



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	I _D Max T _C = +25°C
60V	17mΩ @ V _{GS} = 10V	46.9A
	24mΩ @ V _{GS} = 4.5V	38.3A

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)} – Ensures On State Losses Are Minimized
- Excellent Q_{gd} x R_{DS(ON)} Product (FOM)

Description and Applications

This new generation MOSFET is designed to minimize the on-state resistance (R_{DS(ON)}) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

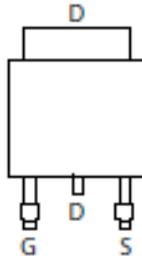
- Power Management Functions
- DC-DC Converters
- Backlighting

Mechanical Data

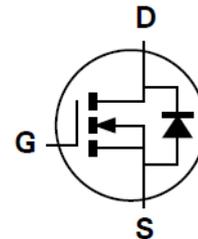
- Case: TO252 (DPAK)
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 
- Weight: 0.33 grams (Approximate)



Top View



Pin Out Top View



Equivalent Circuit

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

Characteristic	Symbol	Value	Unit	
Drain-Source Voltage	V_{DSS}	60	V	
Gate-Source Voltage	V_{GSS}	± 20	V	
Continuous Drain Current (Note 5) $V_{GS} = 10\text{V}$	I_D	$T_A = +25^\circ\text{C}$ $T_A = +100^\circ\text{C}$	10.8 7.6	A
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$		$T_C = +25^\circ\text{C}$ $T_C = +100^\circ\text{C}$	46.9 33.2	A
Maximum Continuous Body Diode Forward Current (Note 6)	I_S	50	A	
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)	I_{DM}	70	A	
Avalanche Current, $L=0.1\text{mH}$	I_{AS}	15.3	A	
Avalanche Energy, $L=0.1\text{mH}$	E_{AS}	11.7	mJ	

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

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P_D	3.2	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	47	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)	P_D	60	W
Thermal Resistance, Junction to Case (Note 6)	$R_{\theta JC}$	2.5	$^\circ\text{C/W}$
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
OFF CHARACTERISTICS (Note 7)						
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	μA	$V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	-	-	± 100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	-	3	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	-	11	17	m Ω	$V_{GS} = 10\text{V}, I_D = 10\text{A}$
		-	16	24	m Ω	$V_{GS} = 4.5\text{V}, I_D = 6\text{A}$
Diode Forward Voltage	V_{SD}	-	0.9	1.2	V	$V_{GS} = 0\text{V}, I_S = 1\text{A}$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	-	864	-	pF	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Output Capacitance	C_{oss}	-	282	-		
Reverse Transfer Capacitance	C_{rss}	-	27.1	-		
Gate Resistance	R_g	-	1.35	-	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ($V_{GS} = 10\text{V}$)	Q_g	-	17	-	nC	$V_{DS} = 30\text{V}, I_D = 10\text{A}$
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_g	-	8.4	-		
Gate-Source Charge	Q_{gs}	-	3.1	-		
Gate-Drain Charge	Q_{gd}	-	4.3	-		
Turn-On Delay Time	$t_{D(ON)}$	-	3.4	-	ns	$V_{DD} = 30\text{V}, V_{GS} = 10\text{V}, R_G = 6\Omega, I_D = 10\text{A}$
Turn-On Rise Time	t_R	-	5.2	-		
Turn-Off Delay Time	$t_{D(OFF)}$	-	12.9	-		
Turn-Off Fall Time	t_F	-	6.8	-		
Body Diode Reverse Recovery Time	t_{RR}	-	22	-	ns	$I_F = 10\text{A}, di/dt = 400\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{RR}	-	11.1	-	nC	

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper pad layout.
 - Device mounted on infinite heat sink and measured by thermal couple attached on bottom heat sink of package.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

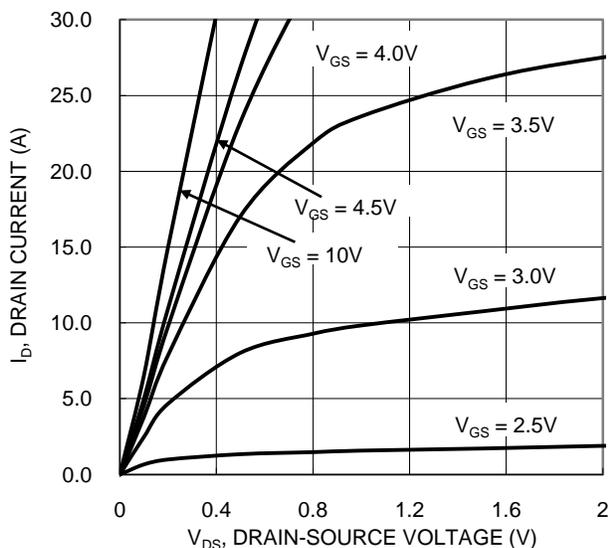


Figure 1. Typical Output Characteristic

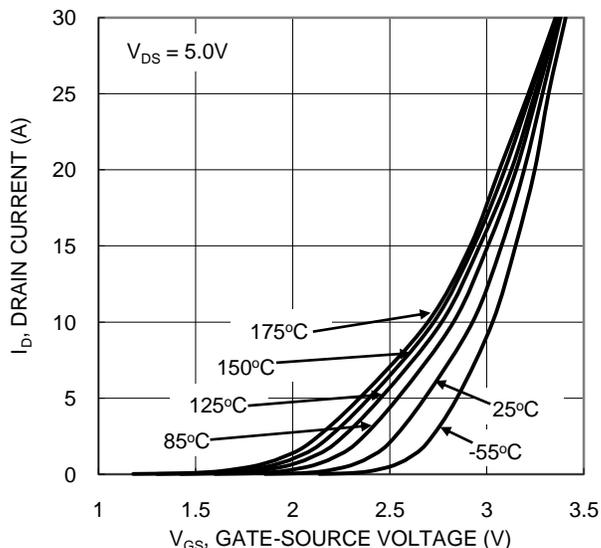


Figure 2. Typical Transfer Characteristic

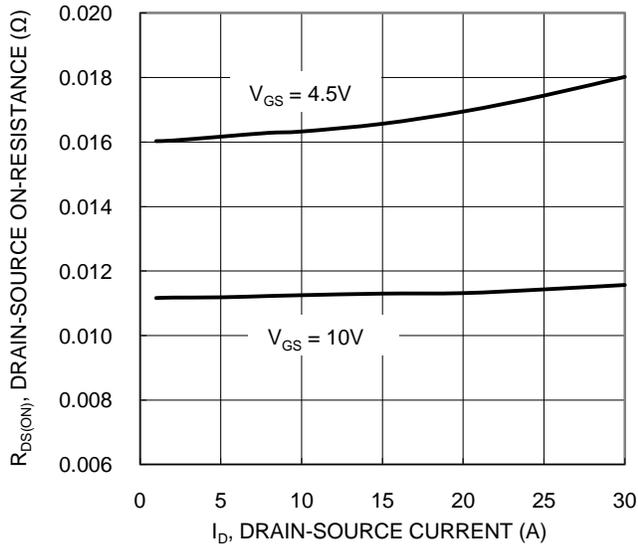


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

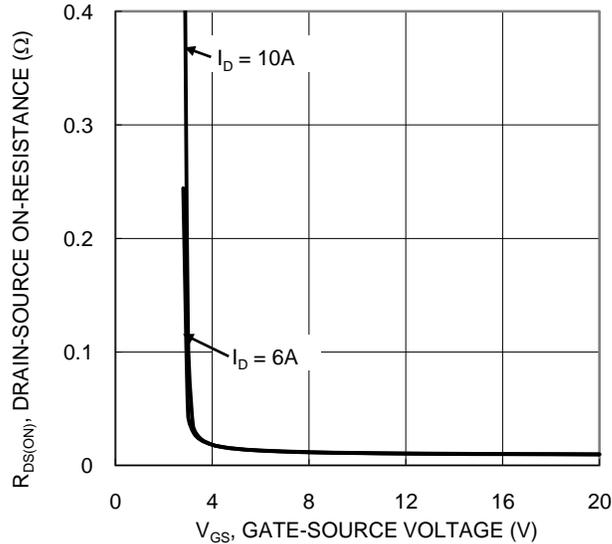


Figure 4. Typical Transfer Characteristic

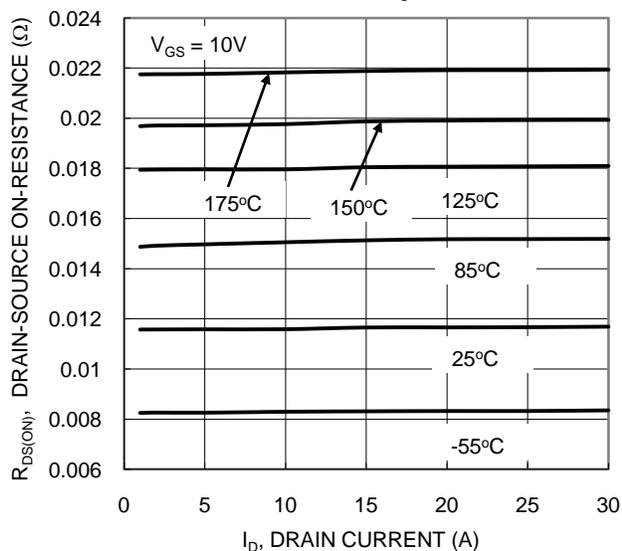


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

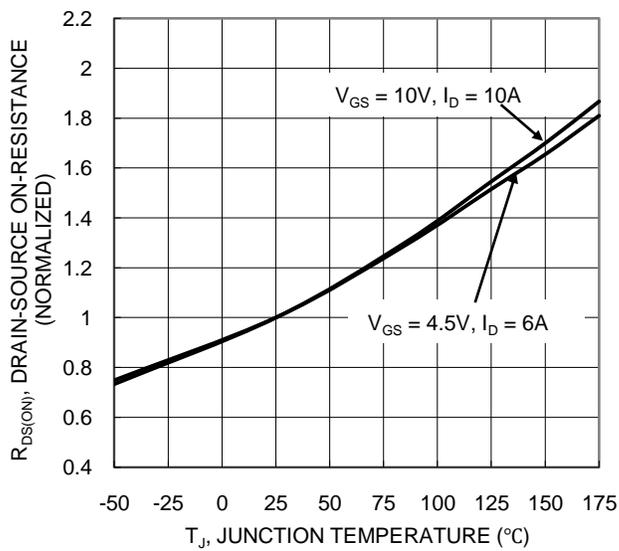


Figure 6. On-Resistance Variation with Temperature

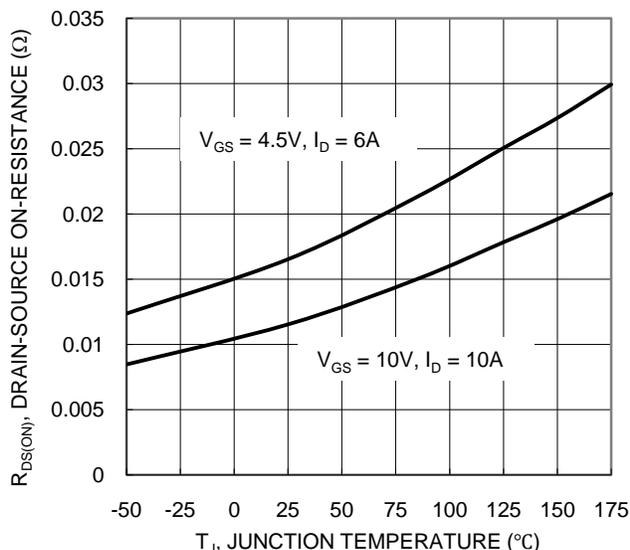


Figure 7. On-Resistance Variation with Temperature

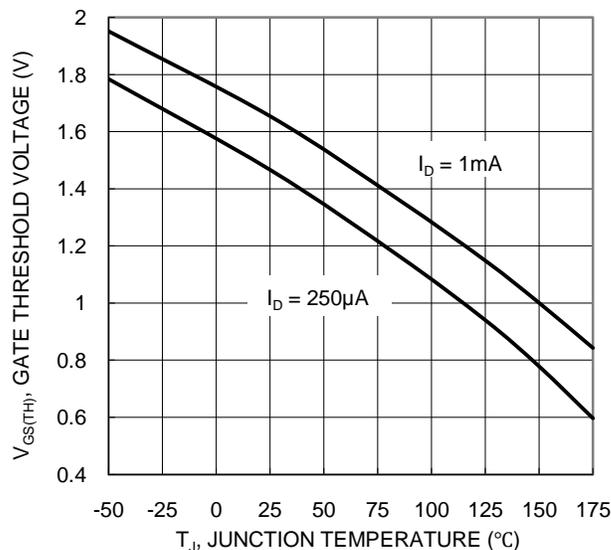


Figure 8. Gate Threshold Variation vs. Temperature

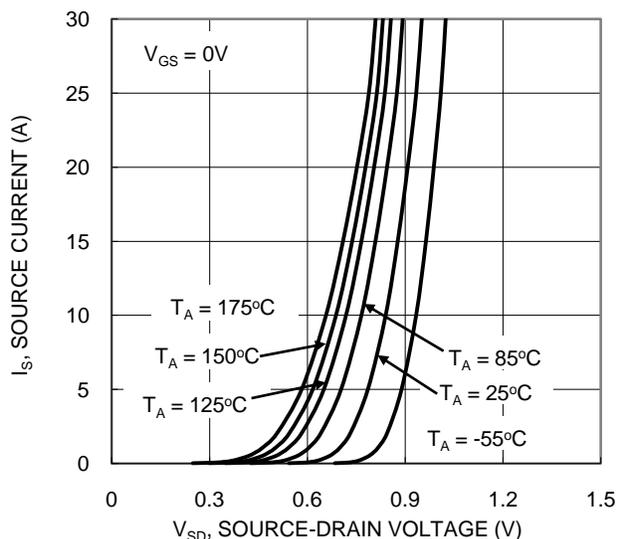


Figure 9. Diode Forward Voltage vs. Current

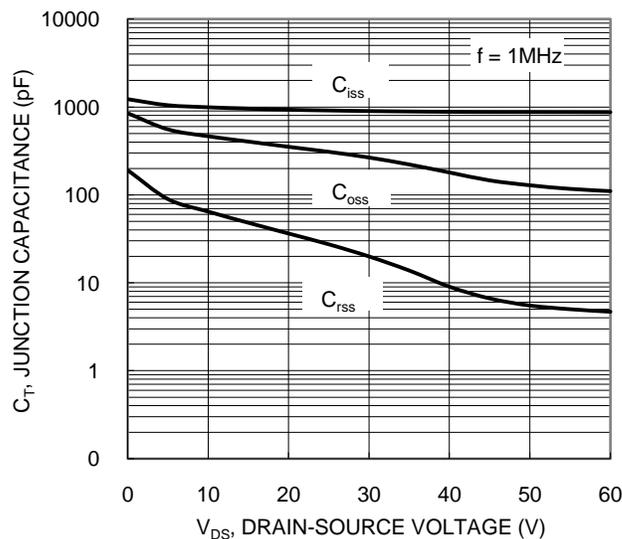


Figure 10. Typical Junction Capacitance

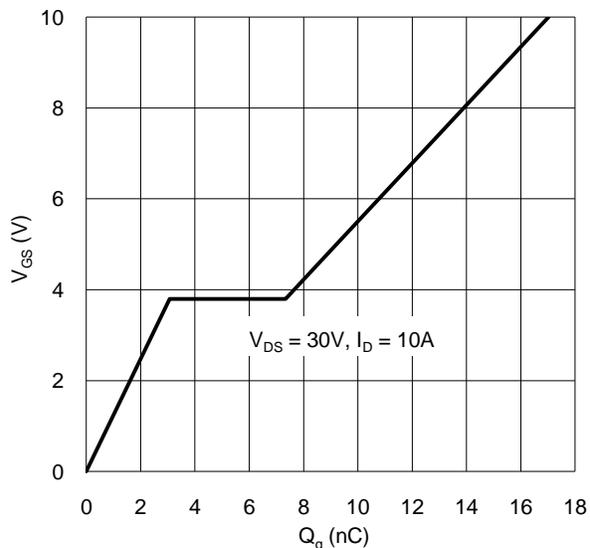


Figure 11. Gate Charge

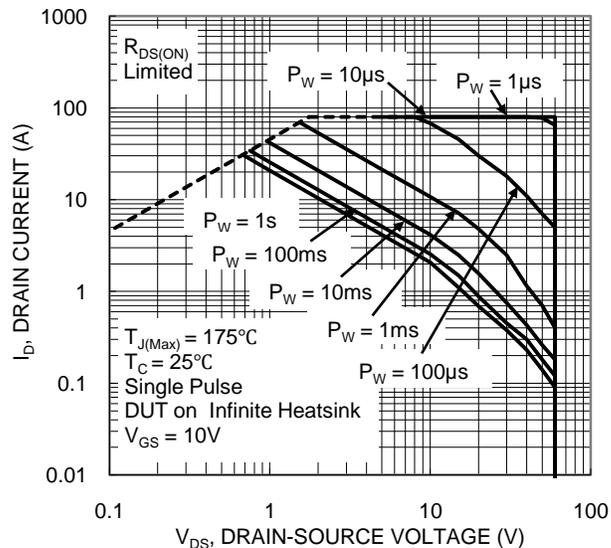


Figure 12. SOA, Safe Operation Area

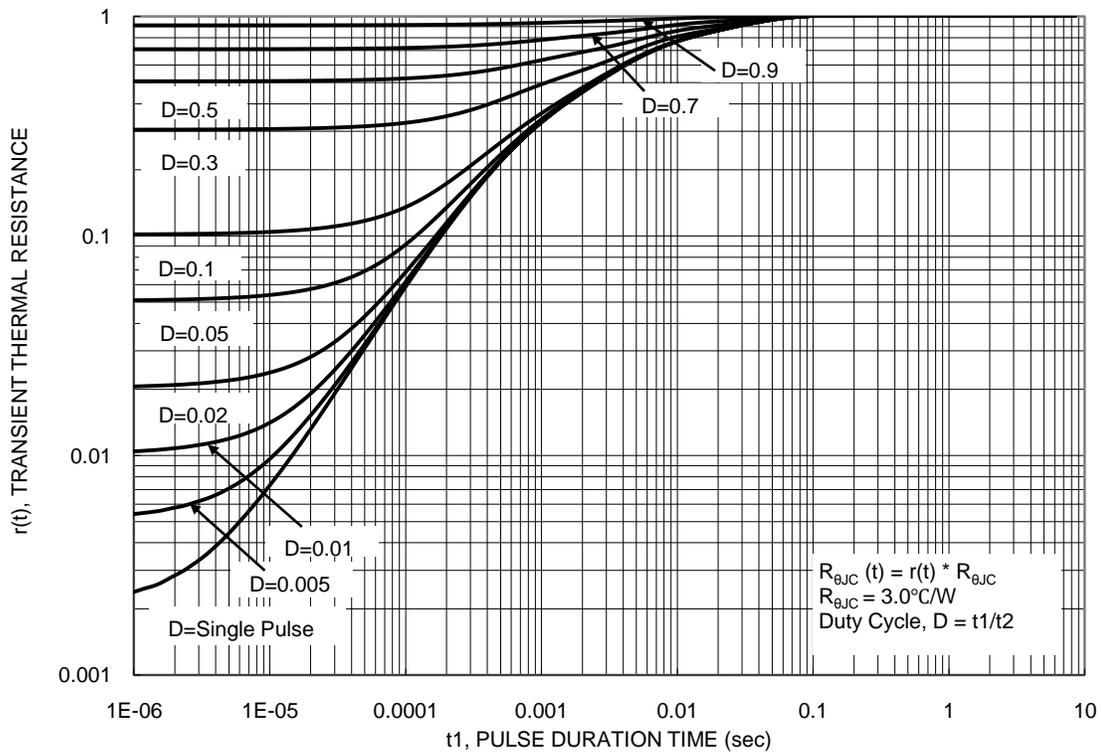
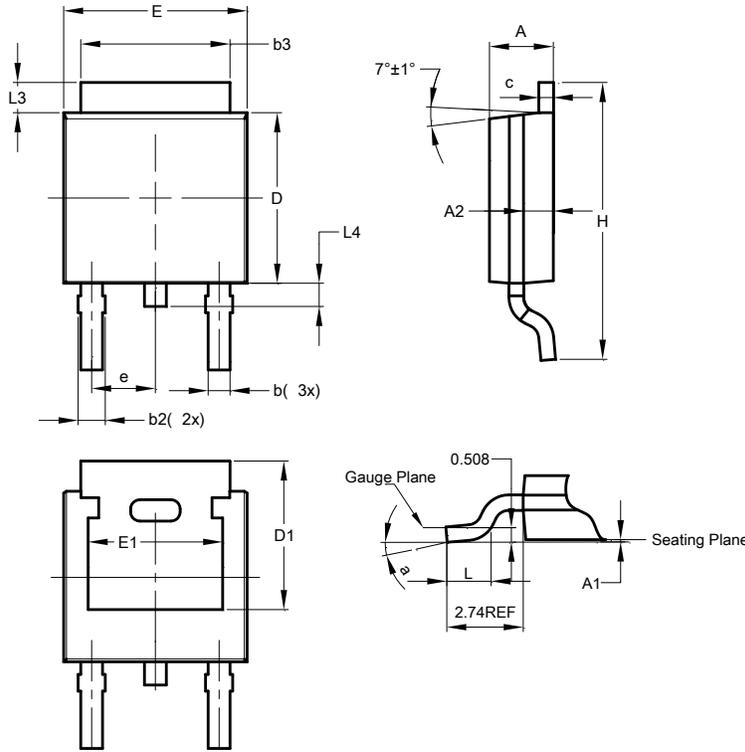


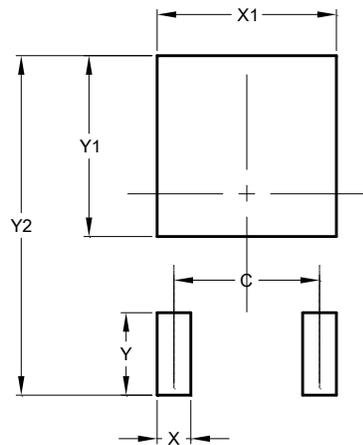
Figure 13. Transient Thermal Resistance

Package Outline Dimensions



TO252 (DPAK)			
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



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