



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

$BV_{DSS}$	$R_{DS(ON)}$ Max	$Q_G$ Typ	$I_D$ Max $T_C = +25^\circ C$ (Note 10)
60V	3.8m $\Omega$ @ $V_{GS} = 10V$	95.4nC	100A

## Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low  $R_{DS(ON)}$  – Minimizes Power Losses
- Low  $Q_G$  – 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

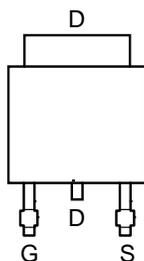
## Mechanical Data

- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.33 grams (Approximate)

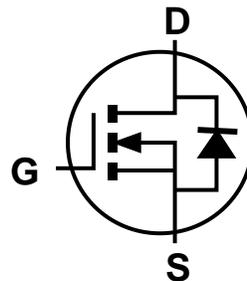
TO252 (DPAK)



Top View



Top View Pin Out



Internal Schematic

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

Characteristic	Symbol	Value	Unit	
Drain-Source Voltage	$V_{DSS}$	60	V	
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V	
Continuous Drain Current (Note 7)	$I_D$	$T_C = +25^\circ\text{C}$ (Note 10)	100	A
		$T_C = +100^\circ\text{C}$	75	
Maximum Body Diode Forward Current (Note 7)	$I_S$	100	A	
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)	$I_{DM}$	150	A	
Avalanche Current, $L = 0.2\text{mH}$	$I_{AS}$	45	A	
Avalanche Energy, $L = 0.2\text{mH}$	$E_{AS}$	200	mJ	

**Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 6)	$P_D$	3.9	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	38	$^\circ\text{C/W}$
Total Power Dissipation (Note 7)	$P_D$	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	$BV_{DSS}$	60	—	—	V	$V_{GS} = 0\text{V}, I_D = 1\text{mA}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$
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	$V_{GS(TH)}$	2	—	4	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	3	3.8	m $\Omega$	$V_{GS} = 10\text{V}, I_D = 90\text{A}$
Diode Forward Voltage	$V_{SD}$	—	0.9	1.2	V	$V_{GS} = 0\text{V}, I_S = 20\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	$C_{ISS}$	—	4,556	—	pF	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Output Capacitance	$C_{OSS}$	—	1,383	—		
Reverse Transfer Capacitance	$C_{RSS}$	—	105.2	—		
Gate Resistance	$R_G$	—	0.66	—	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge	$Q_G$	—	95.4	—	nC	$V_{DS} = 30\text{V}, I_D = 90\text{A}, V_{GS} = 10\text{V}$
Gate-Source Charge	$Q_{GS}$	—	21.6	—		
Gate-Drain Charge	$Q_{GD}$	—	20.4	—		
Turn-On Delay Time	$t_{D(ON)}$	—	13.2	—	ns	$V_{DD} = 30\text{V}, V_{GS} = 10\text{V}, I_D = 90\text{A}, R_G = 3.5\Omega$
Turn-On Rise Time	$t_R$	—	11.7	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	31	—		
Turn-Off Fall Time	$t_F$	—	12	—		
Body Diode Reverse Recovery Time	$t_{RR}$	—	50.5	—	ns	$I_F = 50\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	80.8	—	nC	

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper pad layout.
  - Thermal resistance from junction to soldering point (on the exposed drain pad).
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.
  - Package limited.

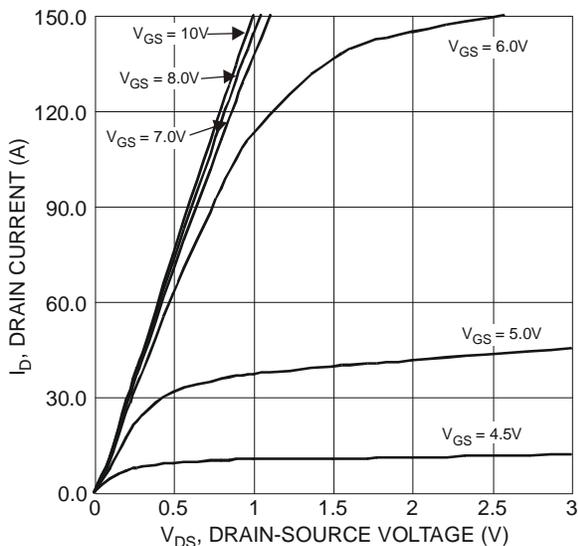


Figure 1 Typical Output Characteristics

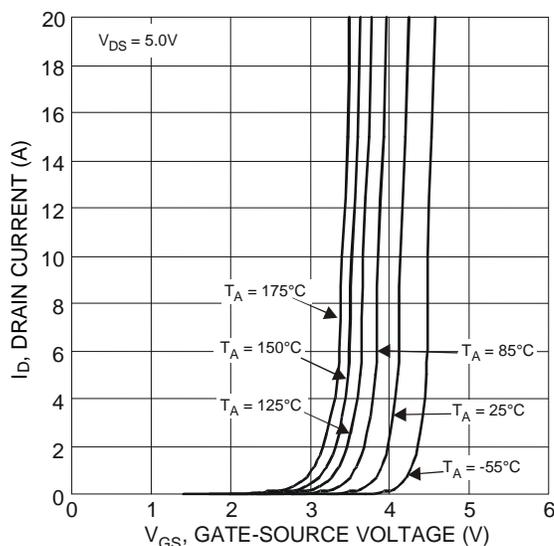


Figure 2 Typical Transfer Characteristics

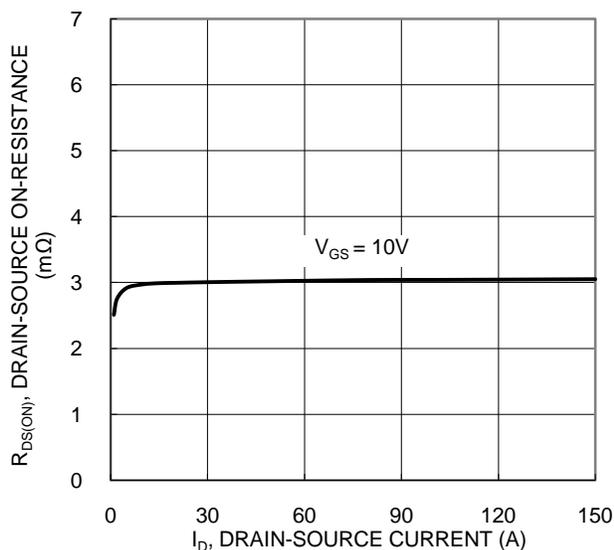


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

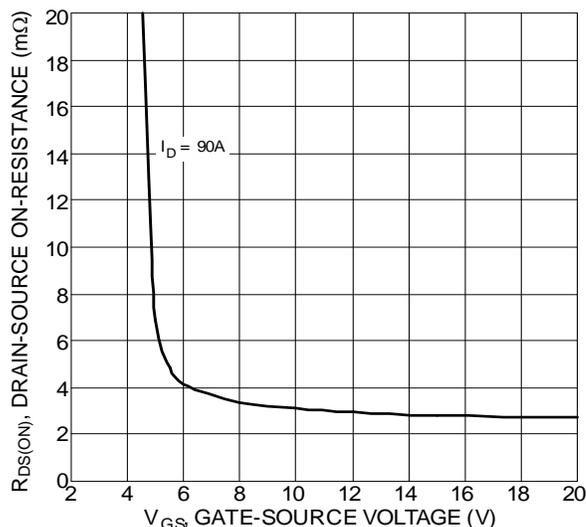


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

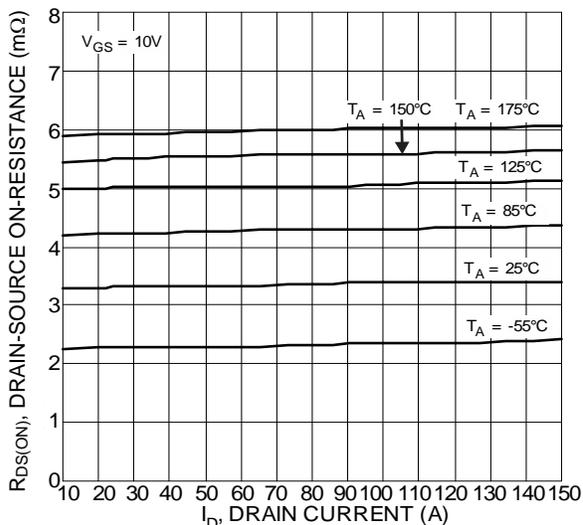


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

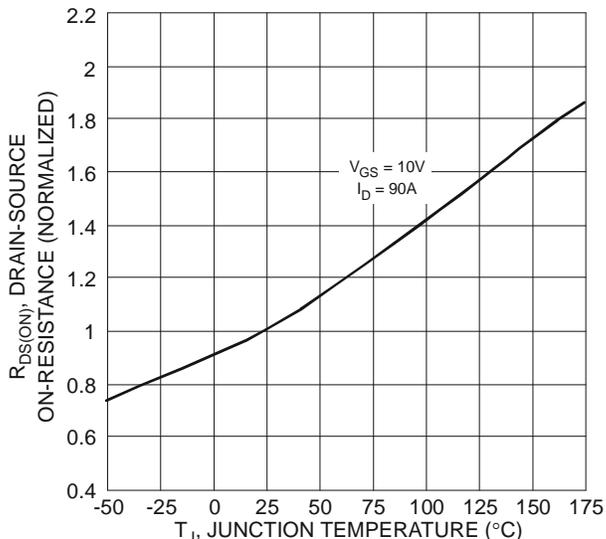
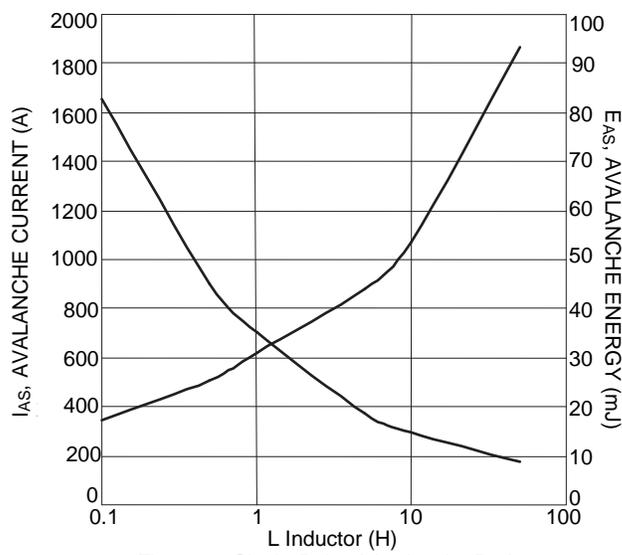
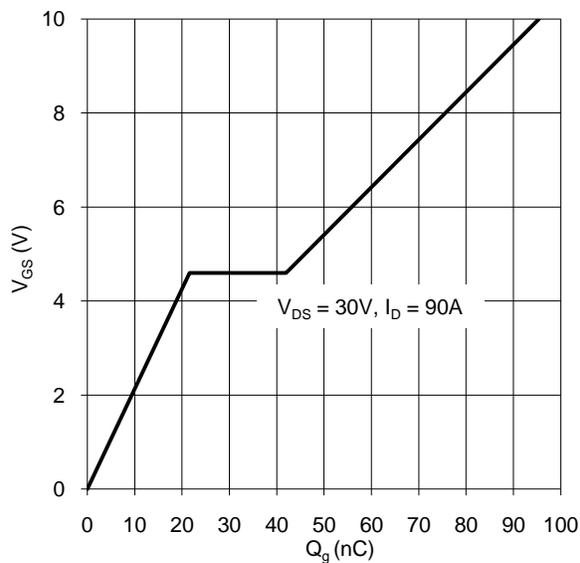
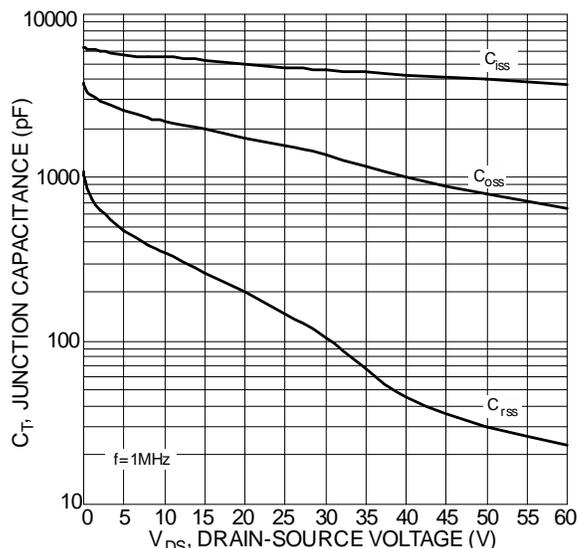
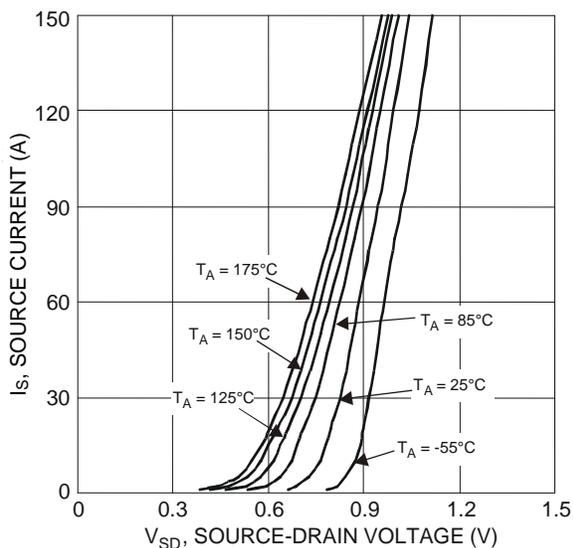
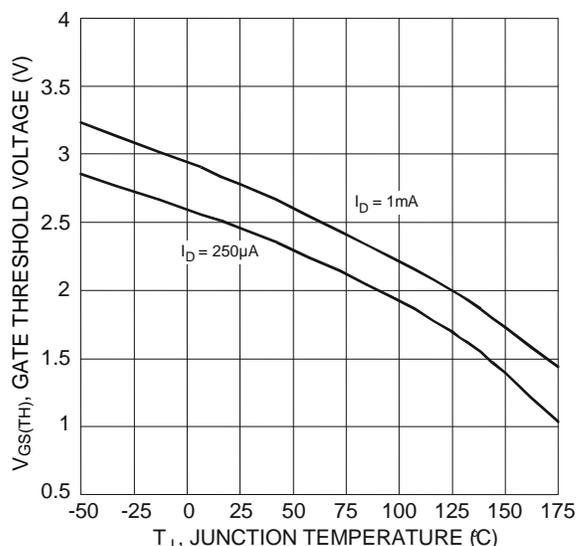
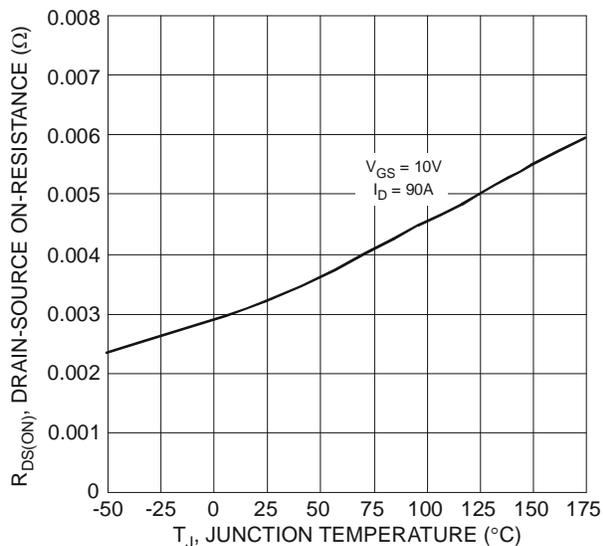


Figure 6 On-Resistance Variation with Temperature



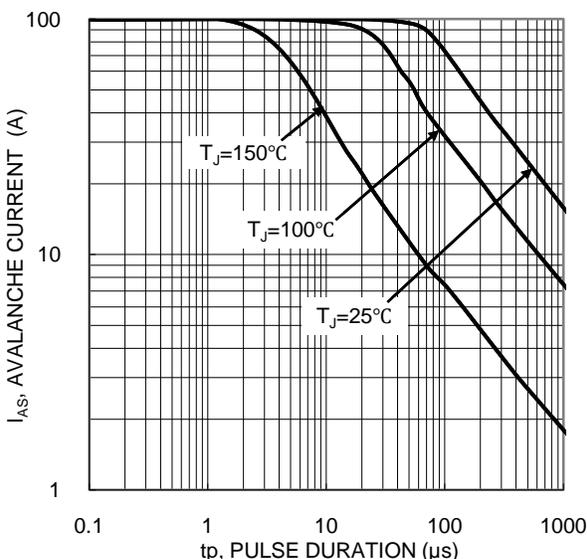


Figure 13 Avalanche Current vs. Pulse Duration

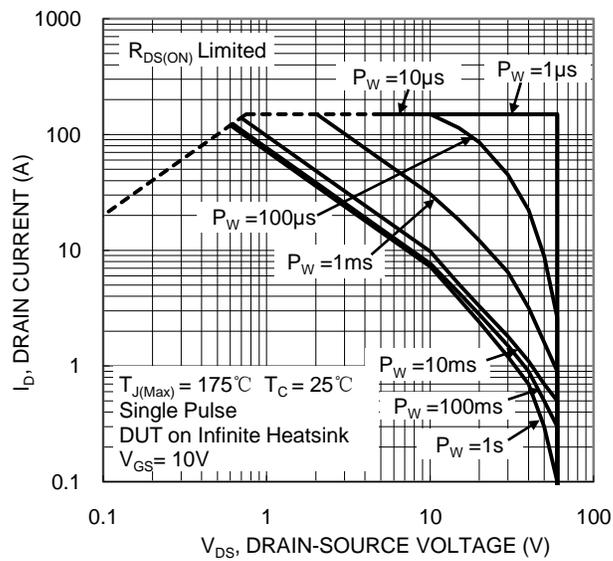


Figure 14 SOA, Safe Operation Area

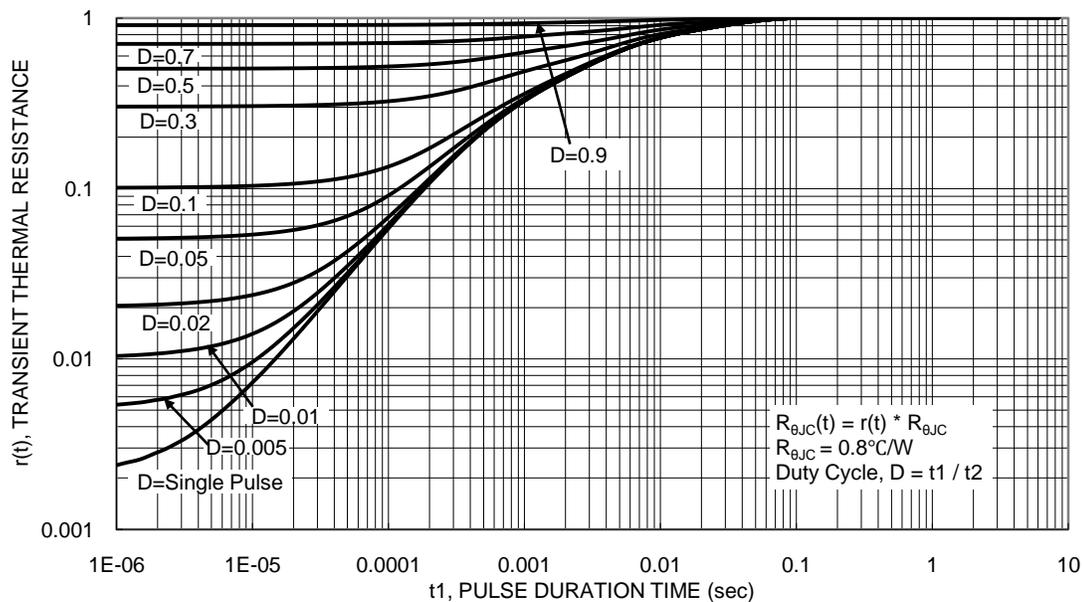
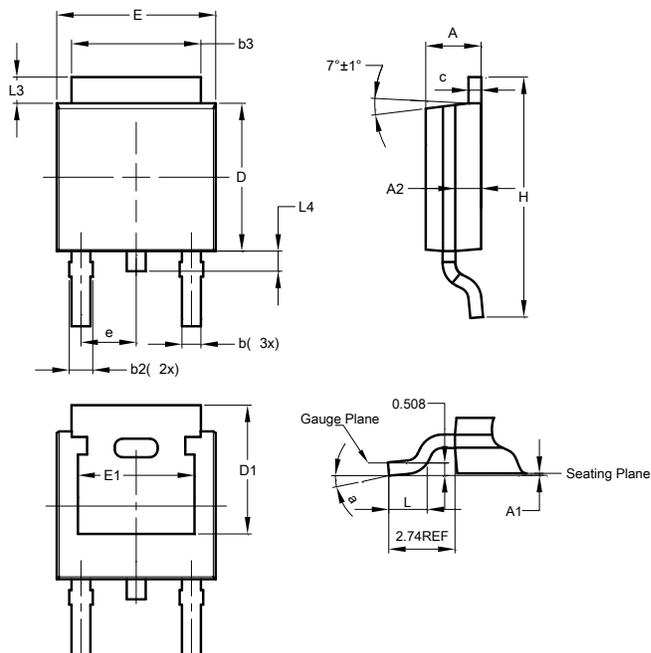


Figure 15 Transient Thermal Resistance

### Package Outline Dimensions

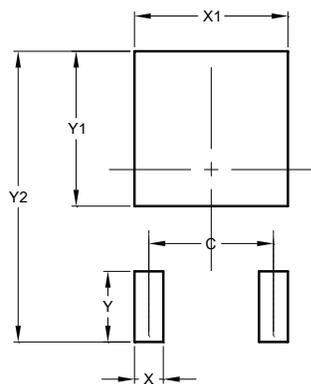
TO252 (DPAK)



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