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

Device	$V_{(BR)DSS}$	$R_{DS(on)}$ max	I_D T_A = +25°C
Q2	40V	24mΩ @ V_{GS} = 10V	6.9A
		32mΩ @ V_{GS} = 4.5V	6.0A
Q1	-40V	45mΩ @ V_{GS} = -10V	-5.1A
		55mΩ @ V_{GS} = -4.5V	-4.5A

Description

This new generation MOSFET has been 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.

Applications

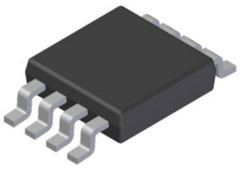
- DC-DC Converters
- Power Management Functions
- Backlighting

Features and Benefits

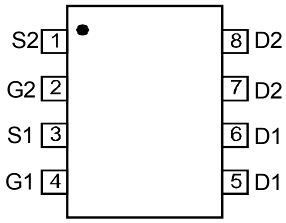
- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed

Mechanical Data

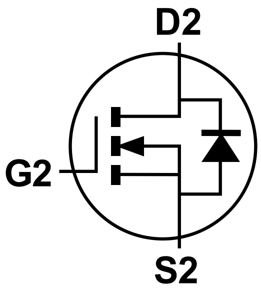
- Case: SO-8
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin annealed over Copper leadframe Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.074 grams (approximate)



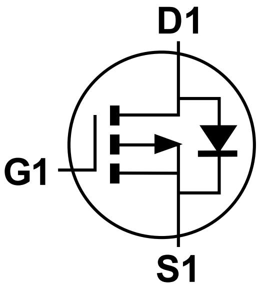
Top View



TOP VIEW
Internal Schematic



N-Channel MOSFET



P-Channel MOSFET

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

Characteristic			Symbol	Value_Q2	Value_Q1	Units
Drain-Source Voltage			V_{DSS}	40	-40	V
Gate-Source Voltage			V_{GSS}	±20	±20	V
Continuous Drain Current (Note 6) V_{GS} = 10V	Steady State	T_A = +25°C	I_D	7.0	-5.1	A
		T_A = +70°C		5.6	-4.1	
	t<10s	T_A = +25°C	I_D	9.0	-6.5	A
		T_A = +70°C		7.2	-5.2	
Maximum Body Diode Forward Current (Note 6)			I_S	2.5	-2.5	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%)			I_{DM}	70	-40	A
Avalanche Current (Notes 7) L = 0.1mH			I_{AR}	20	20	A
Repetitive Avalanche Energy (Notes 7) L = 0.1mH			E_{AR}	20	20	mJ

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	1.3	W
	T_A = +70°C		0.8	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	98	°C/W
	t<10s		59	
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	1.8	W
	T_A = +70°C		1.1	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	71	°C/W
	t<10s		43	
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	11.8	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Electrical Characteristics N-Channel Q2 (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
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 8)						
Gate Threshold Voltage	$V_{GS(th)}$	1.4	—	2.4	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	15	24	mΩ	V_{GS} = 10V, I_D = 6A
		—	20	32		V_{GS} = 4.5V, I_D = 5A
Diode Forward Voltage	V_{SD}	—	0.7	1.0	V	V_{GS} = 0V, I_S = 1.0A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	1060	—	pF	V_{DS} = 20V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	84	—		
Reverse Transfer Capacitance	C_{rss}	—	58	—		
Gate Resistance	R_G	—	1.6	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	8.8	—	nC	V_{DS} = 20V, I_D = 8A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	19.1	—		
Gate-Source Charge	Q_{gs}	—	3.0	—		
Gate-Drain Charge	Q_{gd}	—	2.5	—		
Turn-On Delay Time	$t_{D(on)}$	—	5.3	—	nS	V_{DD} = 25V, R_L = 2.5Ω V_{GS} = 10V, R_G = 3Ω
Turn-On Rise Time	t_r	—	7.1	—		
Turn-Off Delay Time	$t_{D(off)}$	—	15.1	—		
Turn-Off Fall Time	t_f	—	4.8	—		
Body Diode Reverse Recovery Time	t_{rr}	—	10.5	—	nS	I_F = 8A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q_{rr}	—	4.15	—	nC	I_F = 8A, di/dt = 100A/μs

Electrical Characteristics P-Channel Q1 (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
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 8)						
Gate Threshold Voltage	$V_{GS(th)}$	-1.0	—	-2.2	V	V_{DS} = V_{GS}, I_D = -250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	33	45	mΩ	V_{GS} = -10V, I_D = -5A
		—	40	55		V_{GS} = -4.5V, I_D = -4A
Diode Forward Voltage	V_{SD}	—	-0.7	-1.0	V	V_{GS} = 0V, I_S = -1.0A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	1154	—	pF	V_{DS} = -20V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	84	—		
Reverse Transfer Capacitance	C_{rss}	—	66	—		
Gate Resistance	R_G	—	12.6	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	10.6	—	nC	V_{DS} = -20V, I_D = -4.9A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	21.5	—		
Gate-Source Charge	Q_{gs}	—	2.2	—		
Gate-Drain Charge	Q_{gd}	—	3.3	—		
Turn-On Delay Time	$t_{D(on)}$	—	8.7	—	nS	V_{DS} = -20V, I_D = -3.9A V_{GS} = -4.5V, R_G = 1Ω
Turn-On Rise Time	t_r	—	19.6	—		
Turn-Off Delay Time	$t_{D(off)}$	—	34.9	—		
Turn-Off Fall Time	t_f	—	25.5	—		
Body Diode Reverse Recovery Time	t_{rr}	—	9.61	—	nS	I_S = -3.9A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q_{rr}	—	3.30	—	nC	I_S = -3.9A, 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. IAR and EAR rating are based on low frequency and duty cycles to keep TJ = +25°C
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

N-Channel Q2

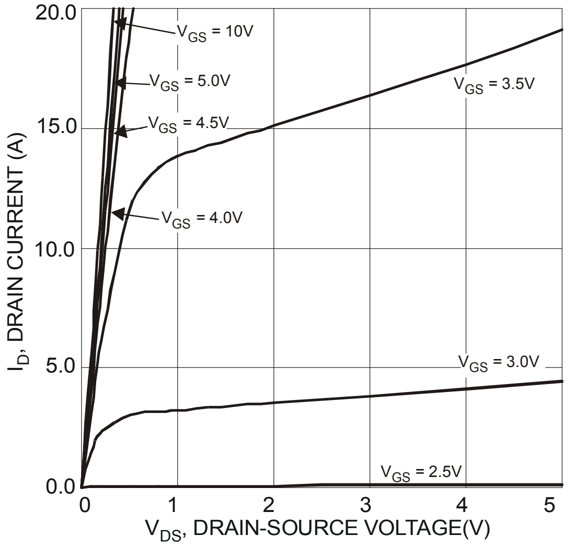


Figure 1 Typical Output Characteristics

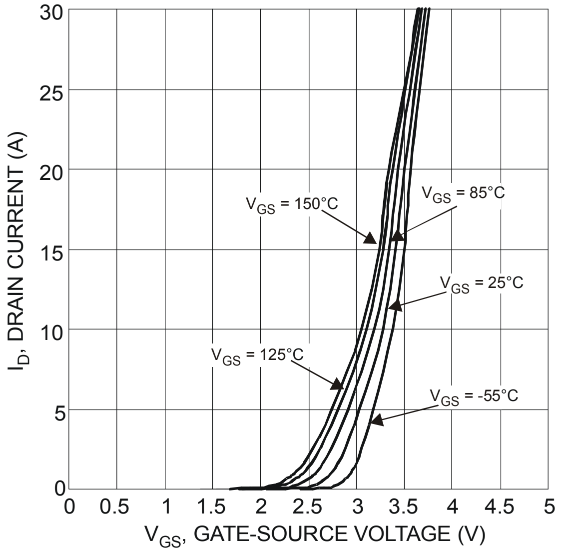


Figure 2 Typical Transfer Characteristics

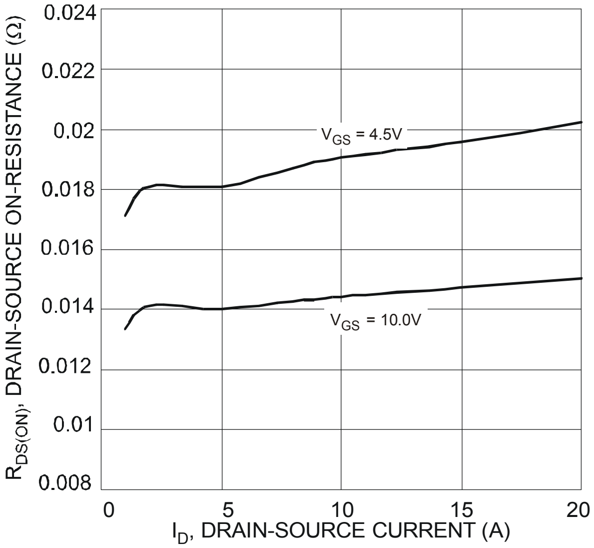


Figure 3 Typical On-Resistance vs.
Drain Current and Gate Voltage

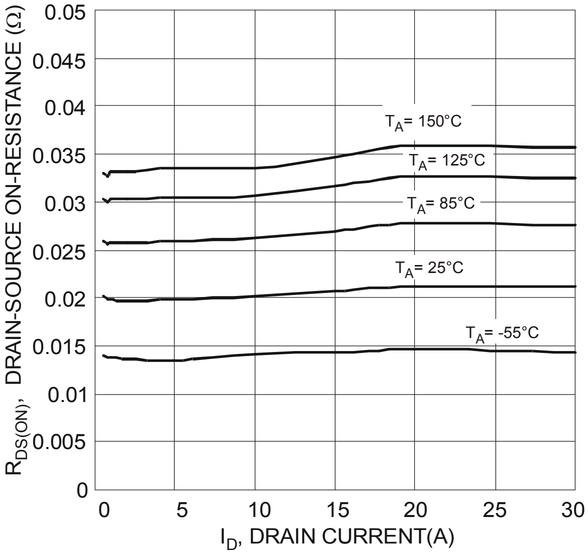


Figure 4 Typical On-Resistance vs.
Drain Current and Temperature

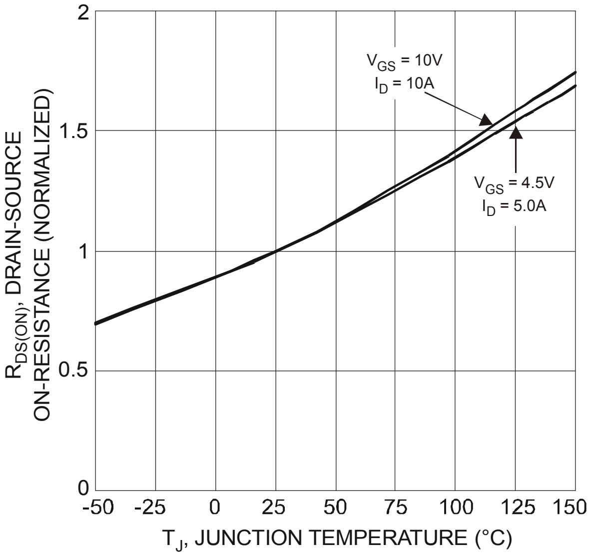


Figure 5 On-Resistance Variation with Temperature

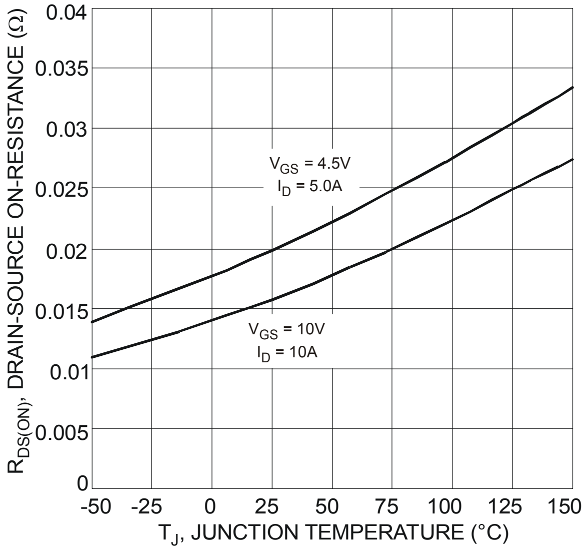


Figure 6 On-Resistance Variation with Temperature

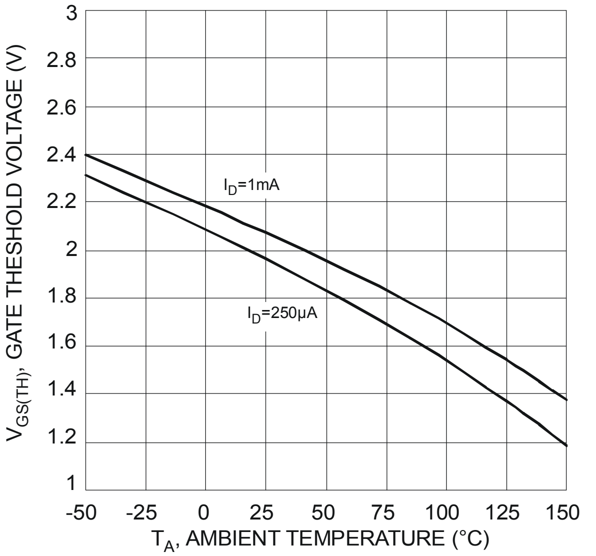


Figure 7 Gate Theshold Variation vs Ambient Temperature

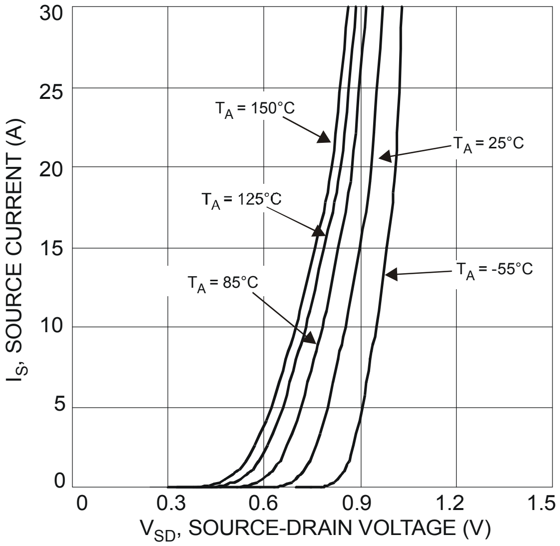


Figure 8 Diode Forward Voltage vs. Current

P-Channel Q1

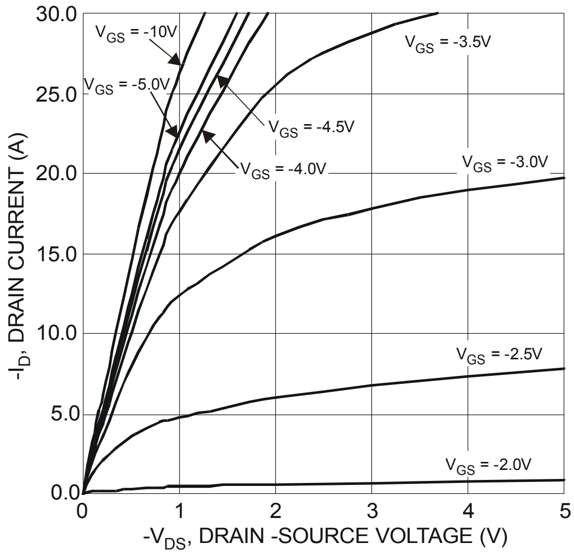


Figure 9 Typical Output Characteristics

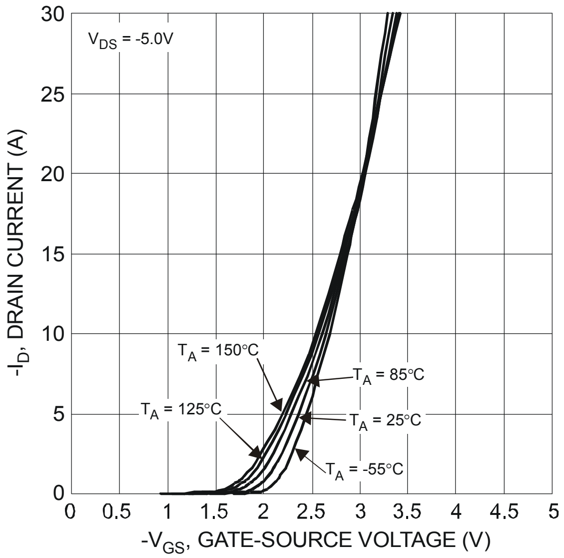


Figure 10 Typical Transfer Characteristics

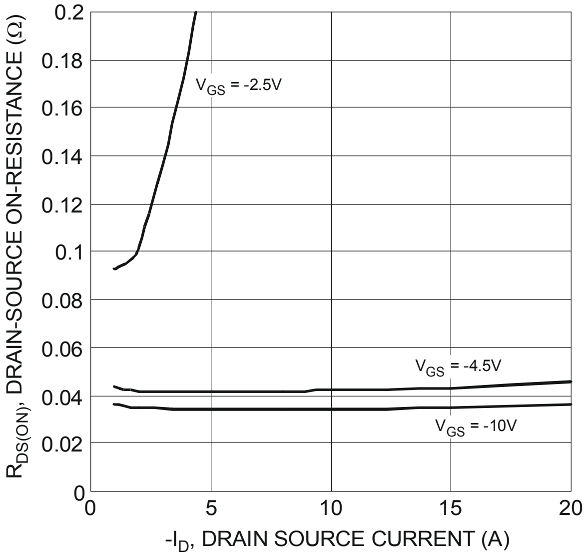


Figure 11 Typical On-Resistance vs. Drain Current and Gate Voltage

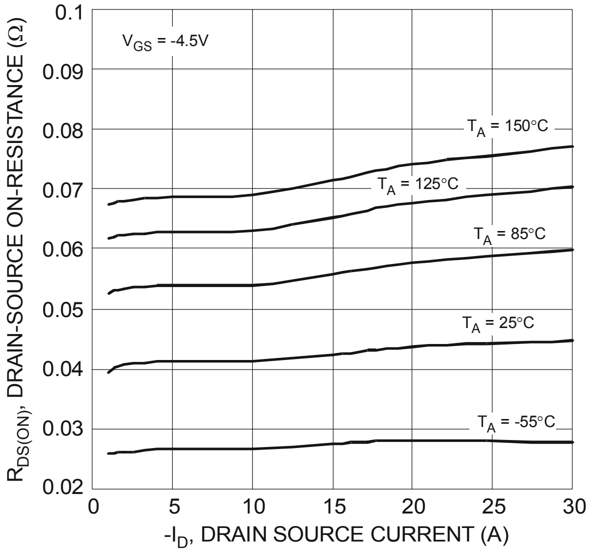


Figure 12 Typical On-Resistance vs. Drain Current and Temperature

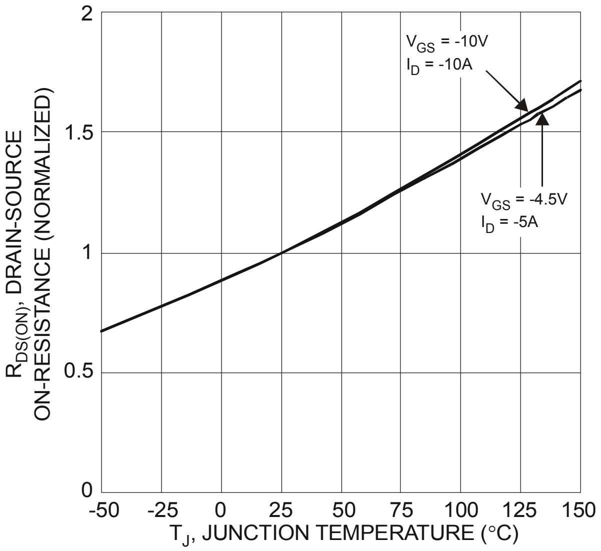


Figure 13 On-Resistance Variation with Temperature

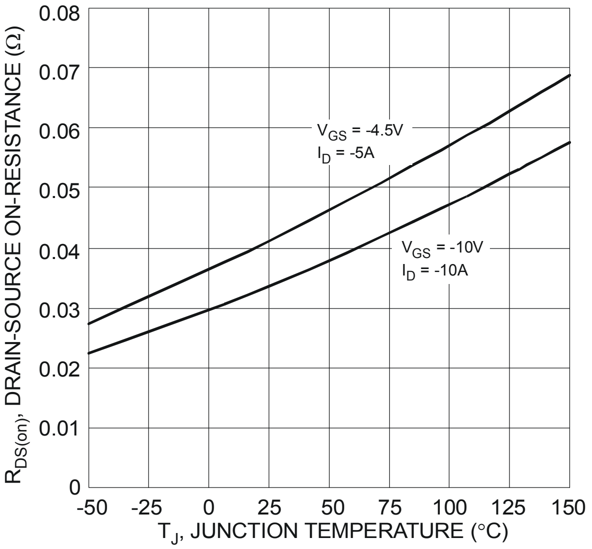


Figure 14 On-Resistance Variation with Temperature

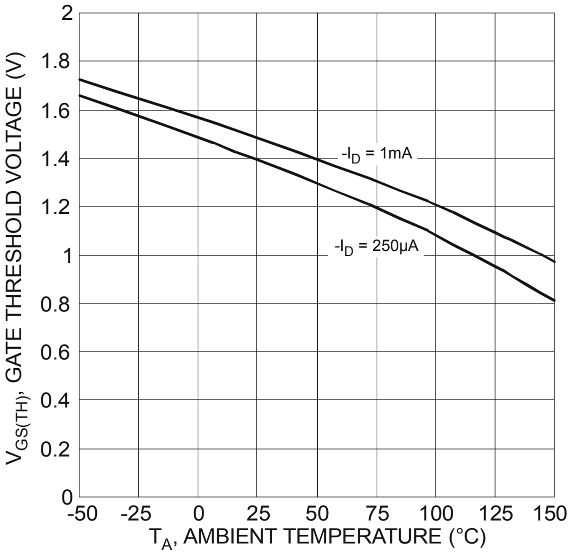


Figure 15 Gate Threshold Variation vs. Ambient Temperature

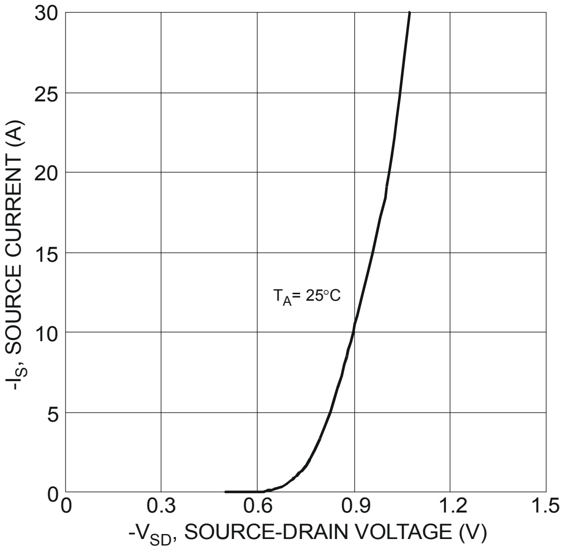


Figure 16 Diode Forward Voltage vs. Current

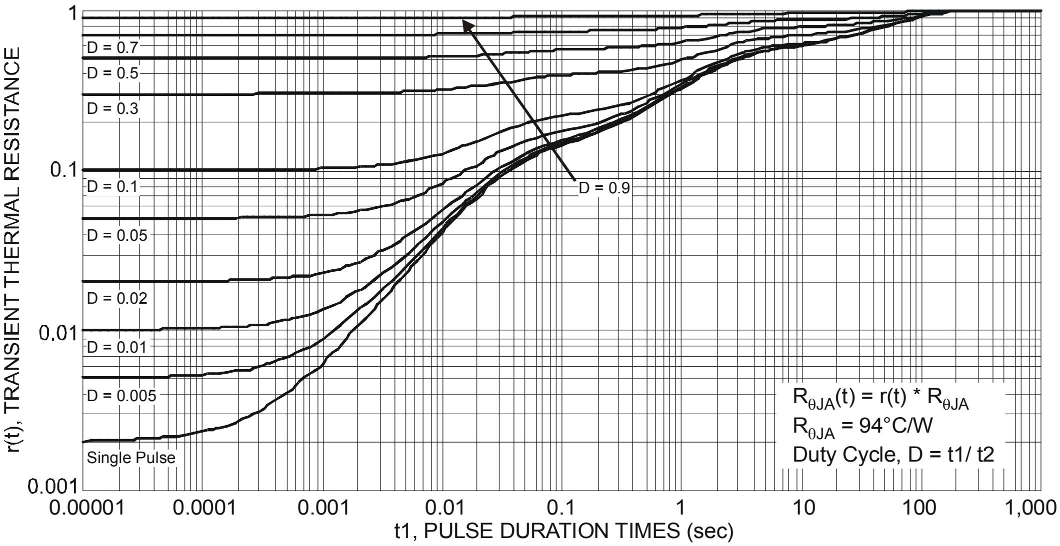
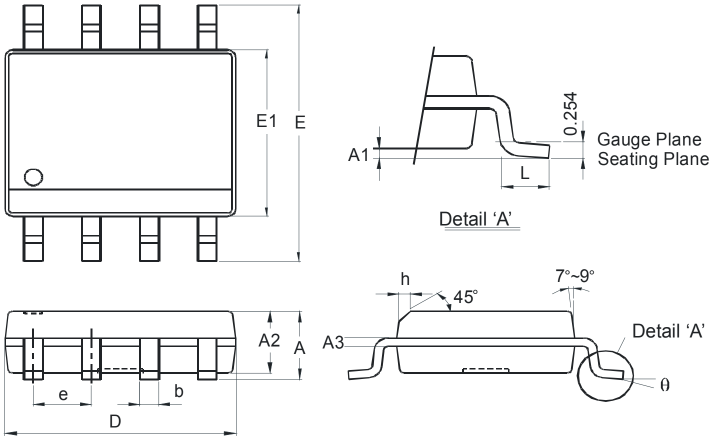
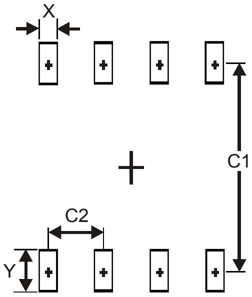


Figure 17 Transient Thermal Resistance



SO-8		
Dim	**Min**	**Max**
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

Suggested Pad Layout



Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27