MOS 数据手册

NPM2033LA

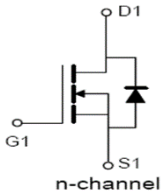
20V Complementary MOS

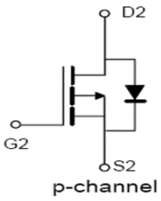
Rev. 1.0

NMOS 20V 5A/PMOS -20V -4.2A　NPM2033LA

产品特性 Features

- 先进沟槽工艺技术　Advanced Trench Technology
- 超低栅极电荷　Super Low Gate Charge
- 超低 Ron 高密度单元设计　High Density Cell Design for Ultra Low Rdson
- RoHS 产品　RoHS Product

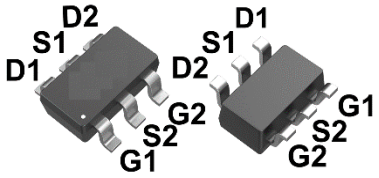




应用领域 Applications

- 负载开关　Load Switching
- 脉宽调制器　PWM
- DC/DC 转换器　DC/DC Converter
- 高频开关　High Frequency Switching

关键参数与封装信息 Key Performance and Package Parameters



SOT23-6L

产品型号 Part No.	封装 Package	漏极-源极电压 V_{DS}	漏极电流 I_D	导通电阻 $R_{DS(on)}$ Typ.	印记 Marking
NPM2033LA	SOT23-6L	20V	5A	22.5mΩ @ V_{GS} =4.5V	2033LA
		-20V	-4.2A	31.5mΩ @ V_{GS} =-4.5V	

最大额定值 Maximum Ratings

参数 Parameter	符号 Symbol	数值 NMOS	数值 PMOS	单位 Unit
最高漏极-源极直流电压 Drain to Source Voltage	V_{DS}	20	-20	V
最高栅源电压 Gate to Source Voltage	V_{GS}	±12	±12	V
连续漏极电流 Drain Current-Continuous, Limited by T_{vjmax} TC = 25°C TC = 100°C	I_D	 5 3.1	 -4.2 -2.7	A
最大脉冲漏极电流 Pulse Drain Current① PW≤300μs,Duty Cycle≤2%	I_{Dpuls}	25	-21	A
二极管正向电流 Diode Forward Current, Limited by T_{vjmax} TC = 25°C	I_S/I_{SM}	5/25	-4.2/-21	A
最大耗散功率 Maximum Power Dissipation TC = 25°C TC = 100°C	P_D	 1.25 0.5	 1.25 0.5	W
结温 Operating Junction Temperature	T_J	-55...+150	-55...+150	°C
存储温度 Storage Temperature	T_{stg}	-55...+150	-55...+150	°C
最高焊接温度 Maximum Soldering Temperature		260	260	°C

① 脉冲宽度由最高结温限制 Pulse width limited by maximum junction temperature

热阻特性 Thermal Resistance

参数 Parameter	符号 Symbol	数值 (最大) Max. Value	单位 Unit
结到环境热阻 Thermal Resistance Junction to Ambient②	$R_{\theta JA}$	100	°C /W

② Device on 40mm x 40mm x 1.5mm epoxy PCB FR4 with 6cm² (one layer, 7μm thick) copper area for drain connection. PCB is vertical in still air.

NMOS 电气特性 Electrical Characteristics (T_J = 25°C unless otherwise noted)

项目 Parameter	符号 Symbol	测试条件 Conditions	数值 Value			单位 Unit
			Min.	Typ.	Max.	
漏-源击穿电压 Drain to Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250μA	20	-	-	V
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}= 20V, V_{GS}=0V T_J=25°C T_J=150°C	-	-	1 100	μA
栅极漏电流 Gate to Source Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=±12V	-	-	±100	nA
阈值电压 Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	0.4	-	1.1	V
静态导通电阻 Drain to Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=4.5V, I_D=4A	-	22.5	29	mΩ
		V_{GS}=2.5V, I_D=3A	-	28	39	mΩ
正向压降 Diode Forward Voltage	V_{SD}	I_S=5A, V_{GS}=0V	-	-	1.4	V
输入电容 Input Capacitance	C_{iss}	V_{DS}=10V V_{GS}=0V f=1MHz	-	458	-	pF
输出电容 Output Capacitance	C_{oss}		-	59.5	-	pF
反向传输电容 Reverse Transfer Capacitance	C_{rss}		-	51.8	-	pF
栅极电荷总量 Total Gate Charge	Q_g	V_{DS}=10V V_{GS}=4.5V I_{DS}=4A	-	5.83	-	nC
栅极-源极电荷 Gate to Source Charge	Q_{gs}		-	0.67	-	
栅极-漏极电荷 Gate to Drain Charge	Q_{gd}		-	1.75	-	
开启延迟时间 Turn-On Delay Time	$t_{d(on)}$	T_J=25°C V_{DD}=10V, I_D=3A V_{GS}=4.5V, R_G=3Ω	-	9	-	ns
上升时间 Rise Time	t_r		-	69	-	
关断延迟时间 Turn-Off Delay Time	$t_{d(off)}$		-	63	-	
下降时间 Fall Time	t_f		-	26	-	
反向恢复时间 Reverse Recovery Time	t_{rr}	IF=3A, di/dt=100A/μs	-	15	-	ns
反向恢复电荷 Reverse Recovery Charge	Q_{rr}		-	1	-	nC

NMOS 特征曲线 Characteristic Curve

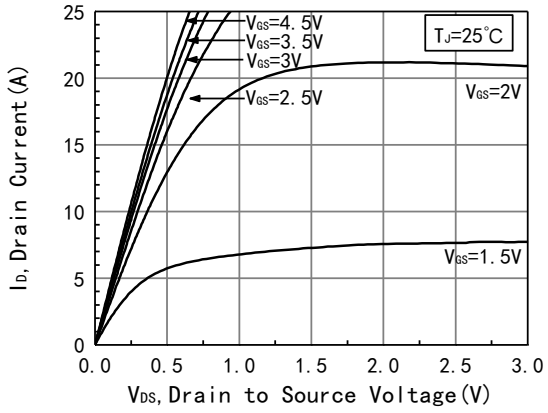


Figure 1. Typical Output Characteristics

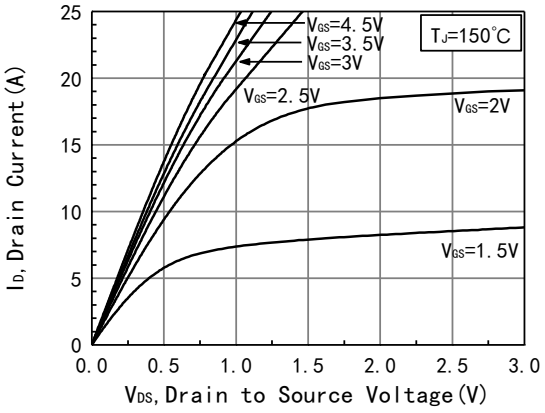


Figure 2. Typical Output Characteristics

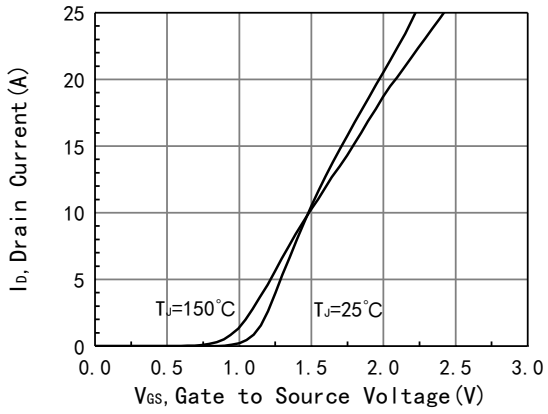


Figure 3. Typical Transfer Characteristics

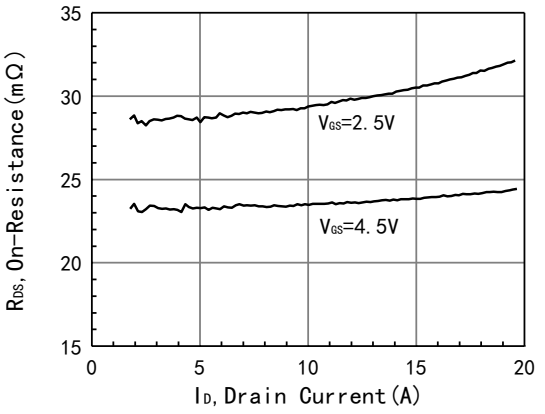


Figure 4. $R_{DS(on)}$ vs. I_D

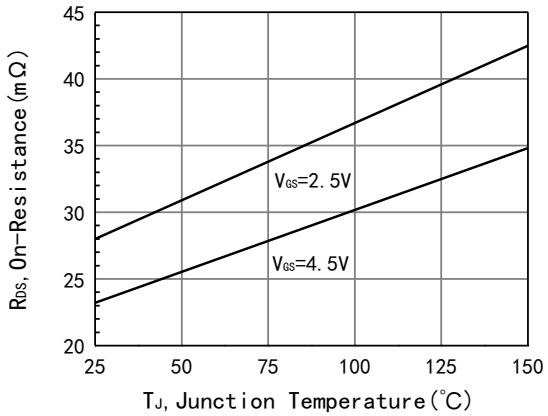


Figure 5. $R_{DS(on)}$ vs. T_J

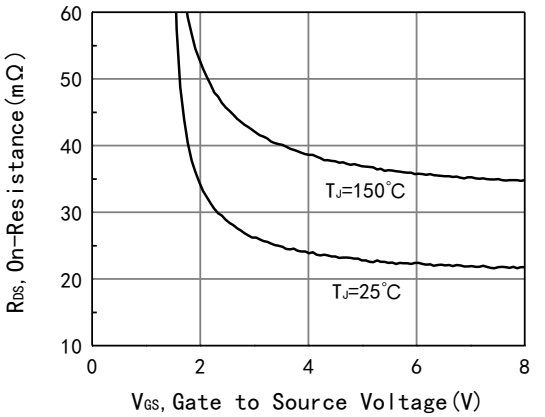


Figure 6. $R_{DS(on)}$ vs. V_{GS}

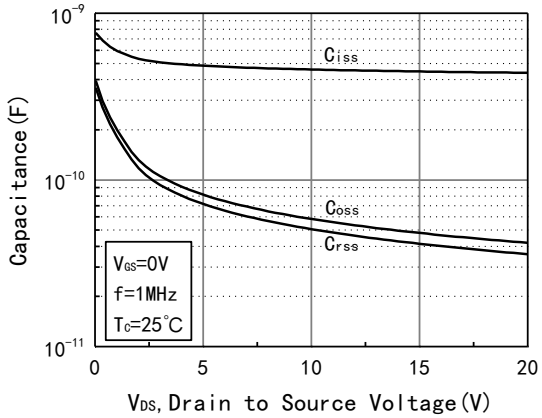


Figure 7. Capacitance vs. V_{DS}

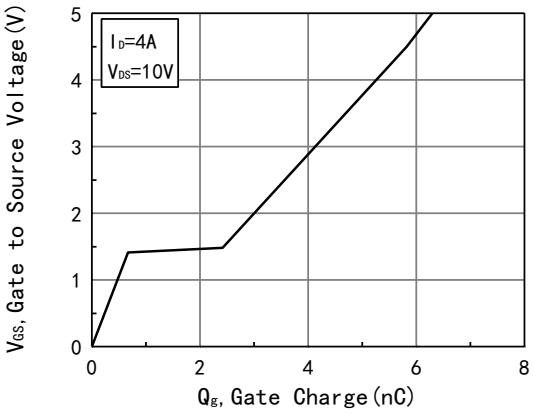


Figure 8. Gate Charge Characteristic

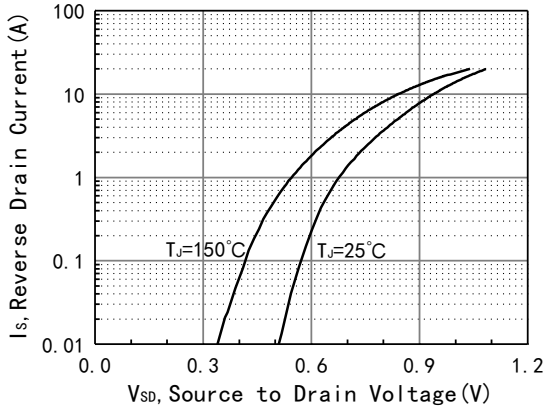


Figure 9. Diode Forward Characteristic

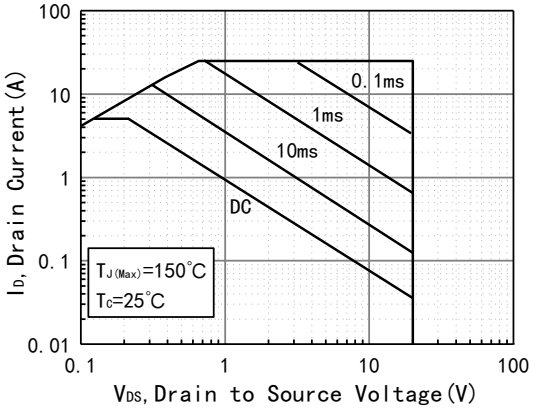


Figure 10. Safe Operating Area

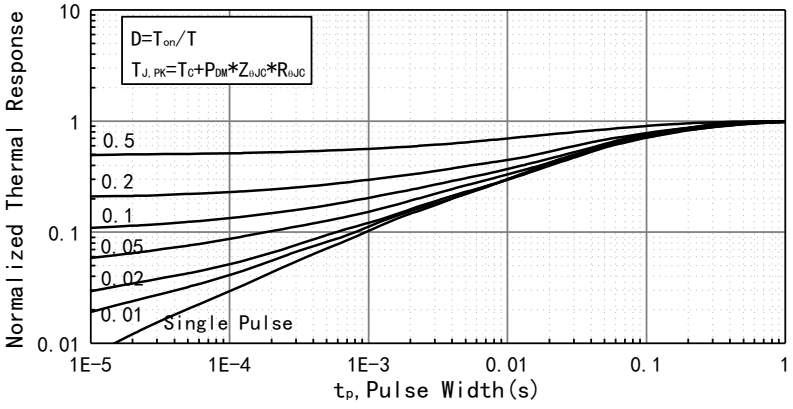


Figure 11. Normalized Maximum Transient Thermal Impedance

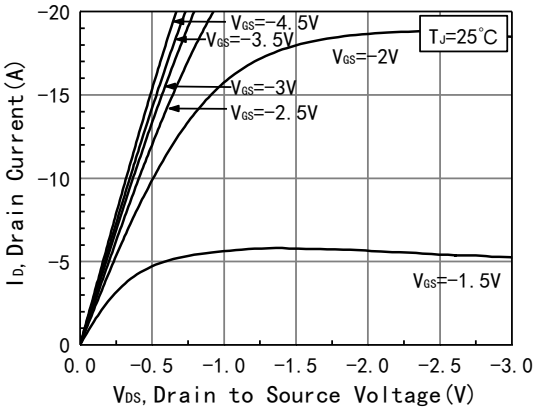
Notes:

Pulse Test：Pulse Width≤380μs，Pulse Delay≤200μs.

PMOS 电气特性 Electrical Characteristics (T_J = 25°C unless otherwise noted)

项目 Parameter	符号 Symbol	测试条件 Conditions	数值 Value			单位 Unit
			Min.	Typ.	Max.	
漏-源击穿电压 Drain to Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=-250μA	-20	-	-	V
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}= -20V, V_{GS}=0V T_J=25°C T_J=150°C	-	-	-1 -100	μA
栅极漏电流 Gate to Source Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=±12V	-	-	±100	nA
阈值电压 Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=-250μA	-0.4	-	-0.9	V
静态导通电阻 Drain to Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-4.5V, I_D=-3A	-	31.5	40	mΩ
		V_{GS}=-2.5V, I_D=-2A	-	37.5	52	mΩ
正向压降 Diode Forward Voltage	V_{SD}	I_S=-4A, V_{GS}=0V	-	-	-1.4	V
输入电容 Input Capacitance	C_{iss}	V_{DS}=-10V V_{GS}=0V f=1MHz	-	935	-	pF
输出电容 Output Capacitance	C_{oss}		-	112	-	pF
反向传输电容 Reverse Transfer Capacitance	C_{rss}		-	108	-	pF
栅极电荷总量 Total Gate Charge	Q_g	V_{DS}=-10V V_{GS}=-4.5V I_{DS}=-3A	-	17	-	nC
栅极-源极电荷 Gate to Source Charge	Q_{gs}		-	2.5	-	
栅极-漏极电荷 Gate to Drain Charge	Q_{gd}		-	4.6	-	
开启延迟时间 Turn-On Delay Time	$t_{d(on)}$	T_J=25°C V_{DD}=-10V, I_D=-3A V_{GS}=-4.5V, R_G=3Ω	-	14	-	ns
上升时间 Rise Time	t_r		-	31	-	
关断延迟时间 Turn-Off Delay Time	$t_{d(off)}$		-	41	-	
下降时间 Fall Time	t_f		-	34	-	
反向恢复时间 Reverse Recovery Time	t_{rr}	IF=-3A, di/dt=100A/μs	-	35	-	ns
反向恢复电荷 Reverse Recovery Charge	Q_{rr}		-	24	-	nC

PMOS 特征曲线 Characteristic Curve



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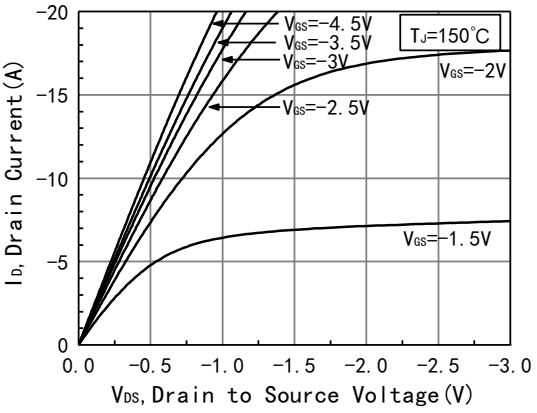


Figure 2. Typical Output Characteristics

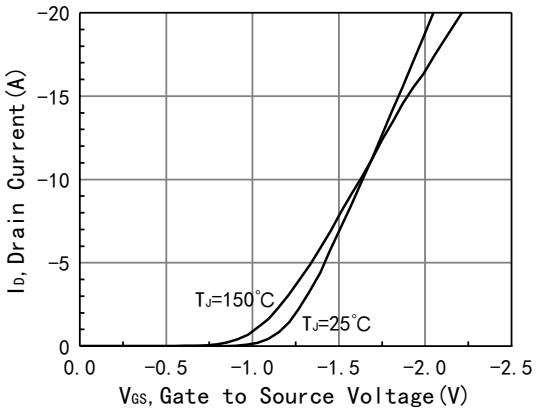
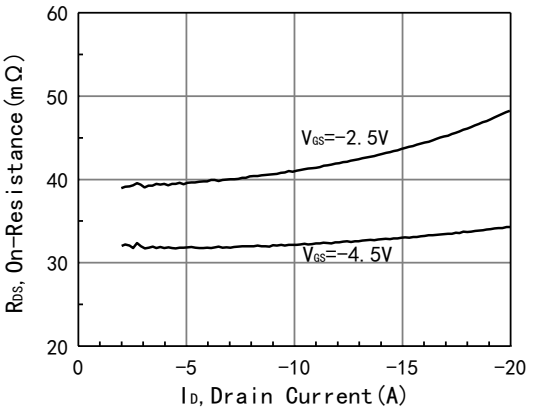


Figure 3. Typical Transfer Characteristics



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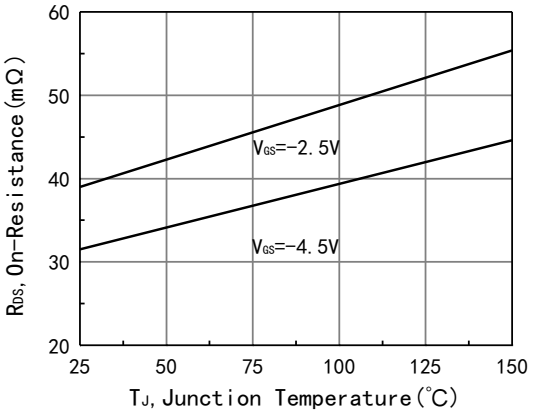

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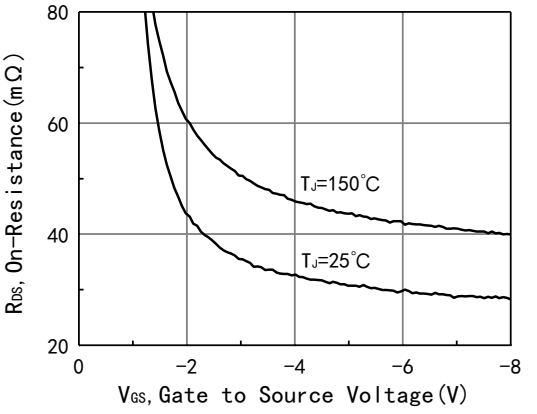
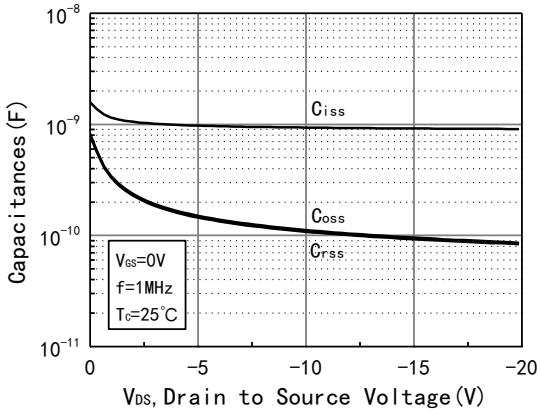


Figure 6. $R_{DS(on)}$ vs. V_{GS}



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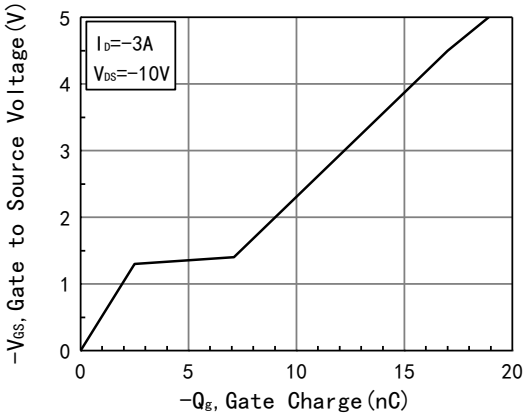


Figure 8. Gate Charge Characteristic

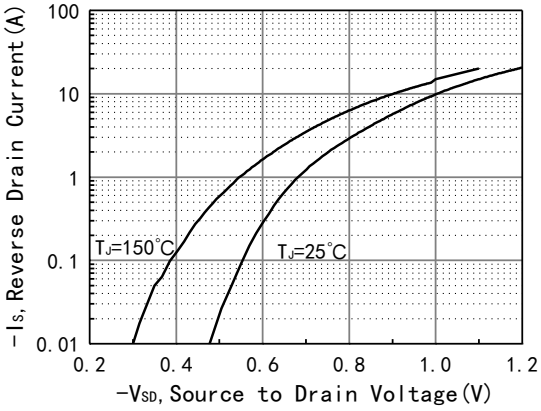
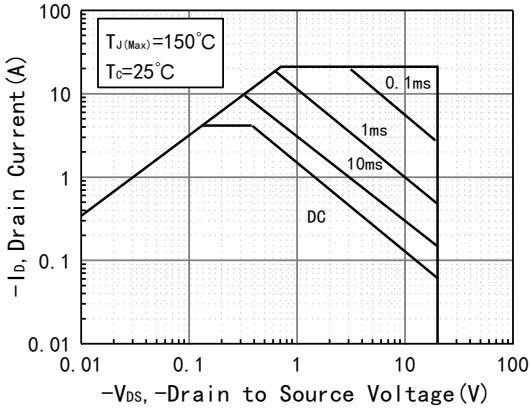


Figure 9. Diode Forward Characteristic



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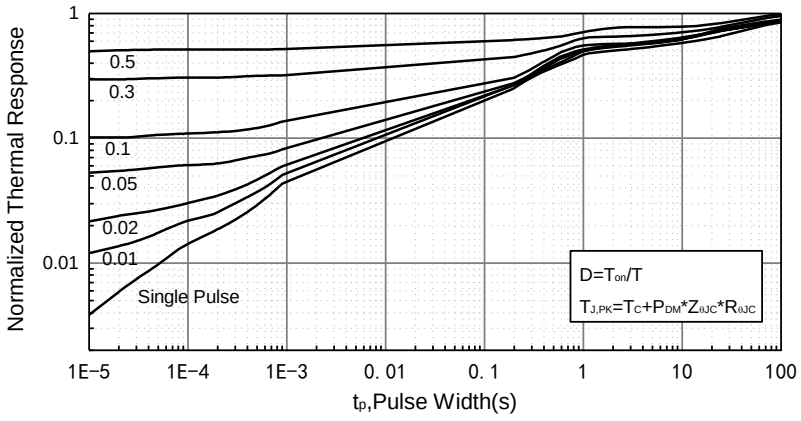
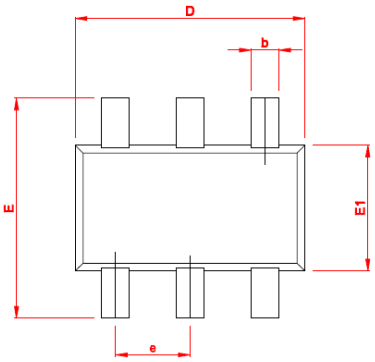


Figure 11. Normalized Maximum Transient Thermal Impedance

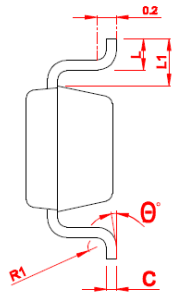
Notes:

Pulse Test：Pulse Width≤380μs，Pulse Delay≤200μs.

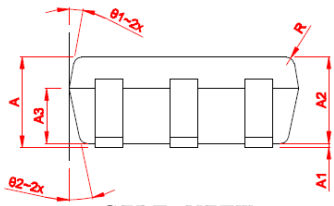
外形尺寸 Mechanical Data: SOT23-6L



TOP VIEW



SIDE VIEW



SIDE VIEW

Symbol	MILLIMETER		
	MIN	NOM	MAX
A	1.10	1.15	1.25
*A1	0.02	0.06	0.10
*A2	1.05	1.10	1.15
A3	0.60	0.65	0.70
*b	0.32	0.35	0.48
*c	0.152 REF		
*D	2.87	2.92	2.92
*E	2.60	2.80	3.00
*E1	1.55	1.60	1.65
*e	0.95 BSC		
*L	0.35	0.45	0.55
L1	0.60 REF		
R	0.10 REF		
R1	0.12 REF		
*θ	0°	3°	8°
θ1	7° BSC		
θ2	10° BSC		

历史版本

版本号	时间	修改内容
V1.0	2022 年 8 月	初始版本