



YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

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## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	Q <sub>g</sub> Typ	I <sub>D</sub> Max T <sub>C</sub> = +25°C (Note 10)
40V	3mΩ @ V <sub>GS</sub> = 10V	83nC	100A
	5mΩ @ V <sub>GS</sub> = 4.5V	35nC	100A

## Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low R<sub>DS(ON)</sub> – Minimizes Power Losses
- Low Q<sub>g</sub> – Minimizes Switching Losses

## Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

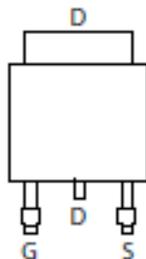
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters
- Motor Control

## Mechanical Data

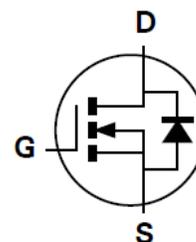
- Case: TO252
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 Ⓔ
- Weight: 0.33 grams (Approximate)



Top View



Pin Out Top View



Equivalent Circuit

**Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Units
Drain-Source Voltage	$V_{DSS}$	40	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Continuous Drain Current (Note 7) $V_{GS} = 10\text{V}$	$I_D$	$T_C = +25^\circ\text{C}$ (Note 10)	100
		$T_C = +100^\circ\text{C}$	100
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)	$I_{DM}$	200	A
Maximum Continuous Body Diode Forward Current (Note 7)	$I_S$	100	A
Avalanche Current, $L = 0.2\text{mH}$	$I_{AS}$	30	A
Avalanche Energy, $L = 0.2\text{mH}$	$E_{AS}$	90	mJ

**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 6) $T_A = +25^\circ\text{C}$	$P_D$	3.9	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	38	$^\circ\text{C/W}$
Total Power Dissipation (Note 7) $T_C = +25^\circ\text{C}$	$P_D$	180	W
Thermal Resistance, Junction to Case (Note 7)	$R_{\theta JC}$	0.8	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	40	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current, $T_J = +25^\circ\text{C}$	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 32\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	2.4	3	m $\Omega$	$V_{GS} = 10\text{V}, I_D = 50\text{A}$
		—	4	5	m $\Omega$	$V_{GS} = 4.5\text{V}, I_D = 50\text{A}$
Diode Forward Voltage	$V_{SD}$	—	0.7	1.2	V	$V_{GS} = 0\text{V}, I_S = 50\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	$C_{iss}$	—	4,450	—	pF	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Output Capacitance	$C_{oss}$	—	1,407	—	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	74	—	pF	
Gate Resistance	$R_g$	—	0.7	—	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ( $V_{GS} = 4.5\text{V}$ )	$Q_g$	—	35	—	nC	$V_{DS} = 20\text{V}, I_D = 30\text{A}$
Total Gate Charge ( $V_{GS} = 10\text{V}$ )	$Q_g$	—	83	—	nC	
Gate-Source Charge	$Q_{gs}$	—	10	—	nC	
Gate-Drain Charge	$Q_{gd}$	—	11.2	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	5.9	—	ns	$V_{GS} = 10\text{V}, V_{DS} = 20\text{V}, R_G = 1.6\Omega, I_D = 30\text{A}$
Turn-On Rise Time	$t_R$	—	13.2	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	25.8	—	ns	
Turn-Off Fall Time	$t_F$	—	7.9	—	ns	
Body Diode Reverse Recovery Time	$t_{RR}$	—	48	—	ns	$I_F = 50\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	72	—	nC	$I_F = 50\text{A}, di/dt = 100\text{A}/\mu\text{s}$

- Notes:
- Device mounted with exposed drain pad on 25mm by 25mm 2oz copper on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions while operating in a steady state.
  - Thermal resistance from junction to solder point (on the exposed drain pin).
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.
  - Package Limited.

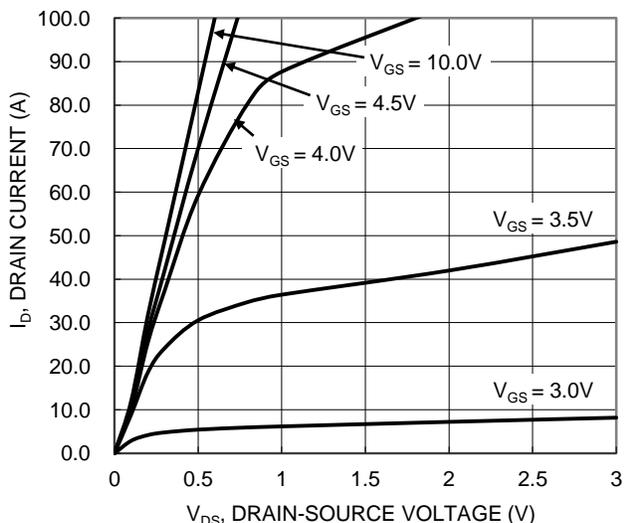


Figure 1. Typical Output Characteristic

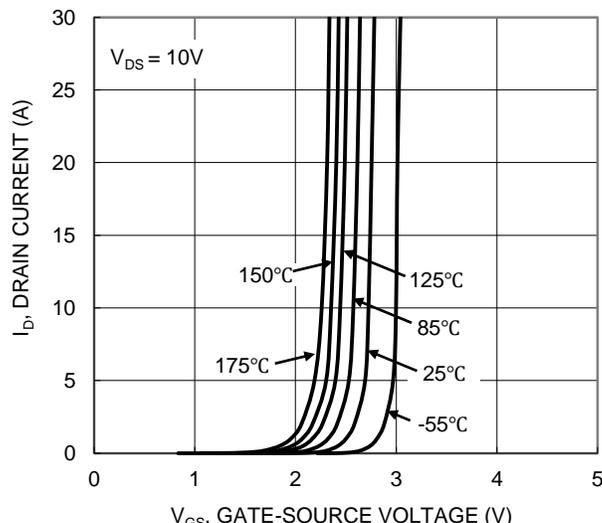


Figure 2. Typical Transfer Characteristic

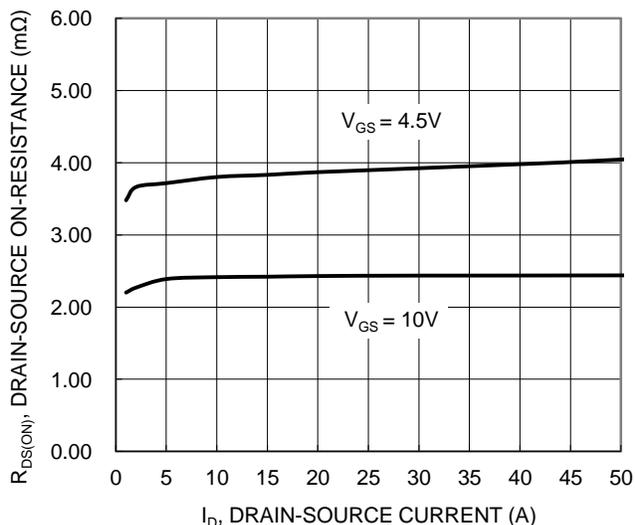


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

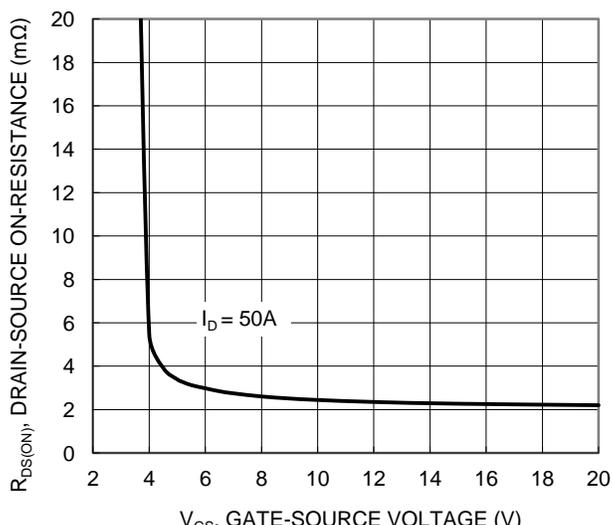


Figure 4. Typical Transfer Characteristic

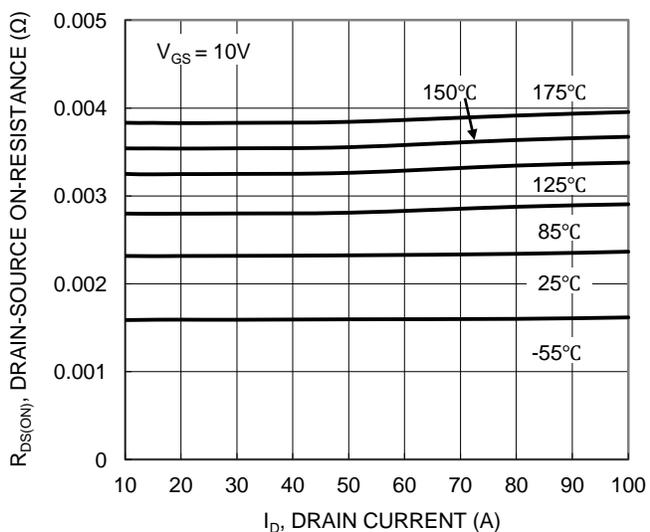


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

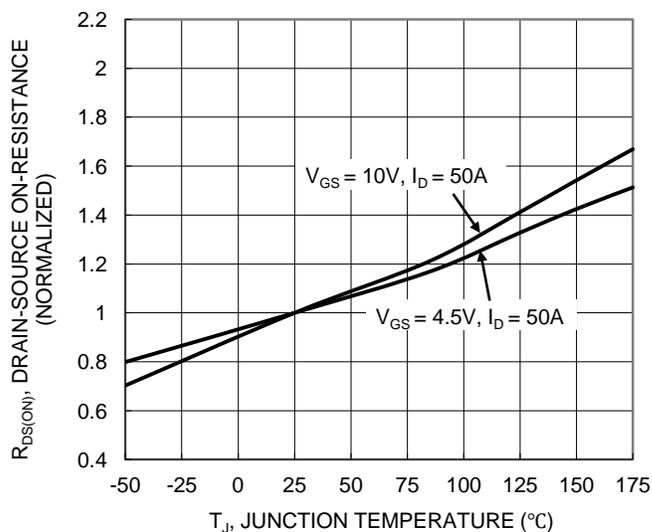


Figure 6. On-Resistance Variation with Temperature

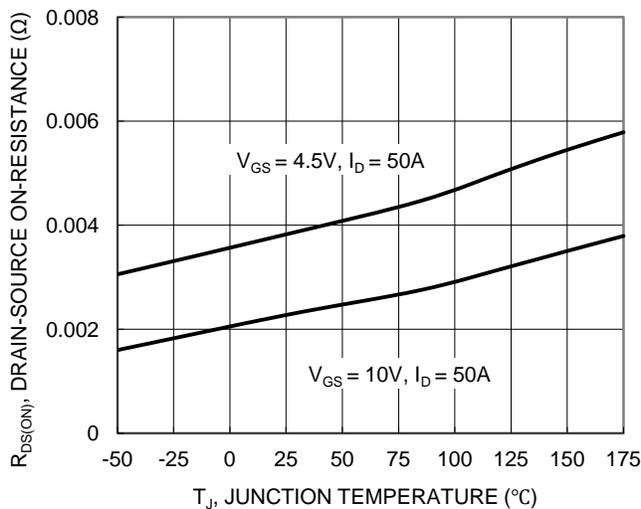


Figure 7. On-Resistance Variation with Temperature

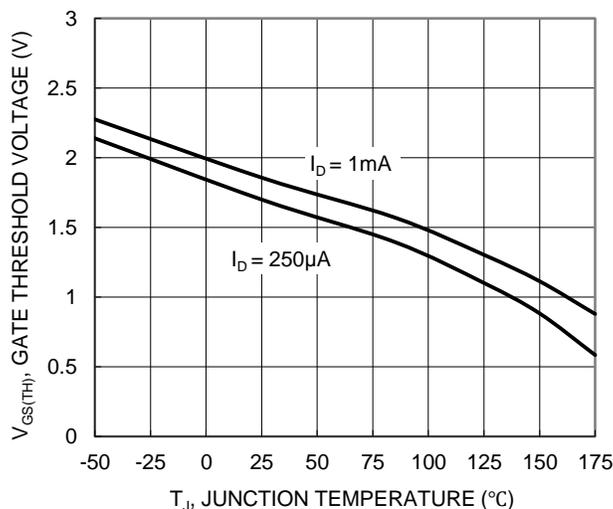


Figure 8. Gate Threshold Variation vs. Temperature

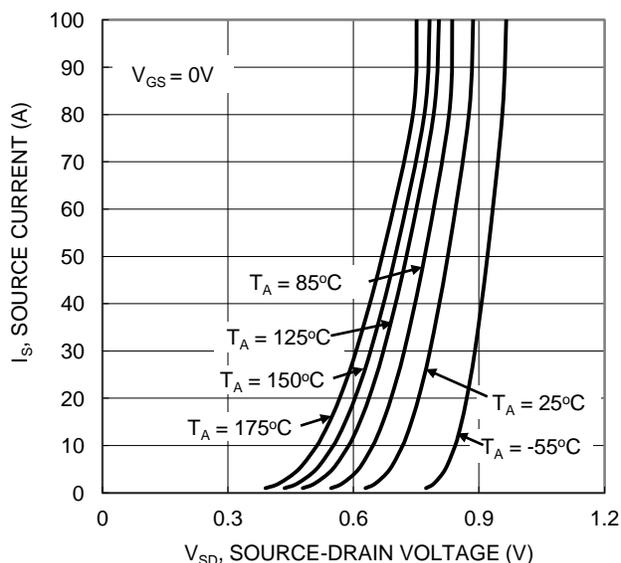


Figure 9. Diode Forward Voltage vs. Current

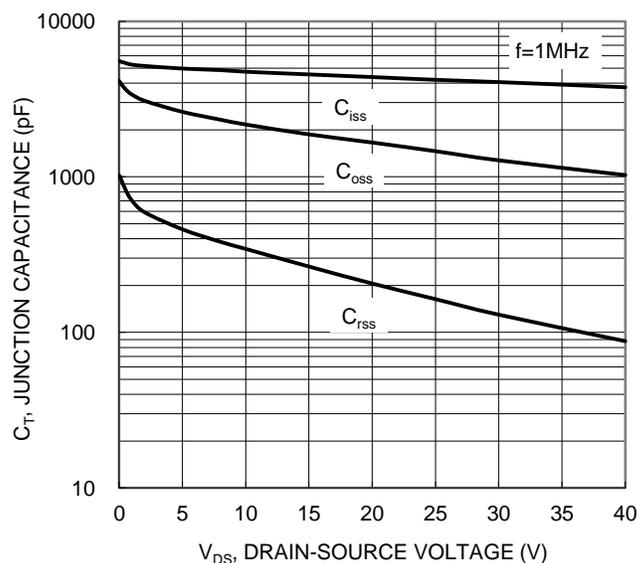


Figure 10. Typical Junction Capacitance

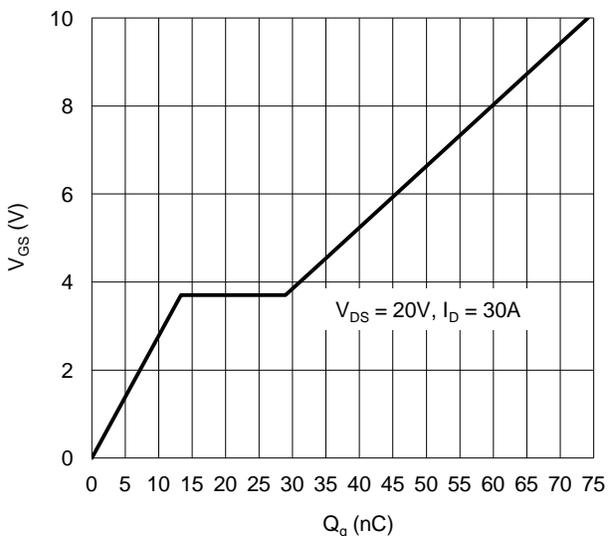


Figure 11. Gate Charge

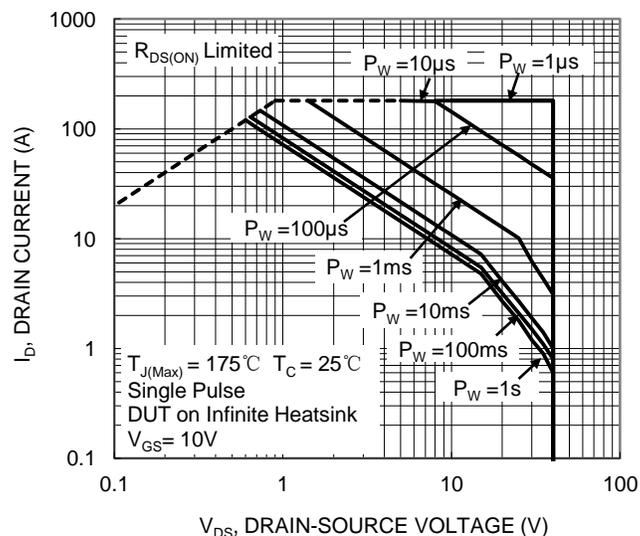


Figure 12. SOA, Safe Operation Area

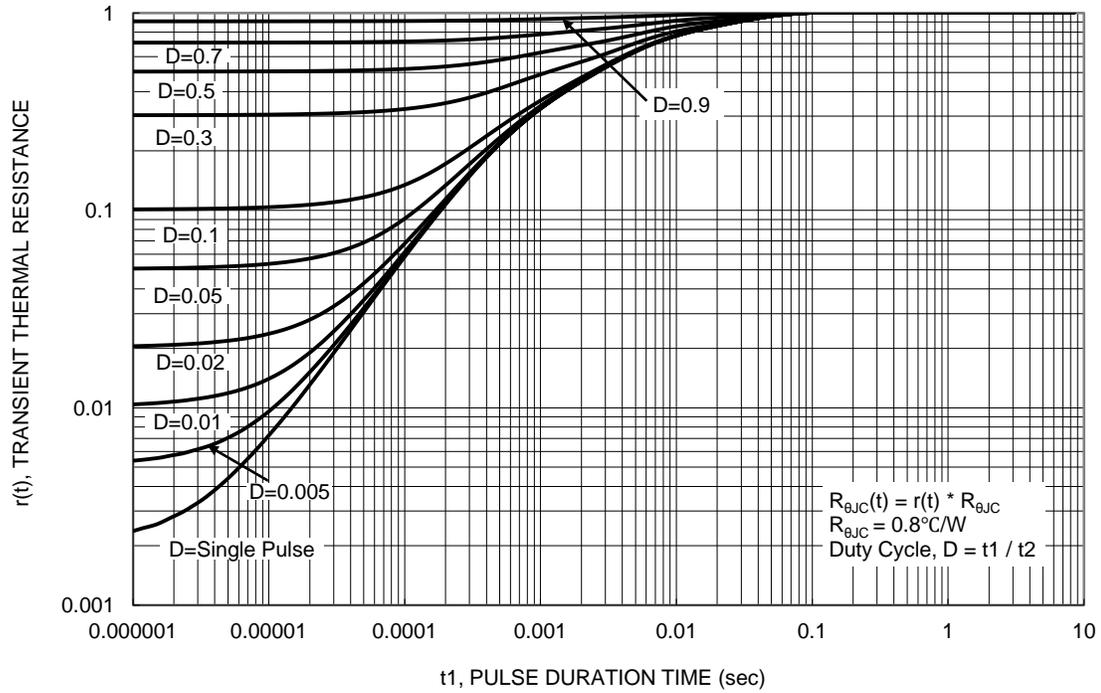
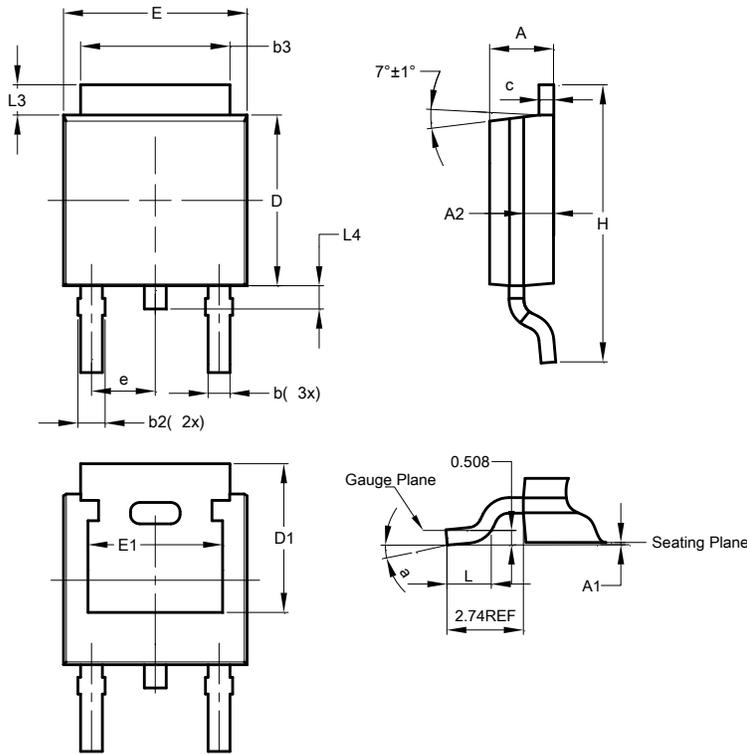


Figure 13. Transient Thermal Resistance

### Package Outline Dimensions

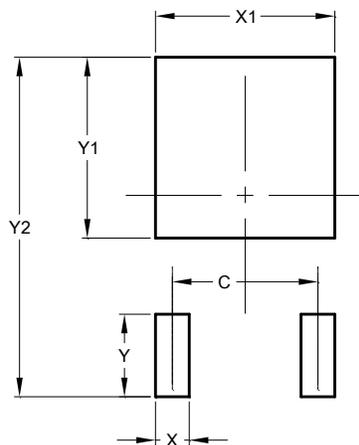
TO252 (DPAK)



TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	-
All Dimensions in mm			

### Suggested Pad Layout

TO252 (DPAK)



Dimensions	Value (in mm)
C	4.572
X	1.060
X1	5.632
Y	2.600
Y1	5.700
Y2	10.700