优尚

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}	$R_{DS(ON)}$	I_D T_A = +25°C
60V	68mΩ @ V_{GS} = 10V	8.5A
	100mΩ @ V_{GS} = 4.5V	7.0A

Features and Benefits

- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low On-Resistance
- Fast Switching Speed

Description and Applications

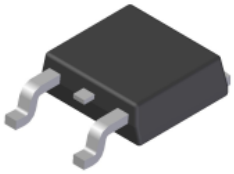
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

- Motor controls
- Transformer driving switches
- DC-DC converters
- Power-management functions
- Uninterrupted power supplies

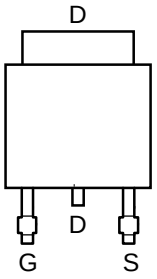
Mechanical Data

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

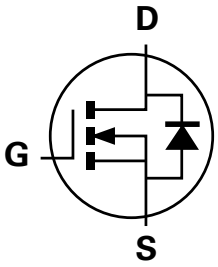
TO252 (DPAK)



Top View



Pin Out — Top View



Equivalent Circuit

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

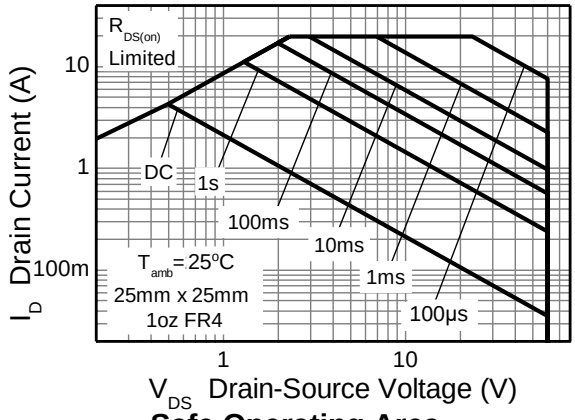
Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	60	V
Gate-Source Voltage		(Note 5)	V_{GS}	±20	V
Single Pulsed Avalanche Energy		(Note 11)	E_{AS}	37.5	mJ
Single Pulsed Avalanche Current		(Note 11)	I_{AS}	5.0	A
Continuous Drain Current	V_{GS} = 10V	(Note 7)	I_D	8.5	A
		T_A = +70°C (Note 7)		6.8	
		(Note 6)		6.0	
		T_C = +25°C (Note 12)		20	
Pulsed Drain Current	V_{GS} = 10V	(Note 8)	I_{DM}	22.2	A
Continuous Source Current (Body Diode)		(Note 7)	I_S	10.2	A
Pulsed Source Current (Body Diode)		(Note 8)	I_{SM}	22.2	A

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

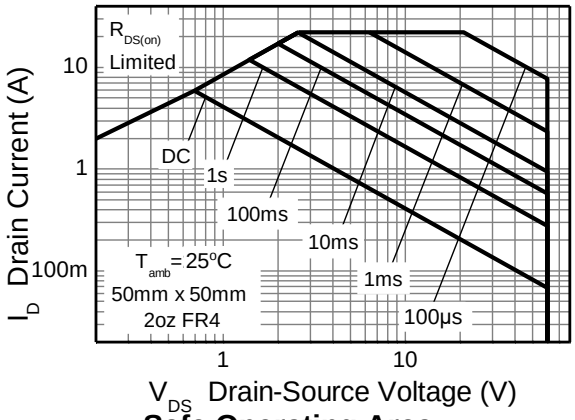
Characteristic		Symbol	Value	Unit
Power Dissipation Linear Derating Factor	(Note 6)	P_D Linear Derating Factor	4.12 33	W mW/°C
	(Note 7)		8.49 67.9	W mW/°C
	(Note 9)		2.12 16.9	W mW/°C
Power Dissipation	T_C = +25°C (Note 12)	P_D	41	W
Thermal Resistance, Junction to Ambient	(Note 6)	$R_{\theta JA}$	30.3	°C/W
	(Note 7)		14.7	
	(Note 9)		59.0	
Thermal Resistance, Junction to Lead	(Note 10)	$R_{\theta JL}$	3.09	
Thermal Resistance, Junction to Case	(Note 12)	$R_{\theta JC}$	3.03	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes:
5. AEC-Q101 V_{GS} maximum is ±16V.
6. For a device surface mounted on 50mm × 50mm × 1.6mm FR4 PCB with high coverage of single-sided 2oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
7. Same as note 6 except the device is measured at t ≤ 10 sec.
8. Same as note 6 except the device is pulsed with D = 0.02 and pulse width 300μs. The pulse current is limited by the maximum junction temperature.
9. For a device surface mounted on 25mm × 25mm × 1.6mm FR4 PCB with high coverage of single-sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
10. Thermal resistance from junction to solder-point (at the end of the drain lead).
11. UIS in production with L = 3.0mH, I_{AS} = 5.0A, R_G = 25Ω, V_{DD} = 50V, starting T_J = +25°C.
12. Thermal resistance from junction to soldering point (on the exposed drain pad).

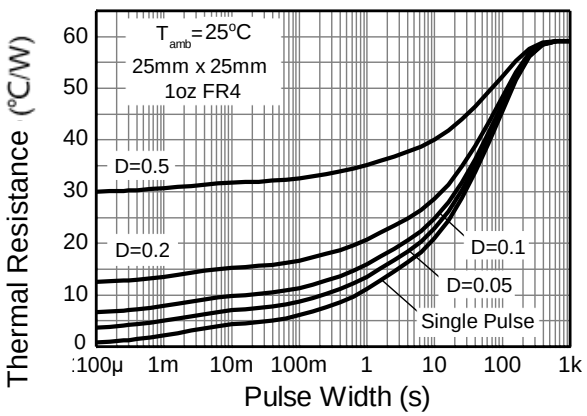
Thermal Characteristics



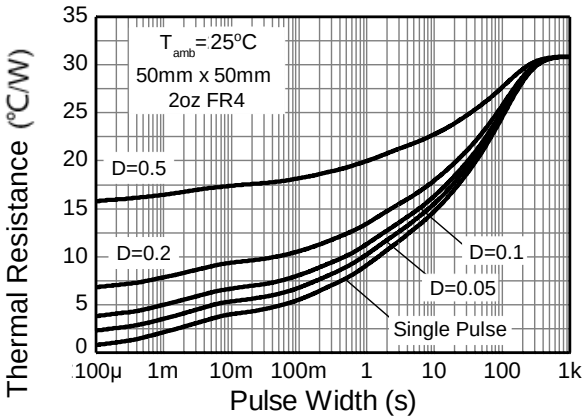
Safe Operating Area



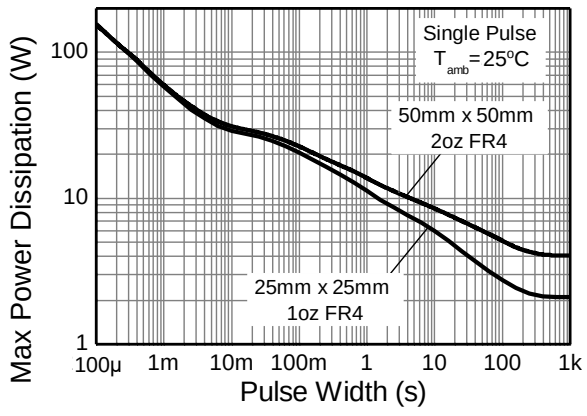
Safe Operating Area



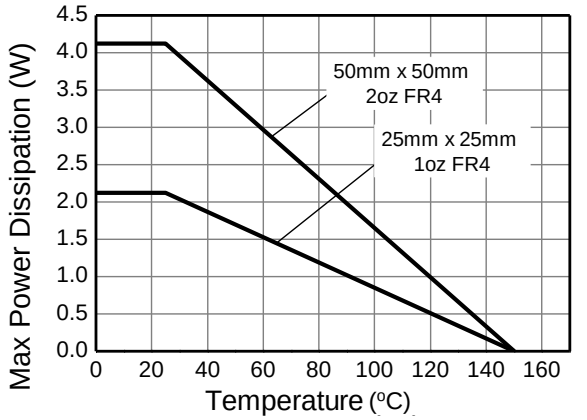
Transient Thermal Impedance



Transient Thermal Impedance



Pulse Power Dissipation



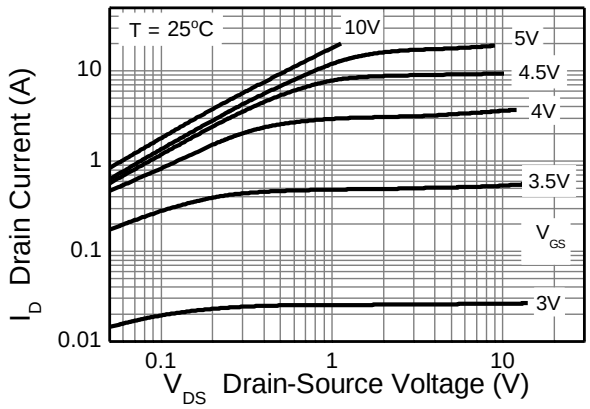
Derating Curve

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

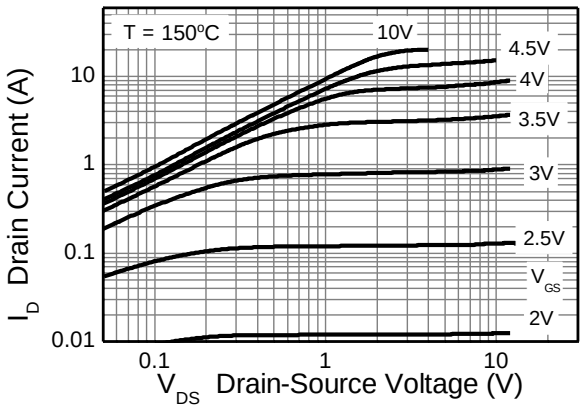
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	I_D = 250μA, V_{GS} = 0V
Zero Gate Voltage Drain Current	I_{DSS}	—	—	0.5	μA	V_{DS} = 60V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	1.0	—	3.0	V	I_D = 250μA, V_{DS} = V_{GS}
Static Drain-Source On-Resistance (Note 13)	$R_{DS\ (ON)}$	—	—	0.068	Ω	V_{GS} = 10V, I_D = 12A
				0.100		V_{GS} = 4.5V, I_D = 6A
Forward Transconductance (Notes 13 & 14)	g_{fs}	—	19.7	—	S	V_{DS} = 15V, I_D = 12A
Diode Forward Voltage (Note 13)	V_{SD}	—	0.98	1.15	V	I_S = 12A, V_{GS} = 0V
Reverse recovery time (Note 14)	t_{RR}	—	145	—	ns	I_S = 12A, di/dt = 100A/μs
Reverse recovery charge (Note 14)	Q_{RR}	—	929	—	nC	
DYNAMIC CHARACTERISTICS (Note 14)						
Input Capacitance	C_{iss}	—	502	—	pF	V_{DS} = 30V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	45.7	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	27.1	—	pF	
Total Gate Charge	Q_g	—	5.55	—	nC	V_{GS} = 4.5V; V_{DS} = 30V, I_D = 12A
Total Gate Charge	Q_g	—	10.3	—	nC	V_{GS} = 10V; V_{DS} = 30V, I_D = 12A
Gate-Source Charge	Q_{gs}	—	1.6	—	nC	V_{GS} = 10V; V_{DS} = 30V, I_D = 12A
Gate-Drain Charge	Q_{gd}	—	3.5	—	nC	V_{GS} = 10V; V_{DS} = 30V, I_D = 12A
Turn-On Delay Time (Note 15)	$t_{D(ON)}$	—	3.6	—	ns	V_{DD} = 30V, V_{GS} = 10V I_D = 12A, $R_G \cong$ 6.0Ω
Turn-On Rise Time (Note 15)	t_R	—	10.8	—	ns	
Turn-Off Delay Time (Note 15)	$t_{D(OFF)}$	—	11.9	—	ns	
Turn-Off Fall Time (Note 15)	t_F	—	8.7	—	ns	

Notes: 13. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%.
14. For design aid only, not subject to production testing.
15. Switching characteristics are independent of operating junction temperatures.

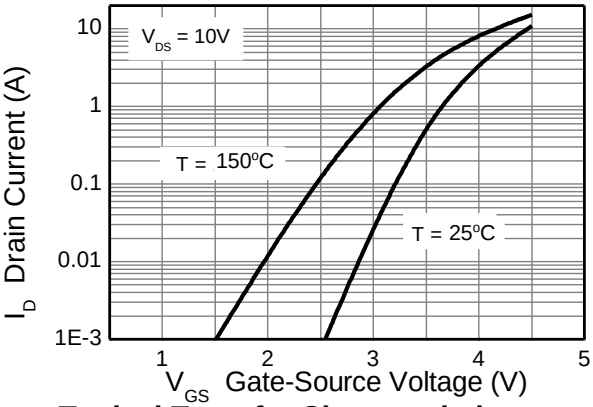
Typical Characteristics



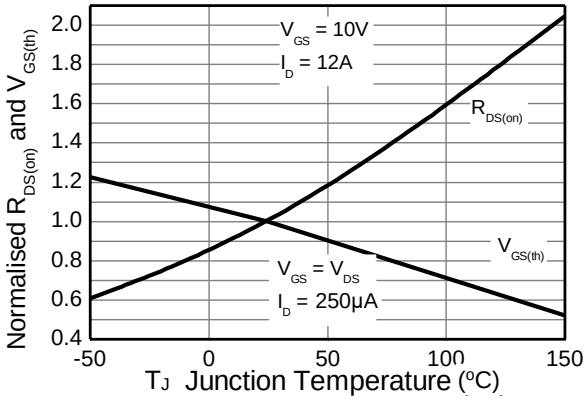
Output Characteristics



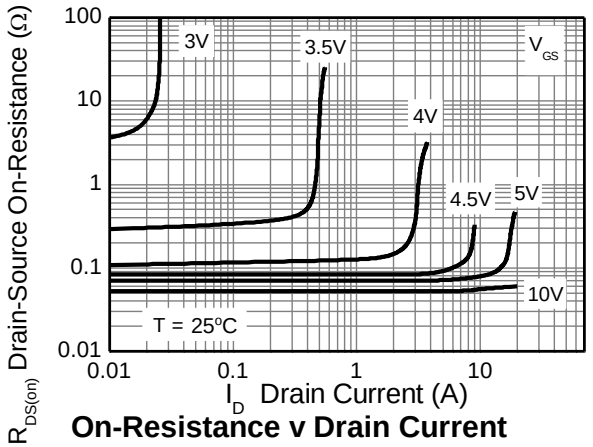
Output Characteristics



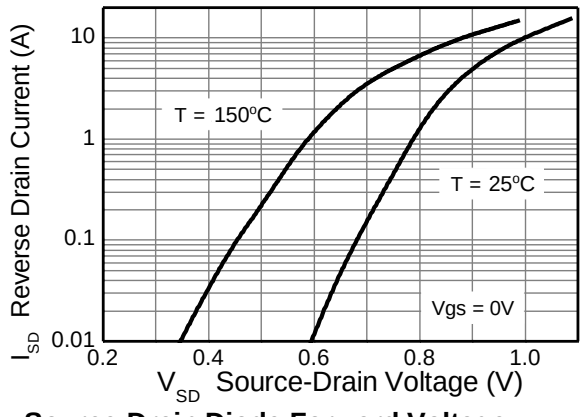
Typical Transfer Characteristics



Normalised Curves v Temperature

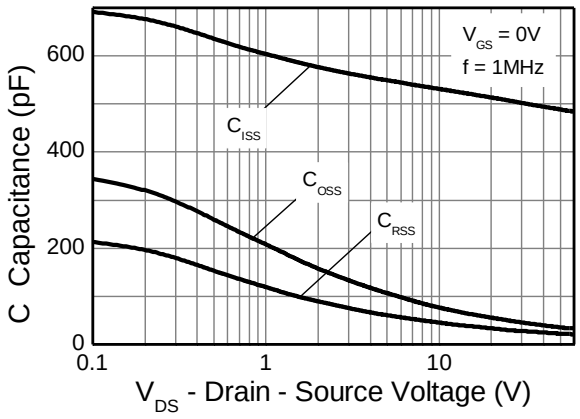


On-Resistance v Drain Current

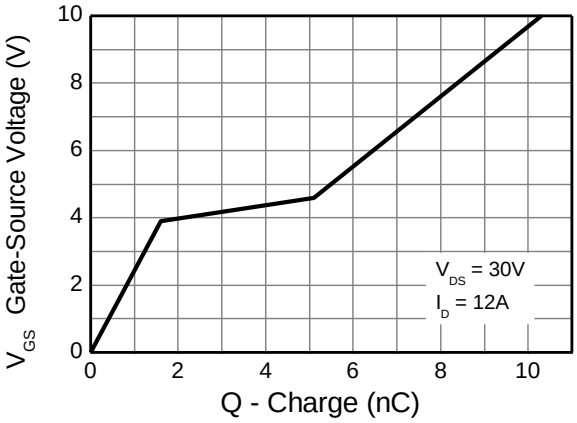


Source-Drain Diode Forward Voltage

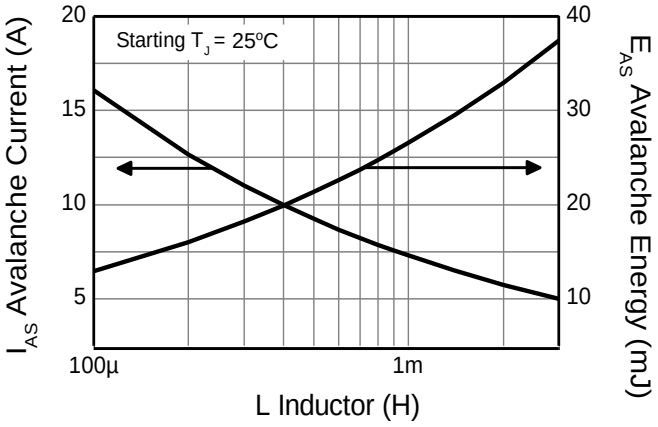
Typical Characteristics (continued)



Capacitance v Drain-Source Voltage

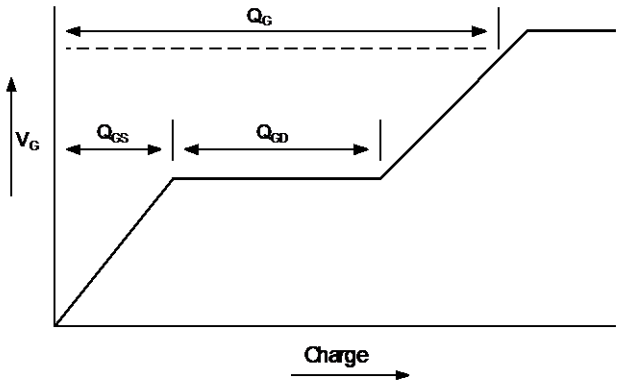


Gate-Source Voltage v Gate Charge

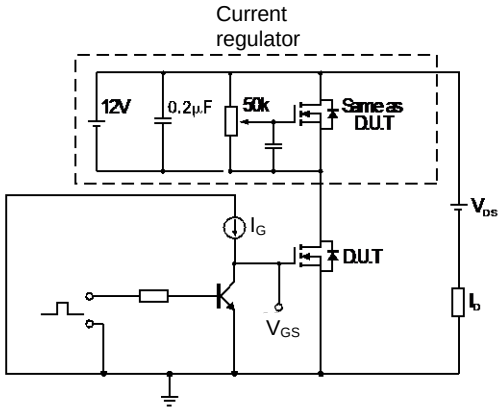


Single-Pulsed Avalanche Rating

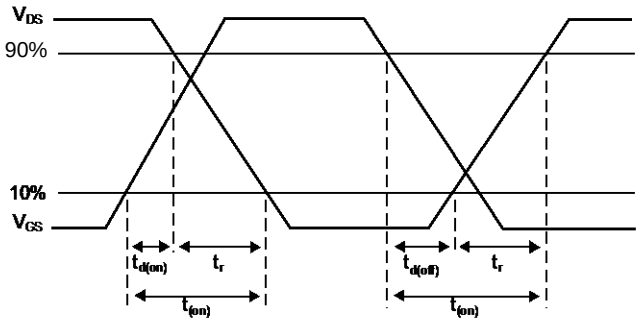
Test Circuits



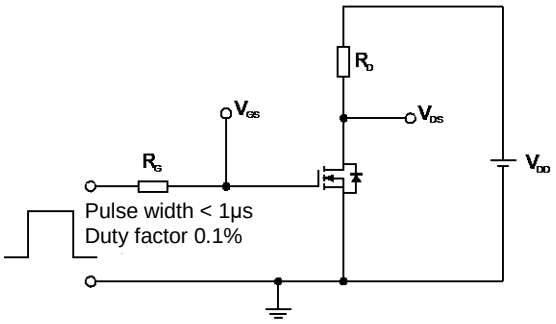
Basic Gate Charge Waveform



Gate Charge Test Circuit



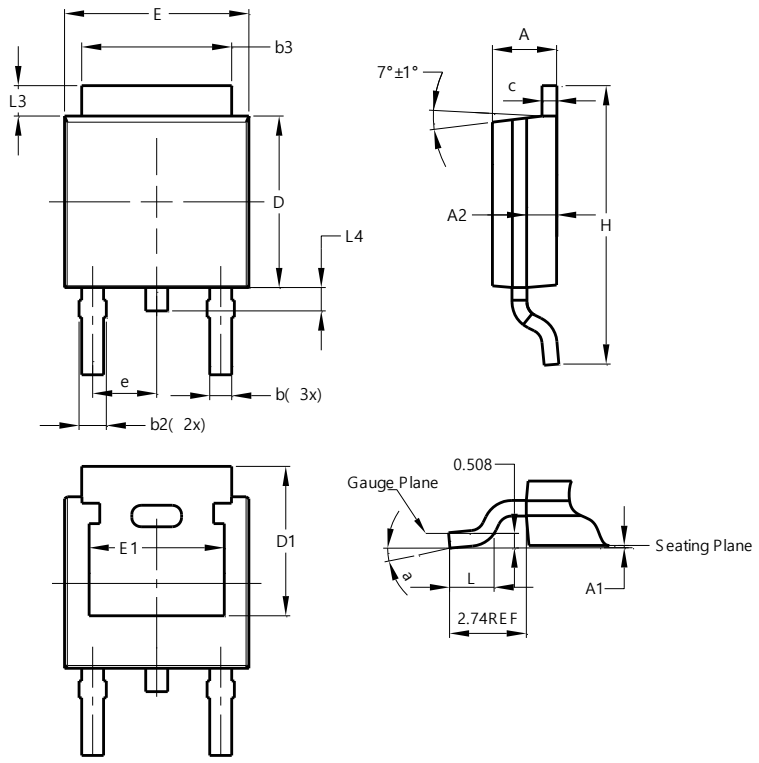
Switching Time Waveforms



Switching Time Test Circuit

Package Outline Dimensions

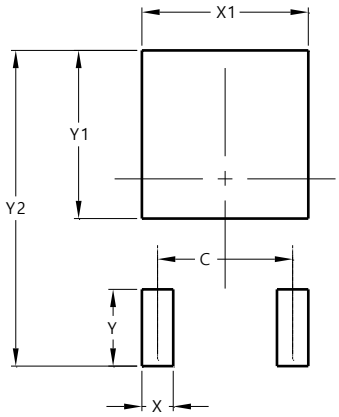
TO252 (DPAK)



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	5.50	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	--	--
e	2.286 BSC		
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