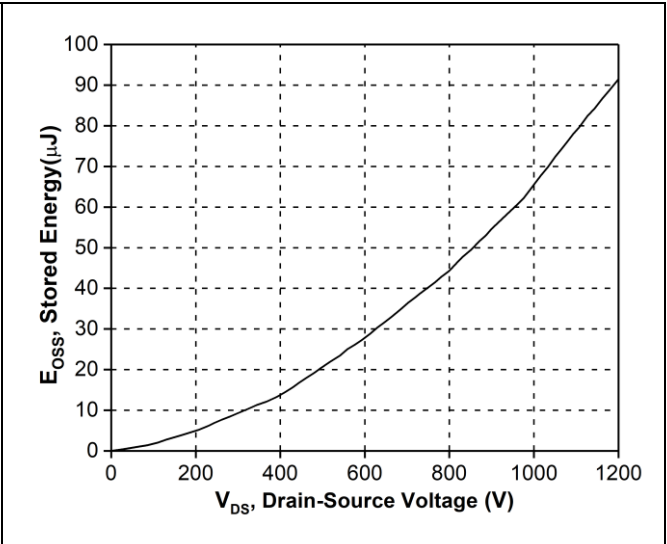


Figure 10. Output Capacitor Stored Energy

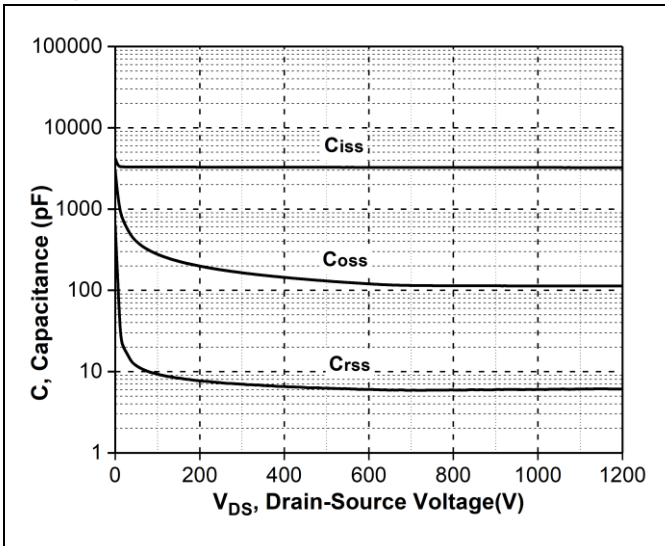


Figure 11. Capacitances vs. Drain-Source Voltage (0 - 1200V)

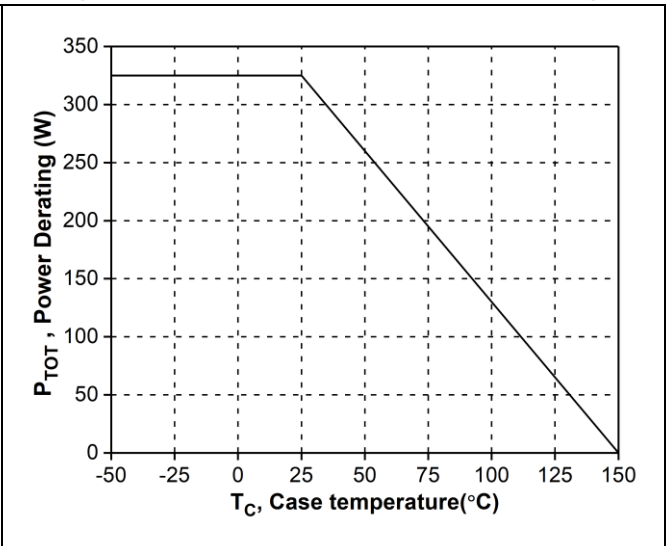


Figure 12. Maximum Power Dissipation Derating vs. Case Temperature

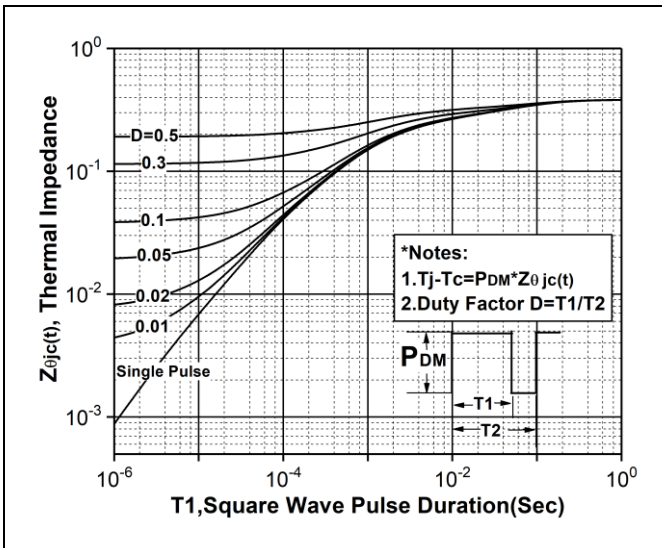


Figure 13. Transient Thermal Impedance (Junction - Case)

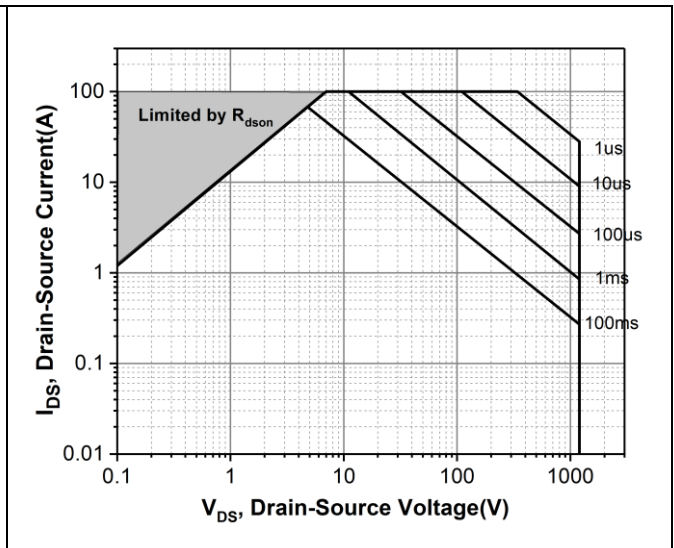


Figure 14. Safe Operating Area

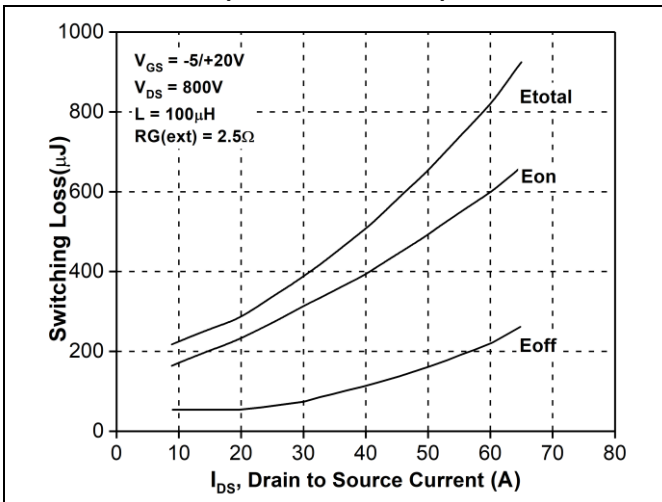


Figure 15. Clamped inductive Switching Energy vs. Drain Current ($V_{DD} = 800V$)

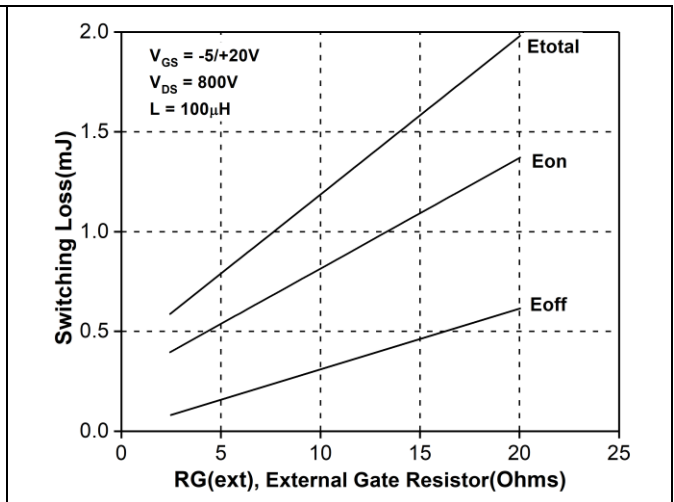


Figure 16. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

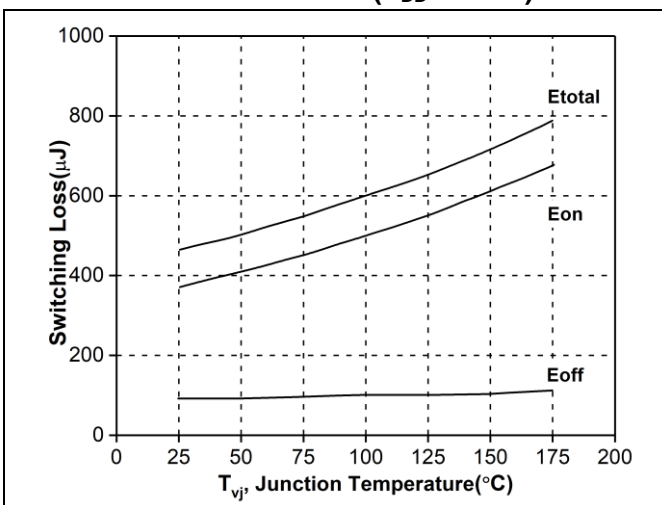


Figure 17. Clamped Inductive Switching Energy vs. Temperature

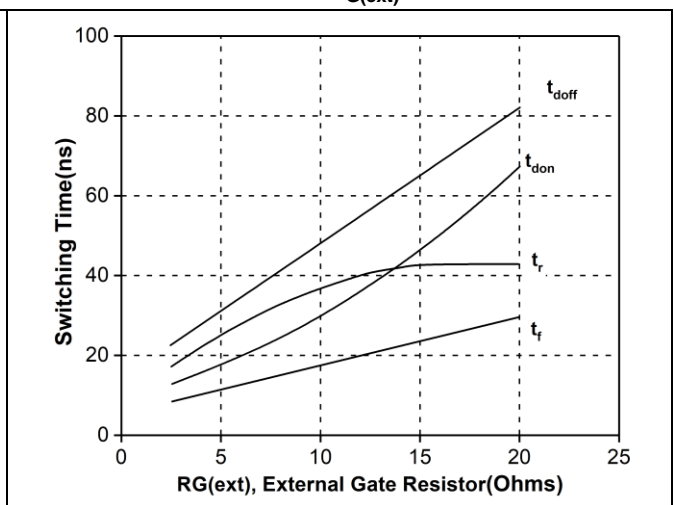
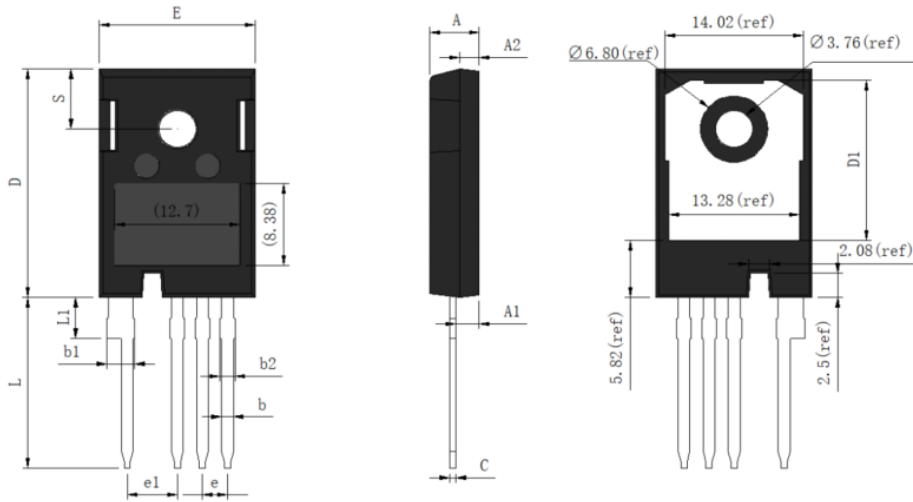


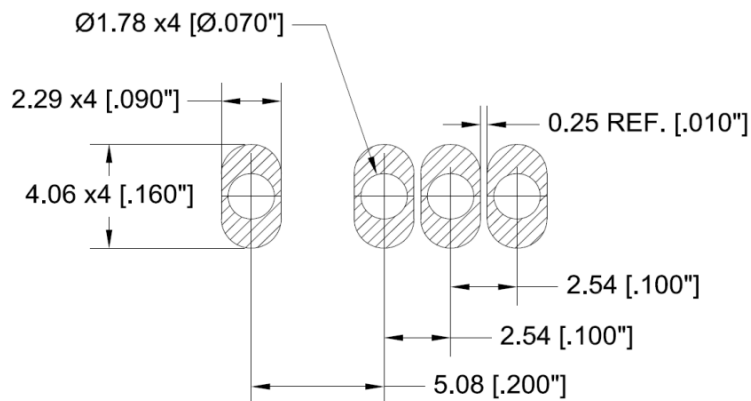
Figure 18. Switching Times vs. $R_{G(ext)}$

Package TO-247-4L



Unit		A	A1	A2	b	b1	b2	C	D	D1	E	e	e1	L	L1	S
mm	max	5.20	2.49	2.11	1.30	2.93	1.6	0.70	23.63	16.54	16.01	2.54	5.08	17.75	4.40	6.26
	typ	5.00	2.39	2.01	1.20	2.83	1.5	0.60	23.43	16.44	15.81			17.55	4.20	6.16
	min	4.80	2.29	1.91	1.10	2.73	1.4	0.50	23.23	16.34	15.61			17.35	4.00	6.06
mil	max	205	98	83	51	115	63	28	930	651	630	100	200	699	173	246
	typ	197	94	79	47	111	59	24	922	647	622			691	165	243
	min	189	90	75	43	107	55	20	915	643	615			683	157	239

参考焊盘图 / Recommended Solder Pad Layout



mm[inch]

TO-247-4L

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