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 T_C = +25°C
-40V	15mΩ @ V_{GS} = -10V	-55A
	23mΩ @ V_{GS} = -4.5V	-50A

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low On-Resistance
- Fast Switching Speed

Description

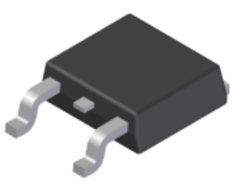
This MOSFET has been designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Reverse polarity protections
- Motor controls
- Power managements

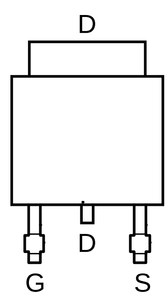
Mechanical Data

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

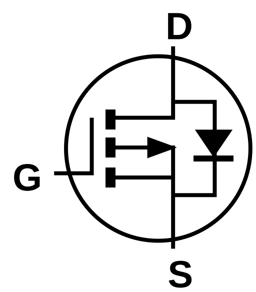
TO252 (DPAK)



Top View



Top View
Pin-Out



Equivalent Circuit

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-40	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 6) V_{GS} = -10V	Steady State	T_C = +25°C T_C = +100°C	I_D	-55 -40	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	-120	A
Maximum Body Diode Forward Current (Note 6)			I_S	-55	A
Pulsed Source Current (10µs Pulse, Duty Cycle = 1%)			I_{SM}	-120	A
Avalanche Current, L = 0.1mH			I_{AS}	-40	A
Avalanche Energy, L = 0.1mH			E_{AS}	69	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)		P_D	2.1	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	71	°C/W
Total Power Dissipation (Note 6)		P_D	3.7	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	41	°C/W
Thermal Resistance, Junction to Case		$R_{\theta JC}$	1.7	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	-40	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1	µA	V_{DS} = -40V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1.0	—	-3.0	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	10	15	mΩ	V_{GS} = -10V, I_D = -10A
		—	15	23		V_{GS} = -4.5V, I_D = -8A
Diode Forward Voltage	V_{SD}	—	-0.7	-1.2	V	V_{GS} = 0V, I_S = -1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	4004	—	pF	V_{DS} = -20V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	309	—		
Reverse Transfer Capacitance	C_{rss}	—	229	—		
Gate Resistance	R_g	—	3.5	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	31	—	nC	V_{DS} = -20V, I_D = -10A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	67	—		
Gate-Source Charge	Q_{gs}	—	13.2	—		
Gate-Drain Charge	Q_{gd}	—	11	—		
Turn-On Delay Time	$t_{D(ON)}$	—	9.9	—	ns	V_{GS} = -10V, V_{DD} = -20V, R_G = 3Ω, I_D = -10A
Turn-On Rise Time	t_R	—	32	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	46	—		
Turn-Off Fall Time	t_F	—	53	—		
Reverse Recovery Time	t_{RR}	—	19.5	—	ns	I_F = -10A, di/dt = -100A/µs
Reverse Recovery Charge	Q_{RR}	—	11.6	—	nC	I_F = -10A, di/dt = -100A/µs

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

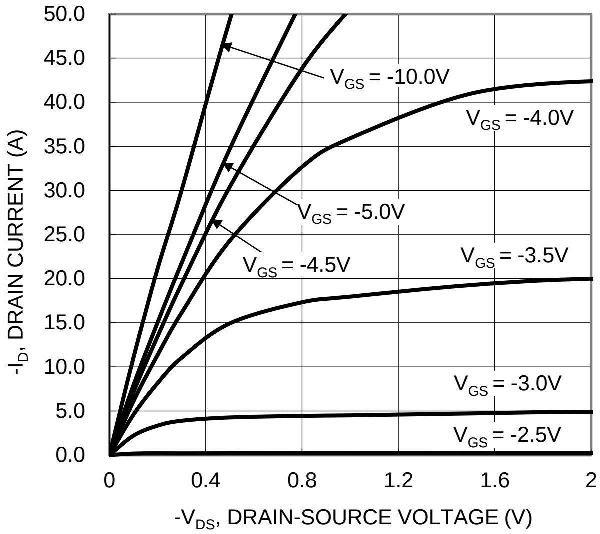


Figure 1.Typical Output Characteristic

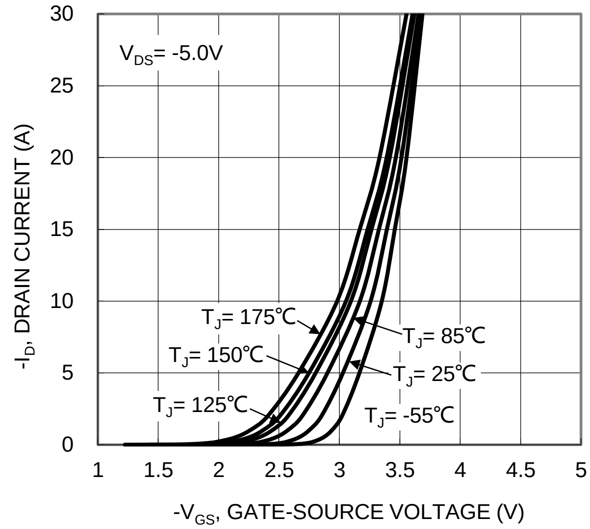


Figure 2. Typical Transfer Characteristic

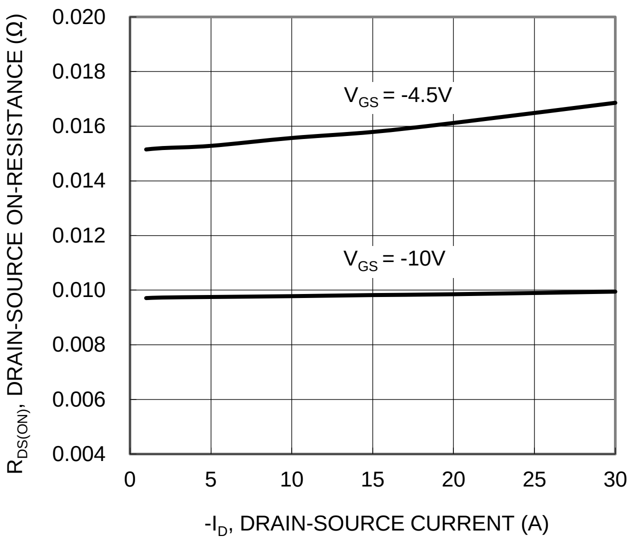


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

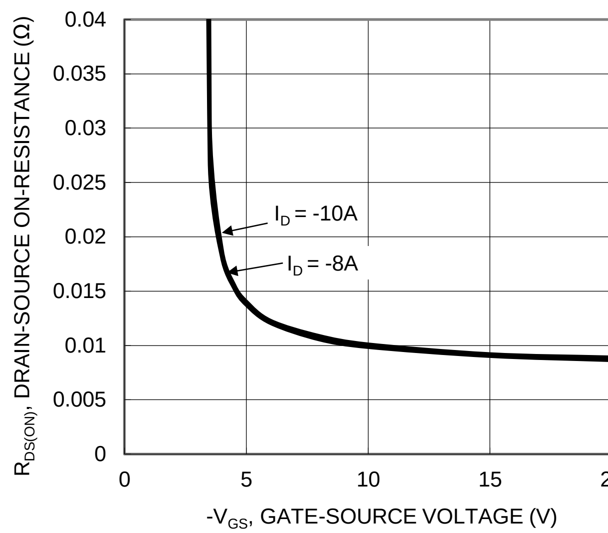


Figure 4. Typical Transfer Characteristic

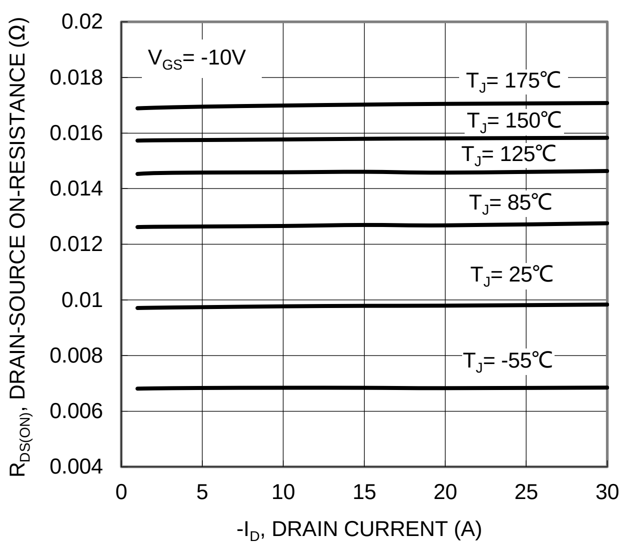


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

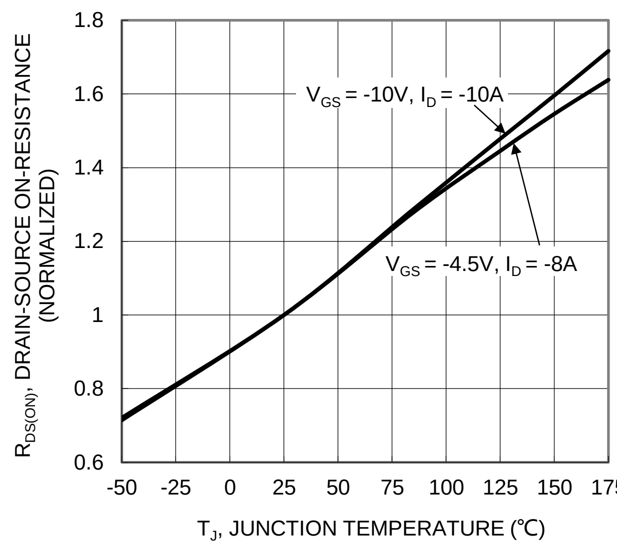


Figure 6. On-Resistance Variation with Temperature

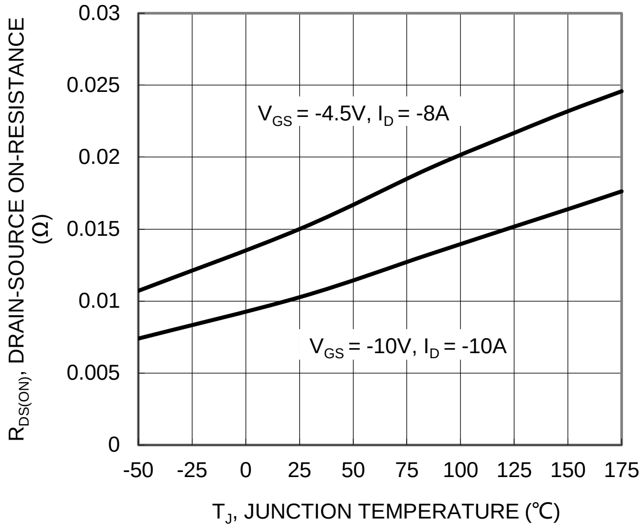


Figure 7. On-Resistance Variation with Temperature

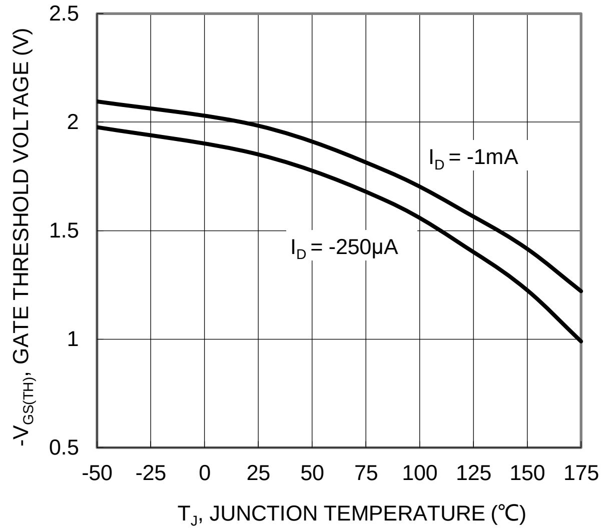


Figure 8. Gate Threshold Variation vs. Junction Temperature

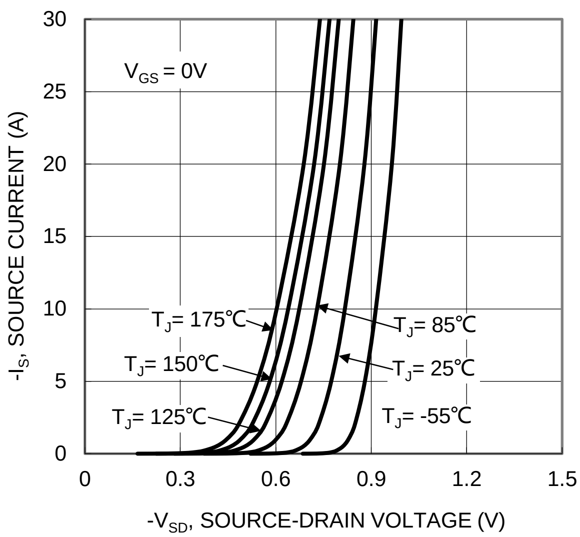


Figure 9. Diode Forward Voltage vs. Current

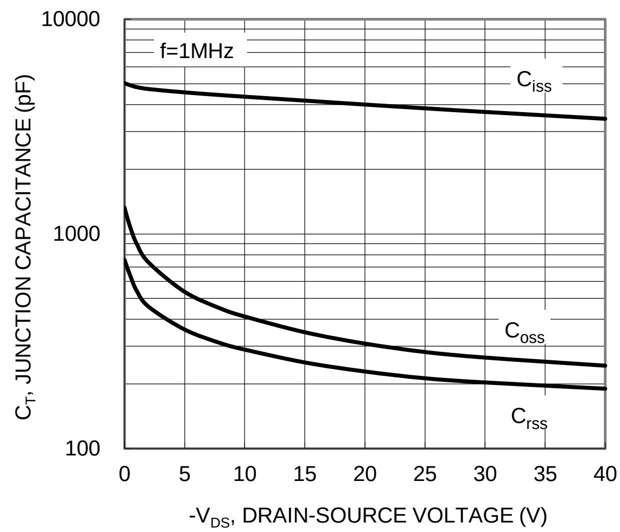


Figure 10. Typical Junction Capacitance

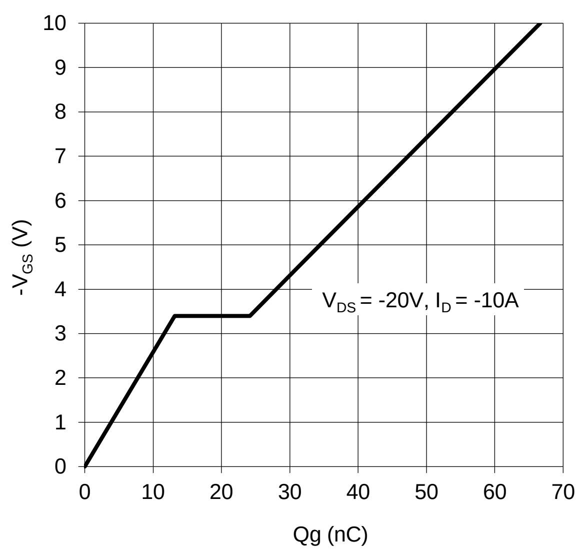


Figure 11. Gate Charge

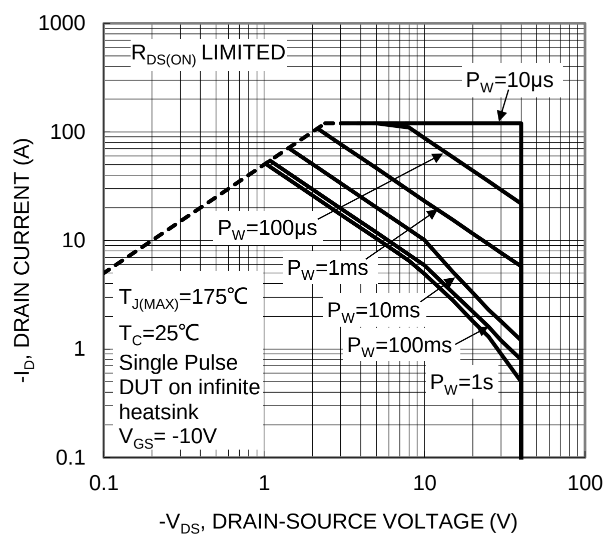


Figure 12. SOA, Safe Operation Area

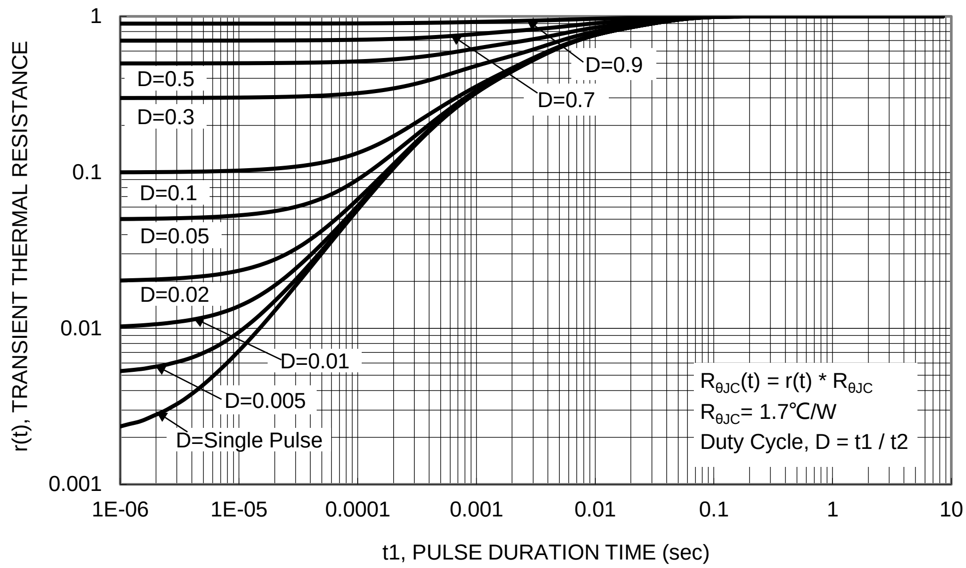
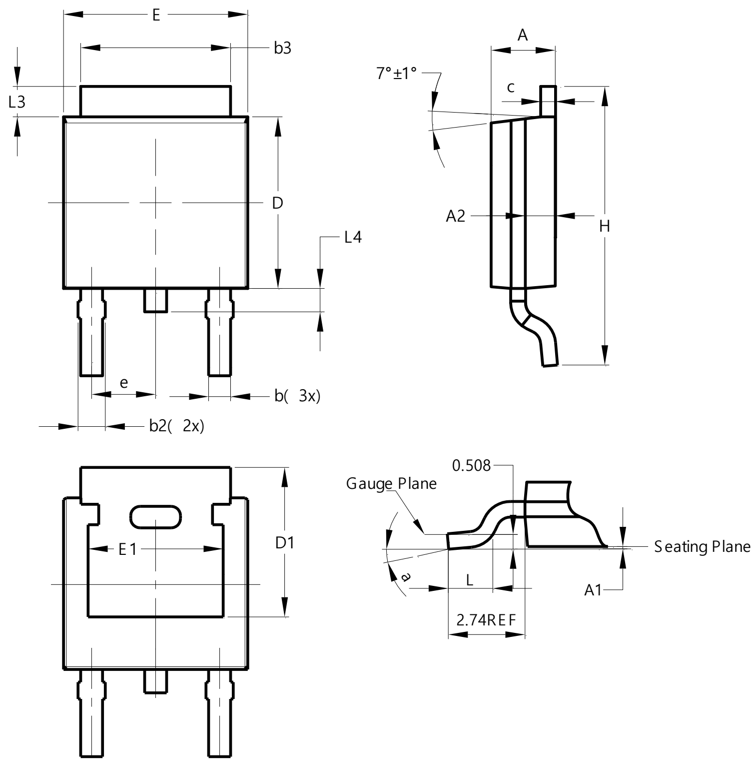


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

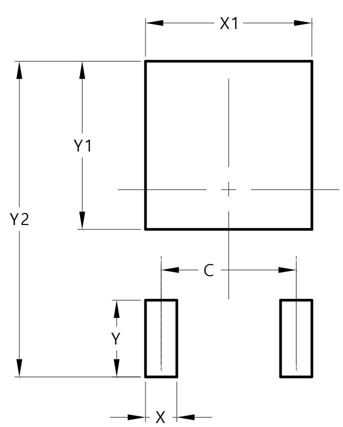
TO252 (DPAK)



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	5.50	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