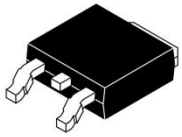


IRFR5410

TO-252 P Channel MOS Field Effect Transistor
TO-252 P 沟道场效应管

1. Description 描述

This P Channel MOSFET encapsulated in a TO-252 Surface-Mounted Device (SMD) plastic package.

这种 P 沟道 MOS 场效应管采用 TO-252 表面贴装（SMD）塑料封装。

2. Features 特性

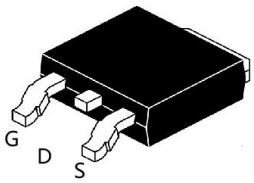
Feature 特性	Description 描述
Drain-Source Voltage 漏极-源极电压	$V_{DS} = -100V$
Drain Current(continuous) 漏极电流-连续	$I_D = -8.8A$
Applications 应用	• Power Switch 电源开关 • DC/DC Converters 直流/直流转换器
Environmental Compliance 环保合规	Totally Lead-Free & Fully RoHS Compliant. 完全无铅和符合 RoHS 标准[1] Halogen and Antimony Free, "Green" Device. 无卤素和无锑，“绿色”器件[2]
Automotive Compliance 汽车合规	Qualified according to AEC-Q101 and recommended for use in automotive applications. 通过了 AEC-Q101 认证，推荐用于汽车电子应用场景。

[1] No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
无铅，完全符合欧盟标准 2002/95/EC（RoHS），2011/65/EU （RoHS 2）和 2015/863/EU （RoHS 3）。

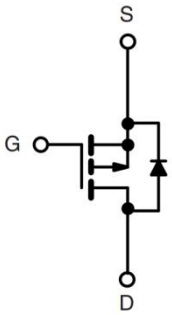
[2] Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
无卤素和无锑的“绿色”产品指溴含量<900ppm，氯含量<900ppm（溴+氯总含量<1500ppm）和锑化合物含量<1000ppm。

3. Mechanical Data 封装数据

Feature 特性	Description 描述
Package 封装	TO-252
Moisture Sensitivity Level 湿敏感度等级	J-STD-020 MSL1
Material 材料	Molded Plastic, “Green” Molding Compound; UL Flammability Classification Rating 94V-0. 模塑塑料封装，“绿色”成型复合材料；UL 可燃性等级 94V-0。
Dimensions 尺寸	$2.286mm$ pitch; $6.1mm \times 6.6mm \times 2.3mm$ body 相邻引脚中心距为$2.286mm$，封装本体（不含引脚）尺寸为$6.1mm \times 6.6mm \times 2.3mm$
Terminals Compliance 引脚合规	3 terminals, Tin Plated Leads; exposed die pad for good heat transfer; Solderable per MILSTD-202, Method 208e3 3 个镀锡引脚，外露散热焊盘以增强热传导；可焊性符合 MIL-STD-202 标准中 208 方法 e3 条款的要求
Weight 重量	2.24 grams (Approximate) 约 2.24 克
Polarity 极性	See Diagrams Below 极性见下图



TO-252 Top View



Device Symbol

4. Ordering Information 订购信息

Part Number	Compliance	Package	Reel Size (inches)	Tape Width (mm)	Quantity Per Reel
IRFR5410	Automotive	TO-252	13	16	2500

5. Marking Information 丝印信息

Part Number	Marking Code
IRFR5410	FR5410

6. Absolute Maximum Ratings(T_a =+ 25℃) 绝对最大额定值

Characteristic 特性		Symbol 符号	Value 值	Unit 单位
Drain-Source Voltage 漏极-源极电压		V_{DS}	-100	V
Gate- Source Voltage 栅极-源极电压		V_{GS}	±20	V
Continuous Drain Current (continuous) 漏极电流-连续（$T_J = 150℃$）	$T_C = 25℃$	I_D	-8.8	A
	$T_C = 70℃$	I_D	-7.1	A
Continuous Source-Drain Current (Diode Conduction) 连续源漏极电流（二极管导通状态）		I_S	-8.8	A
Drain Current(pulsed)漏极电流-脉冲		I_{DM}	-25	A

7. Thermal Characteristics(T_a =+ 25℃) 热特性

Characteristic 特性		Symbol 符号	Value 值	Unit 单位
Power Dissipation 耗散功率[3]	$T_C = 25℃$	P_D	32.1[4]	W
	$T_A = 25℃$[5]	P_D	2.5	W
Thermal Resistance From Junction To Ambient 结到环境的热阻		$R_{\theta JA}$	50	$℃/W$
Junction Temperature 结温		T_J	-55 ~ +150	℃
Storage Temperature 储藏温度		T_{stg}	-55 ~ +150	℃

[3] Duty cycle ≤ 1%. 占空比≤ 1%。

[4] See Safe Operating Area(SOA) curve for voltage derating. 电压降额请参见安全工作区（SOA）曲线。

[5] When Mounted on 1" square PCB (FR-4 material). 当安装在 1 英寸见方的 FR-4 材质 PCB 上时。

8. Electrical Characteristics(T_a =+ 25℃) 电特性

Characteristic 特性	Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Conditions 条件
Drain-Source Breakdown Voltage 漏极-源极击穿电压	BV_{DSS}	-100	-	-	V	I_D =− 250μA, V_{GS} = 0
Gate Threshold Voltage 栅极开启电压	$V_{GS(th)}$	-1	-	-2.5	V	I_D =− 250μA, V_{DS} = V_{GS}
Zero Gate Voltage Drain Current 零栅压漏极电流	I_{DSS}	-	-	-1	μA	V_{GS} = 0, V_{DS} =− 100V
		-	-	-50	μA	V_{GS} = 0, V_{DS} =− 100V T_J = 125℃
		-	-	-250	μA	V_{GS} = 0, V_{DS} =− 100V T_J = 150℃
Gate Body Leakage 栅极漏电流	I_{GSS}	-	-	±250	nA	V_{GS} =± 20V, V_{DS} = 0
Static Drain-Source On-State Resistance 静态漏源导通电阻[6]	$R_{DS(on)}$	-	0.25	-	Ω	I_D =− 3.6A, V_{GS} =− 10V
		-	0.28	-	Ω	I_D =− 3.4A, V_{GS} =− 4.5V
Diode Forward Voltage Drop 内附二极管正向压降[6]	V_{SD}	-	-0.8	-1.5	V	I_S =− 2.9A, V_{GS} = 0
Input Capacitance 输入电容	C_{ISS}	-	1055	-	pF	V_{GS} = 0, V_{DS} =− 50V, f = 1MHz
Common Source Output Capacitance 共源输出电容	C_{OSS}	-	65	-	pF	
Reverse Transfer Capacitance 反馈电容	C_{RSS}	-	41	-	pF	
Total Gate Charge 栅极电荷密度	Q_g	-	23.2	34.8	nC	V_{GS} =− 10V, V_{DS} =− 50V, I_D =− 3.6A
		-	11.7	17.6	nC	V_{GS} =− 4.5V, V_{DS} =− 50V, I_D =− 3.6A
Gate Source Charge 栅源电荷密度	Q_{gs}	-	3.5	-	nC	V_{GS} =− 4.5V, V_{DS} =− 50V, I_D =− 3.6A
Gate Drain Charge 栅漏电荷密度	Q_{gd}	-	4.8	-	nC	
Gate Resistance 栅极电阻	R_g	1.2	5.7	11.5	Ω	f = 1MHz

Characteristic 特性	Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Conditions 条件
Turn-ON Delay Time 开启延迟时间	$t_{d(on)}$	-	7	14	ns	$V_{DD} = -50V$, $R_L = 17.2\Omega$ $I_D \cong -2.9A$, $V_{GEN} = -10V$, $R_g = 1\Omega$
Turn-ON Rise Time 开启上升时间	t_r	-	12	18	ns	
Turn-OFF Delay Time 关断延迟时间	$t_{d(off)}$	-	33	50	ns	
Turn-OFF Fall Time 关断下降时间	t_f	-	9	18	ns	

[6] Pulse test; pulse width ≤300 μs, duty cycle ≤ 2%. 脉冲测试：脉冲宽度≤300 μs，占空比≤ 2%。

9. Typical Electrical Characteristics Curve 典型电特性曲线

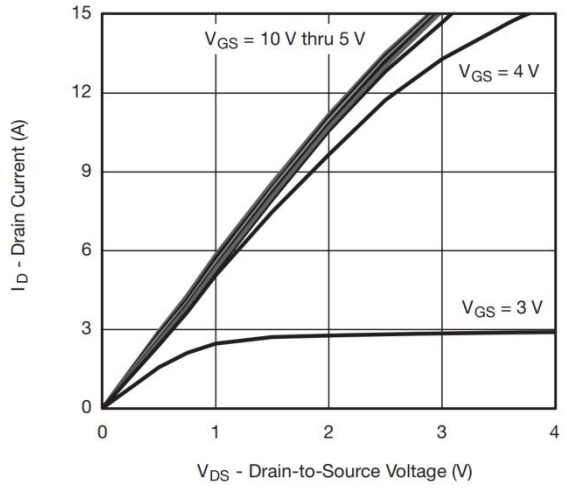


Figure1. Output Characteristics

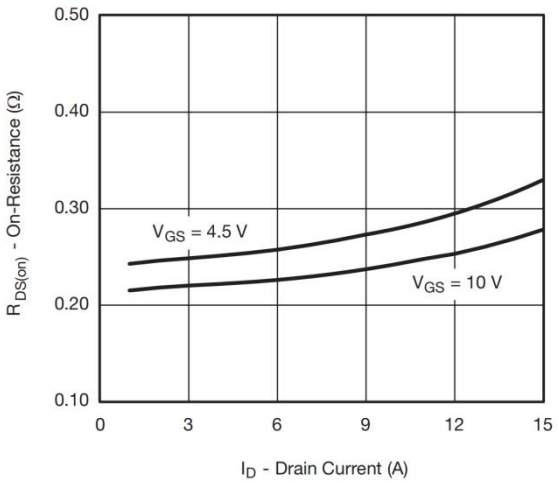


Figure2. On-Resistance vs. Drain Current

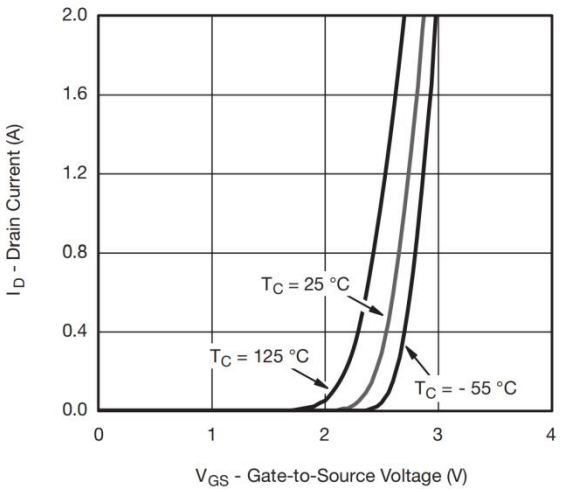


Figure3. Transfer Characteristics

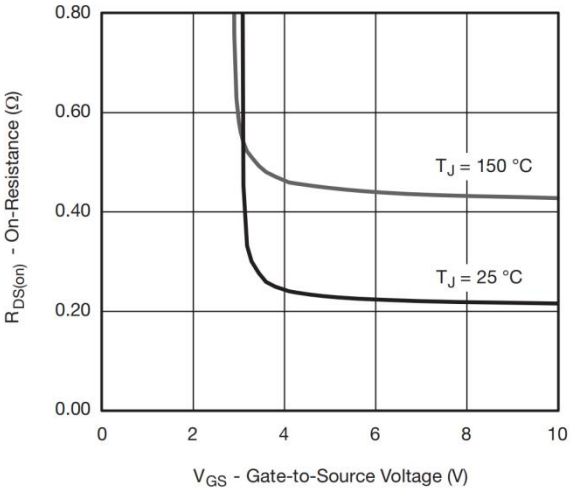


Figure 4. On-Resistance vs. Gate-to-Source Voltage

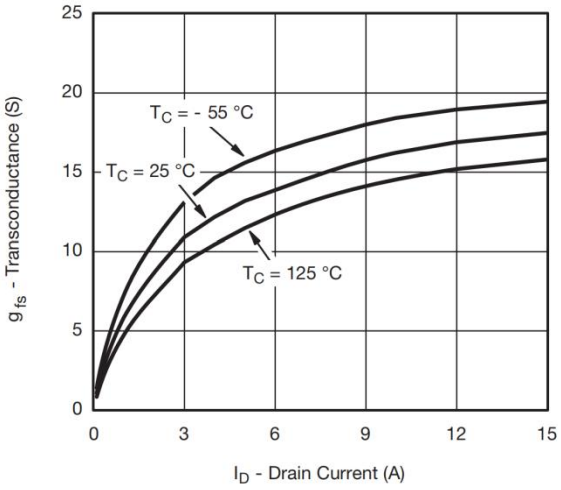


Figure 5. Transconductance

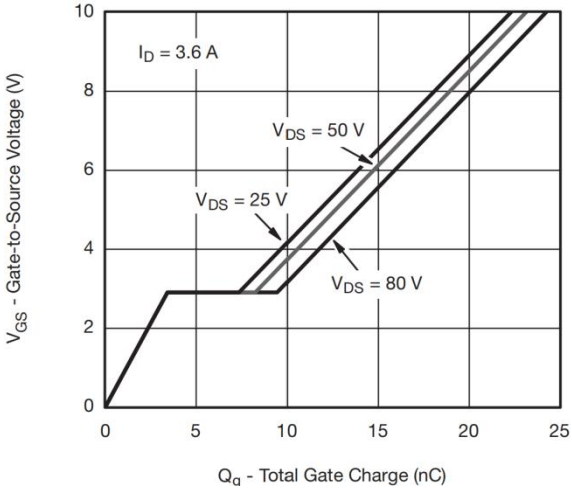


Figure 6. Gate Charge

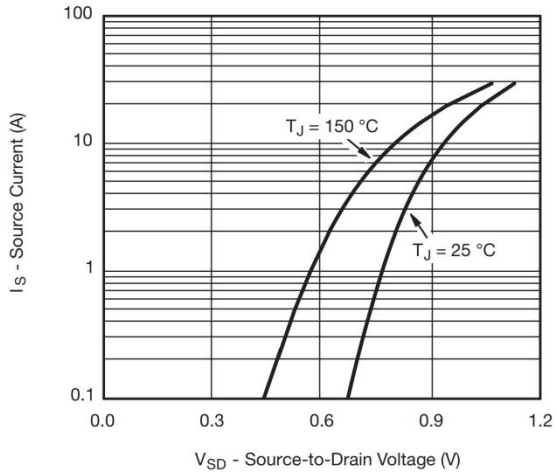


Figure 7. Source-Drain Diode Forward Voltage

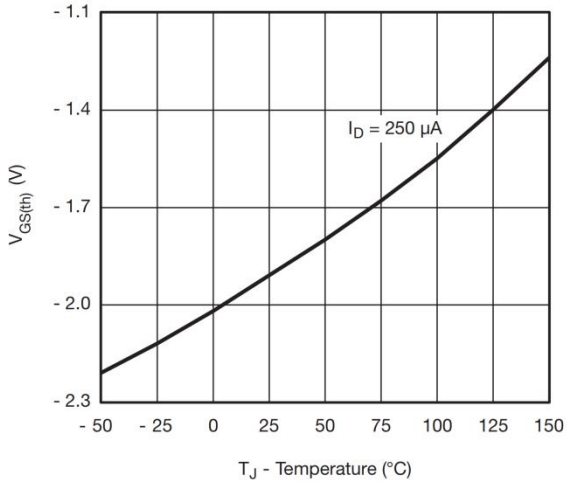


Figure 8. Threshold Voltage

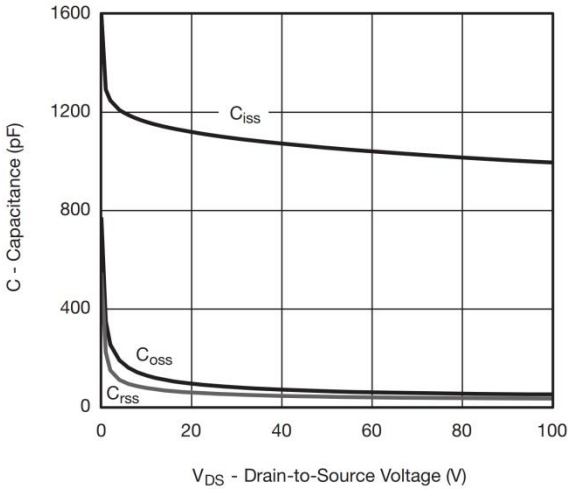


Figure 9. Capacitance

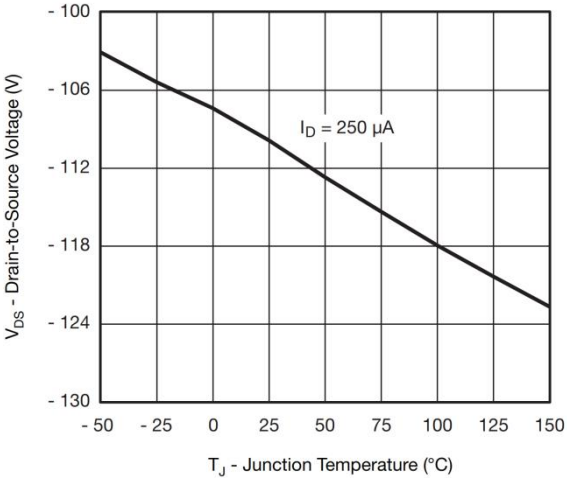


Figure 10. Drain Source Breakdown vs. Junction Temperature

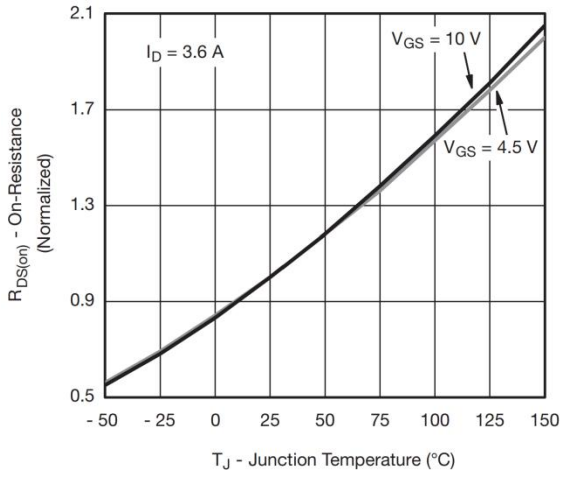


Figure 11. On-Resistance vs. Junction Temperature

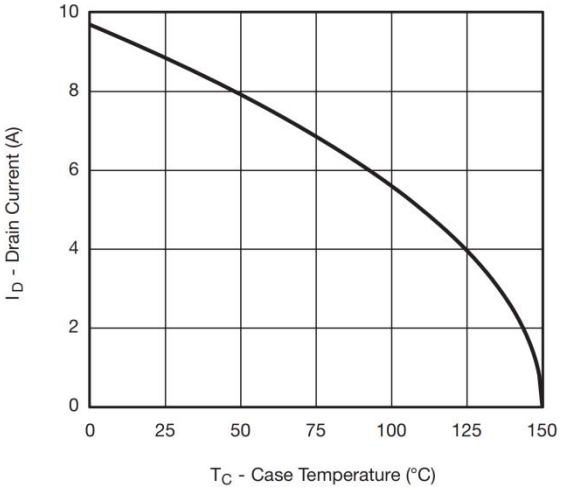


Figure 12. Current Derating

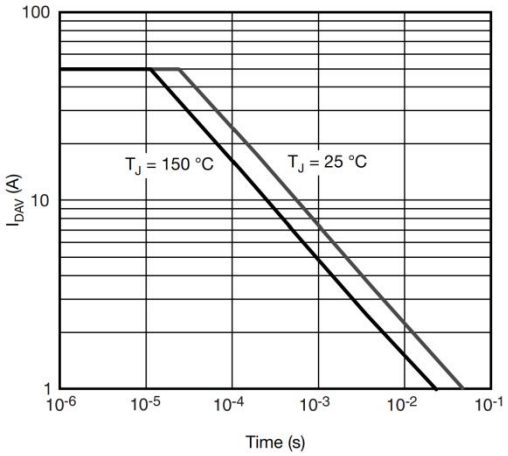


Figure 13. Single Pulse Avalanche Current Capability vs. Time

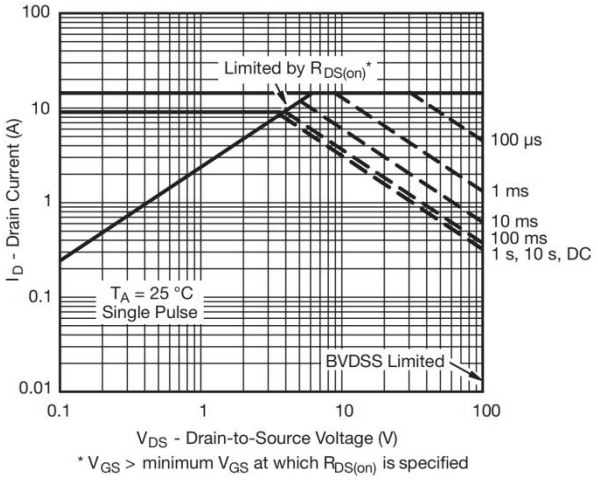


Figure 14. Safe Operating Area

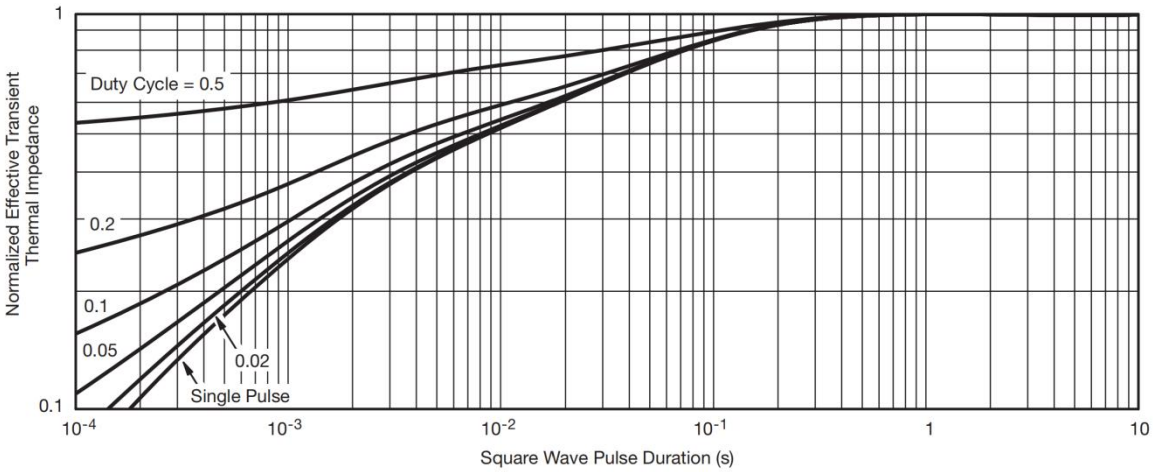
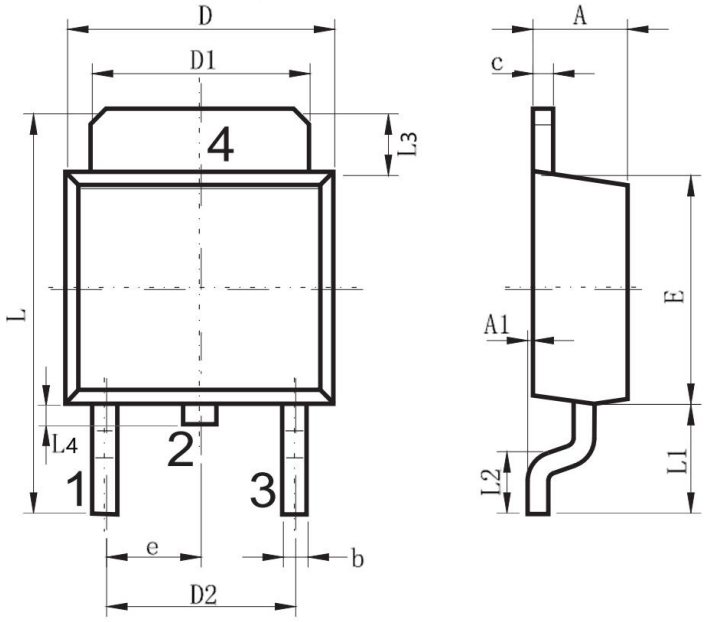


Figure 15. Normalized Thermal Transient Impedance, Junction-to-Case

10. Package Outline Dimensions 封装外形尺寸

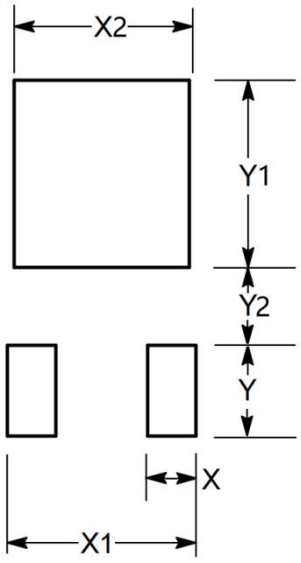
TO-252



Symbol 符号	Millimeters 毫米	
	Min.最小值	Max.最大值
A	2.10	2.50
A1	-	0.127
b	0.50	0.90
c	0.30	0.70
D	6.30	6.70
D1	5.10	5.50
D2	4.4	4.8
E	5.50	6.30
e	2.10	2.50
L	9.70	10.10
L1	2.70	3.10
L2	1.40	1.78
L3	1.20	1.60
L4	-	1.01

11. Suggested Pad Layout 推荐焊盘布局

TO-252



Dimensions 尺寸	Millimeters 毫米
X	1.6
X1	6.17
X2	5.8
Y	3
Y1	6.2
Y2	2.58

Fig. Soldering footprint for TO-252

图 TO-252 的引脚焊接

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