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

0755-83047638
ysbdt@szyoushang.cn
www.szyoushang.cn

企业微信二维码　企业QQ二维码

Product Summary

Device	BV_{DSS}	$R_{DS(ON)}$ Max	I_D T_A = +25°C
Q1	40V	24mΩ @ V_{GS} = 10V	8.3A
		32mΩ @ V_{GS} = 4.5V	7.2A
Q2	-40V	45mΩ @ V_{GS} = -10V	-6.1A
		55mΩ @ V_{GS} = -4.5V	-5.5A

Features and Benefits

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

Description

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

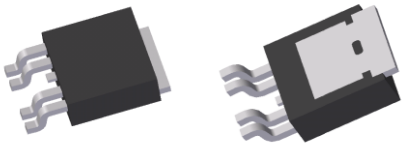
Applications

- DC-DC Converters
- Power Management Functions
- Backlighting

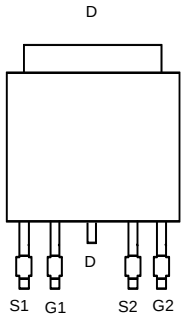
Mechanical Data

- Case: TO252-4
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.34 grams (Approximate)

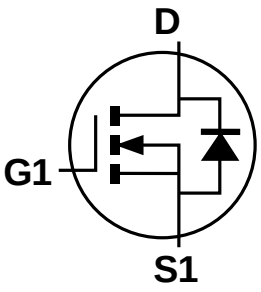
TO252-4



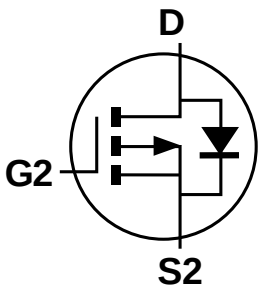
Top View Bottom View



Pin-Out Top View



N-Channel MOSFET



P-Channel MOSFET

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

Characteristic			Symbol	Value_Q1	Value_Q2	Unit
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 T_A = +70°C	I_D	8.3 6.7	-6.1 -4.9	A
	t<10s	T_A = +25°C T_A = +70°C	I_D	11.8 9.4	-8.6 -6.9	A
Maximum Body Diode Forward Current (Note 6)			I_S	2.5	-2.5	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	45	-35	A
Avalanche Current, L = 0.1mH (Note 8)			I_{AS}	21	-20	A
Avalanche Energy, L = 0.1mH (Note 8)			E_{AS}	22	20	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C T_A = +70°C	P_D	1.5 1.0	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State t<10s	$R_{\theta JA}$	88 40	°C/W
Total Power Dissipation (Note 6)	T_A = +25°C T_A = +70°C	P_D	2.9 1.6	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State t<10s	$R_{\theta JA}$	42 20	°C/W
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	4.5	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
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 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	1.0	—	3.0	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	— —	15 20	24 32	mΩ	V_{GS} = 10V, I_D = 6A 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 10)						
Input Capacitance	C_{ISS}	—	1,060	—	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 — Q2 P-Channel (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
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 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1.0	—	-3.0	V	V_{DS} = V_{GS}, I_D = -250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	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 10)						
Input Capacitance	C_{ISS}	—	1,154	—	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}	—	3.3	—	nC	I_S = -3.9A, di/dt = 100A/μs

Notes:
5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
7. Thermal resistance from junction to soldering point (on the exposed drain pad).
8. I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep T_J = +25°C.
9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.

Typical Characteristics — N-Channel

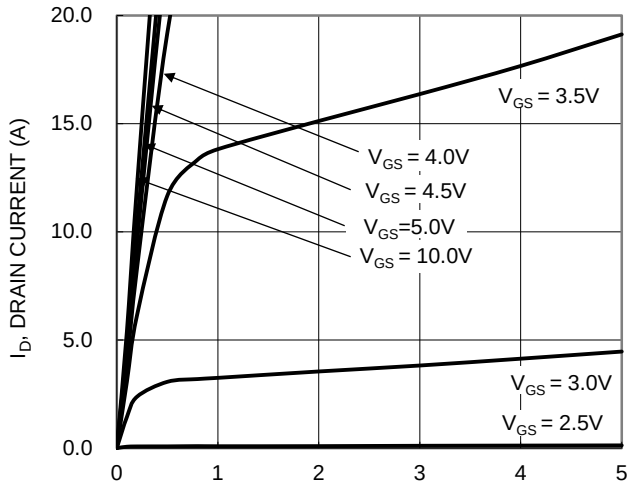


Fig.1 Typical Output Characteristic

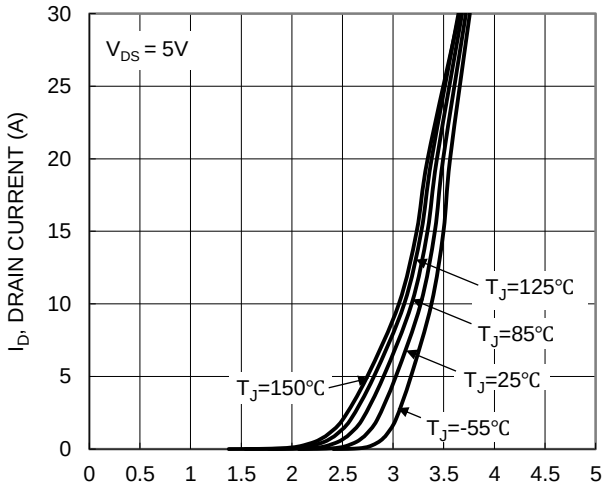


Figure 2. Typical Transfer Characteristic

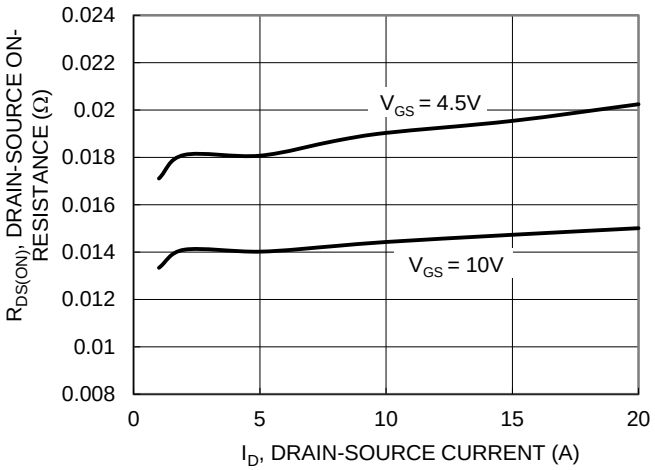


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

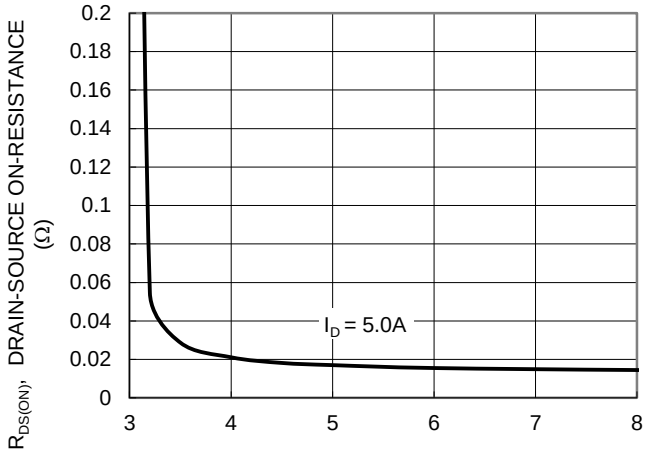


Figure 4. Typical Transfer Characteristic

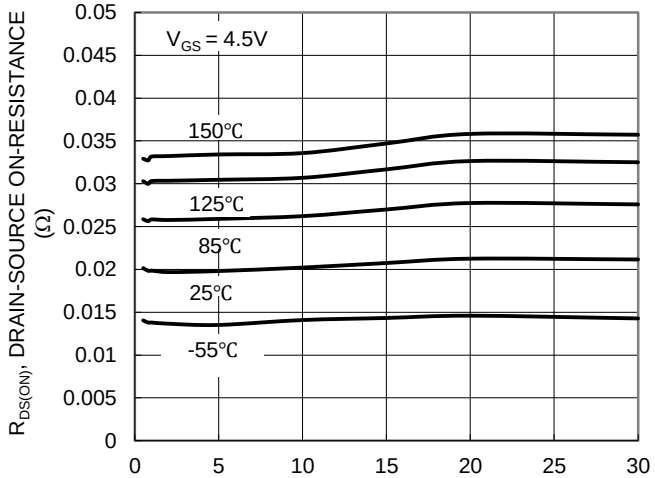


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

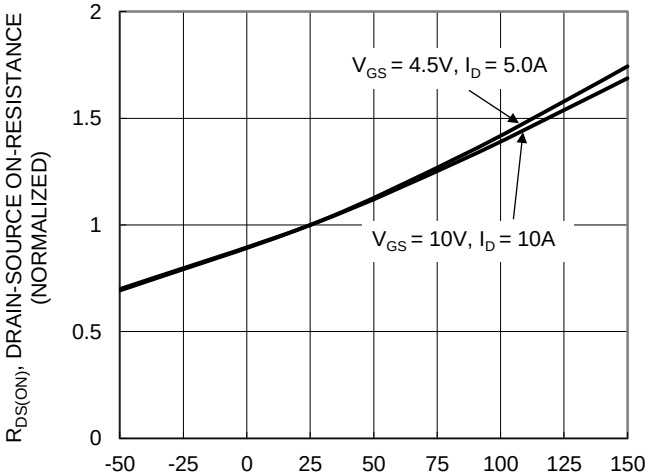


Figure 6. On-Resistance Variation with Temperature

Typical Characteristics — N-Channel (Continued)

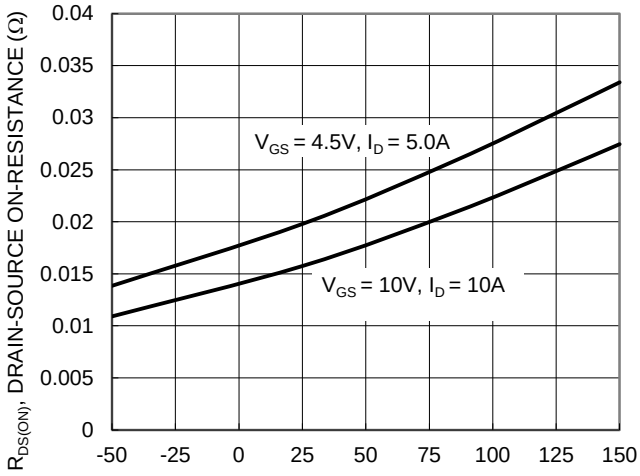


Figure 7. On-Resistance Variation with Temperature

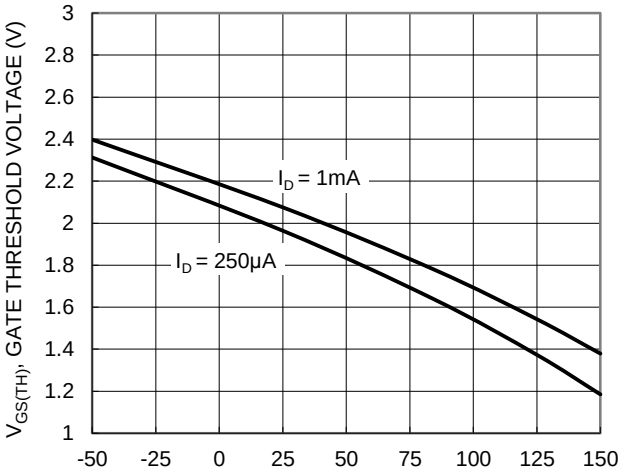


Figure 8. Gate Threshold Variation vs. Temperature

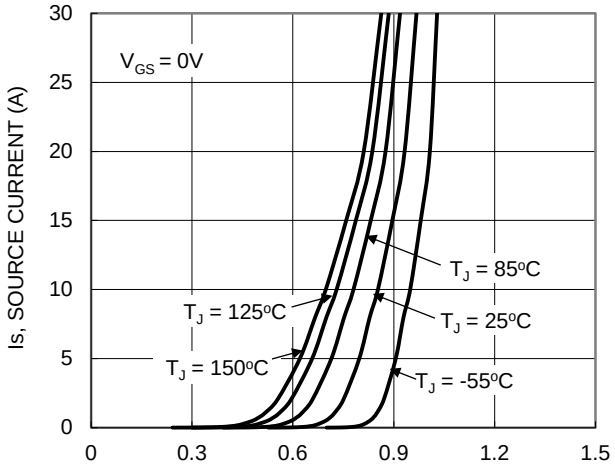


Figure 9. Diode Forward Voltage vs. Current

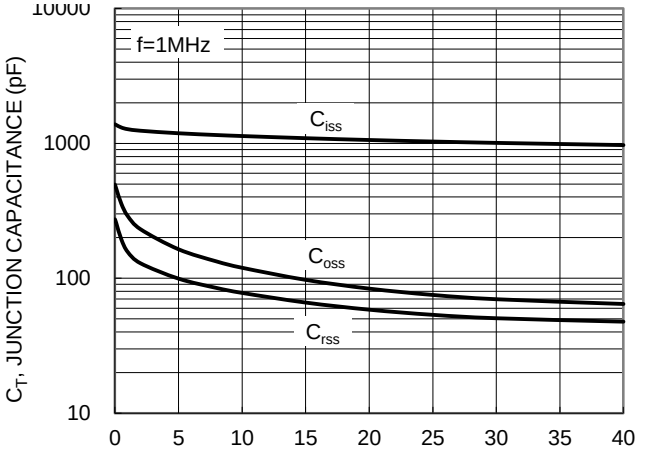


Figure 10. Typical Junction Capacitance

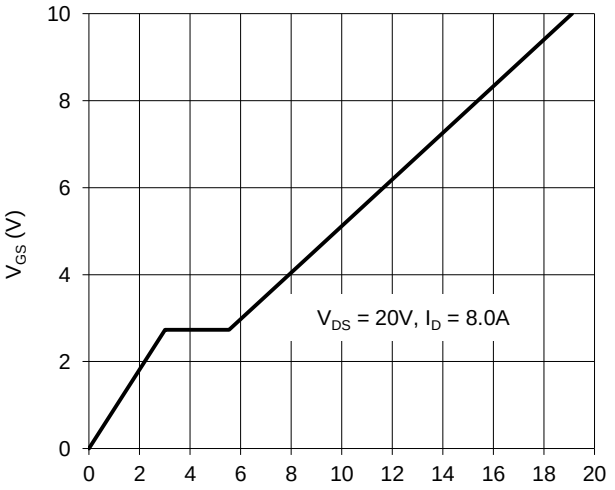


Figure 11. Gate Charge

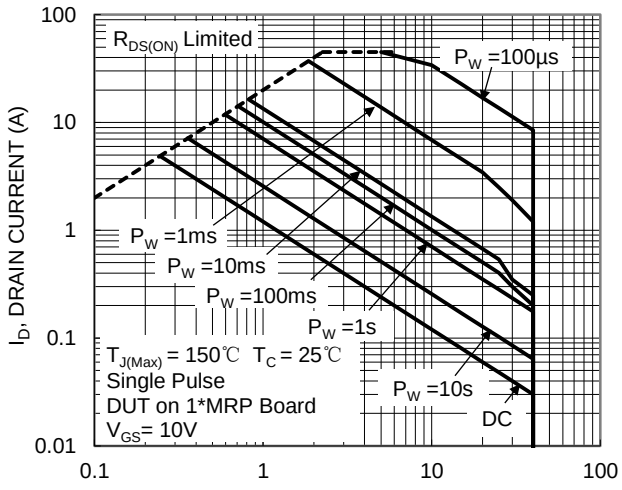


Figure 12. SOA, Safe Operation Area

Typical Characteristics — P-Channel

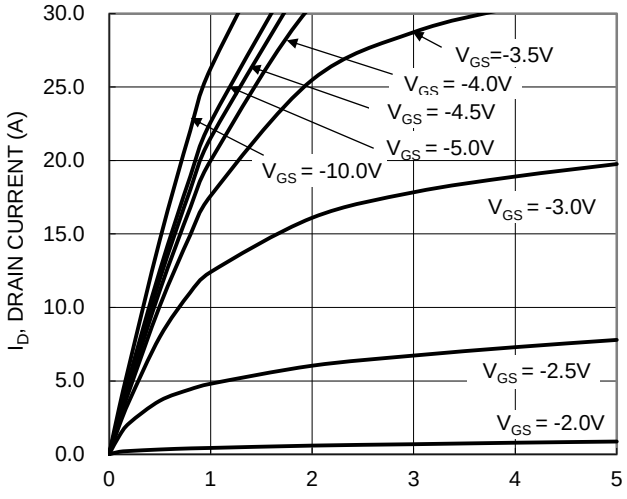


Figure 1. Typical Output Characteristic

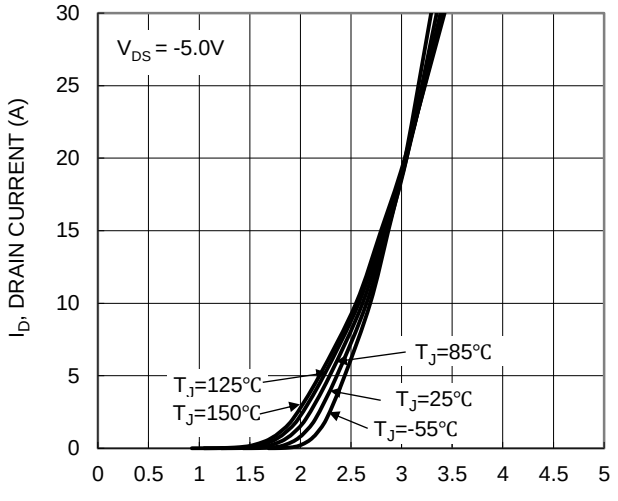


Figure 2. Typical Transfer Characteristic

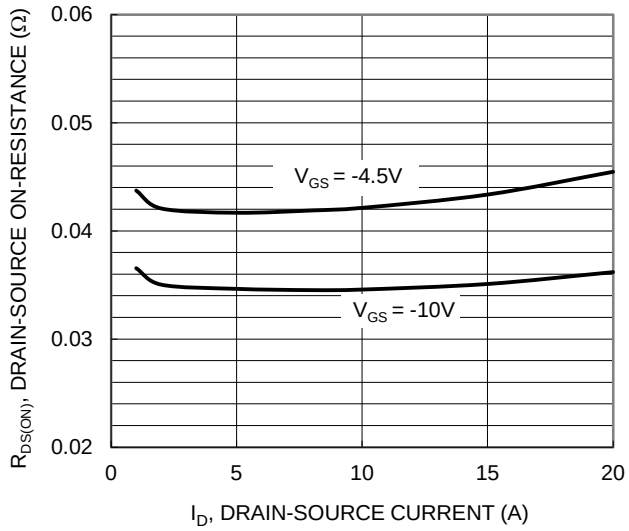


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

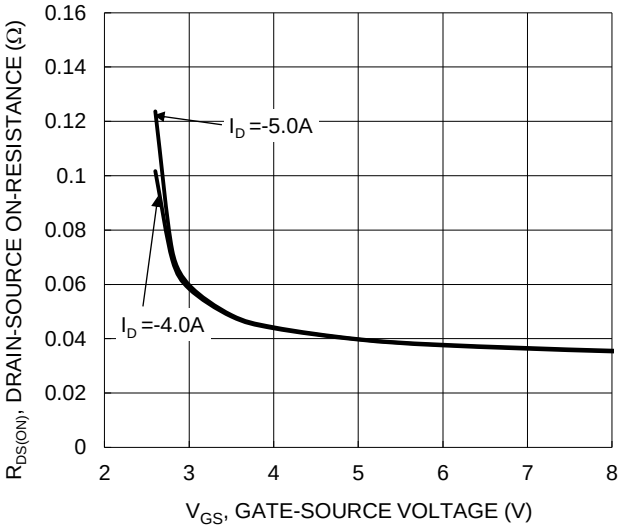


Figure 4. Typical Transfer Characteristic

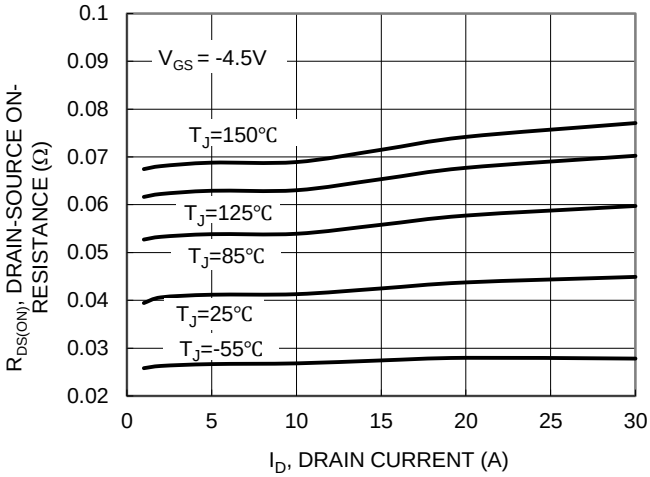


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

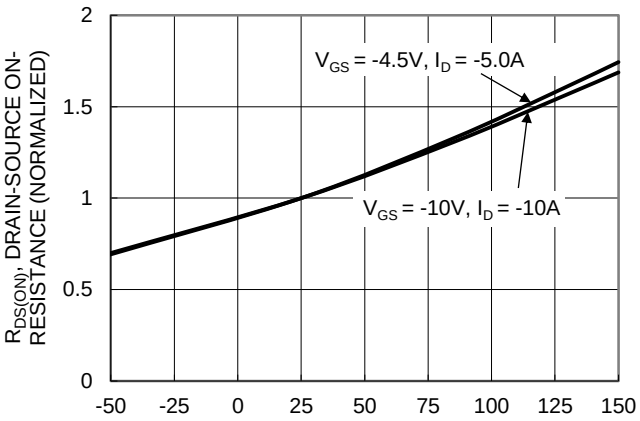


Figure 6. On-Resistance Variation with Temperature

Typical Characteristics — P-Channel (Continued)

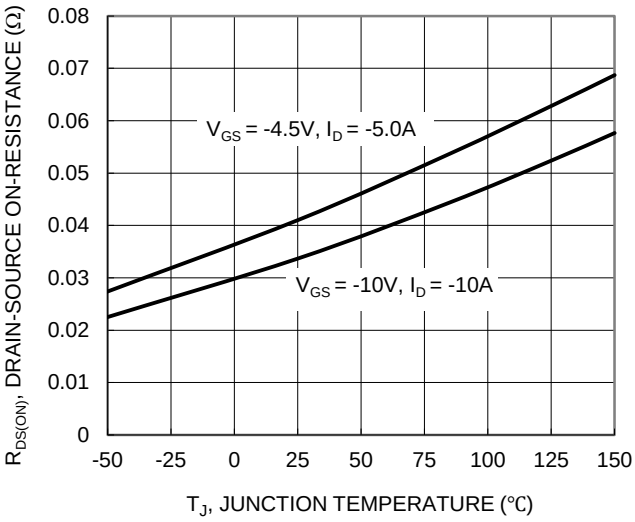


Figure 7. On-Resistance Variation with Temperature

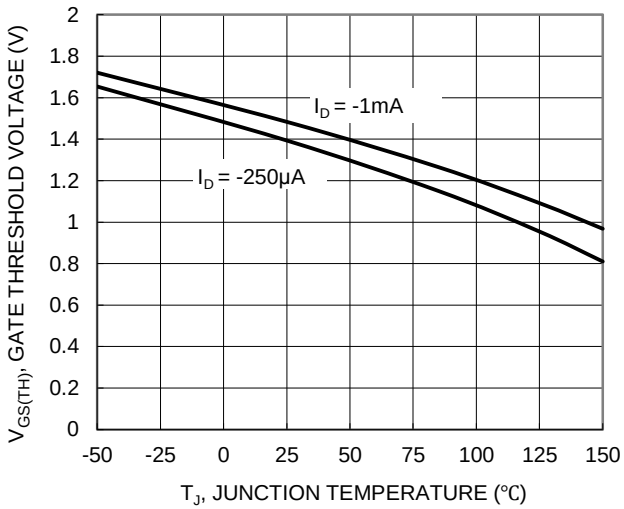


Figure 8. Gate Threshold Variation vs. Temperature

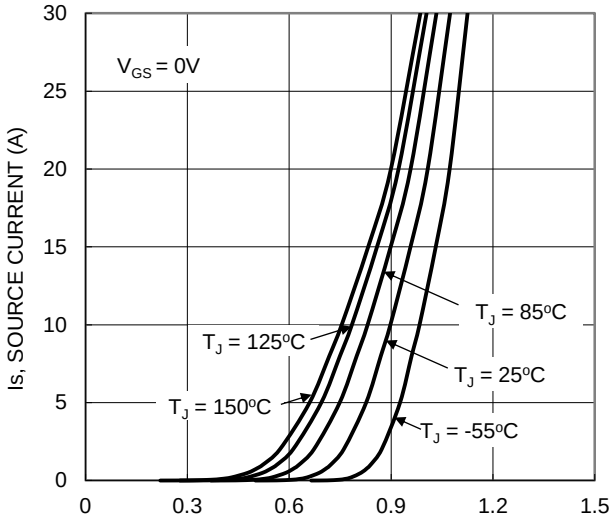


Figure 9. Diode Forward Voltage vs. Current

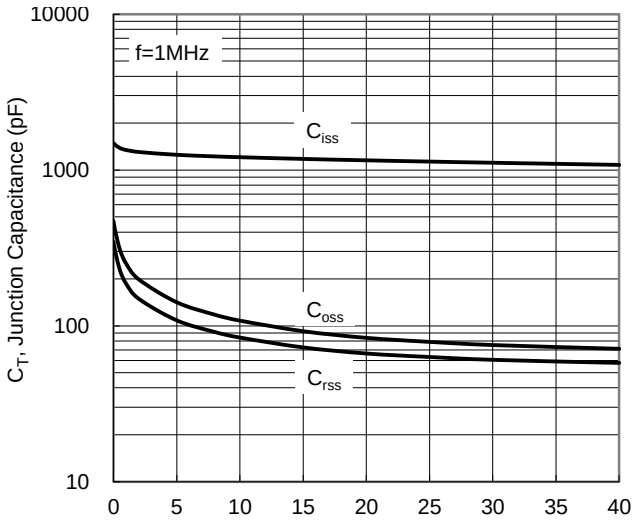


Figure 10. Typical Junction Capacitance

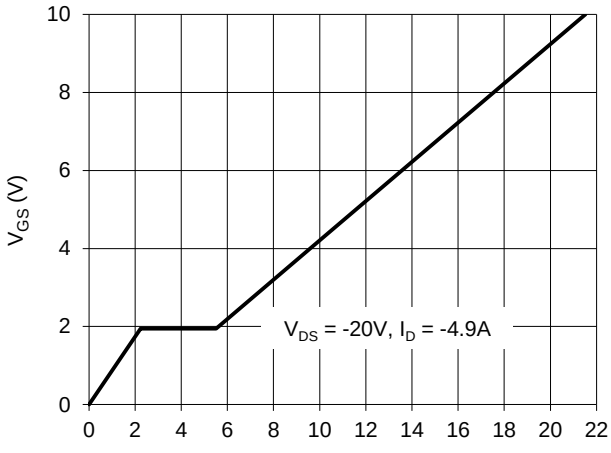


Figure 11. Gate Charge

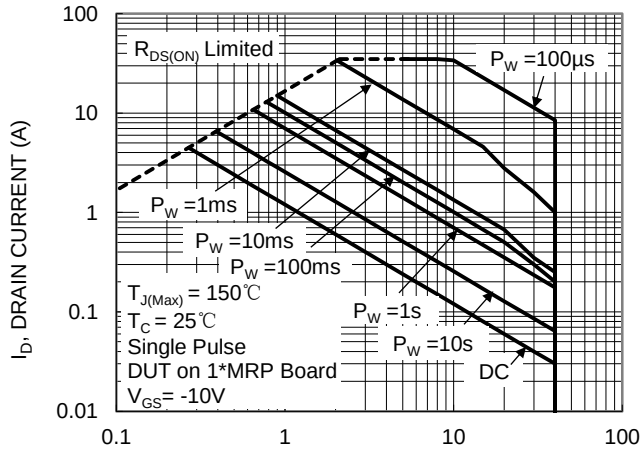


Figure 12. SOA, Safe Operation Area

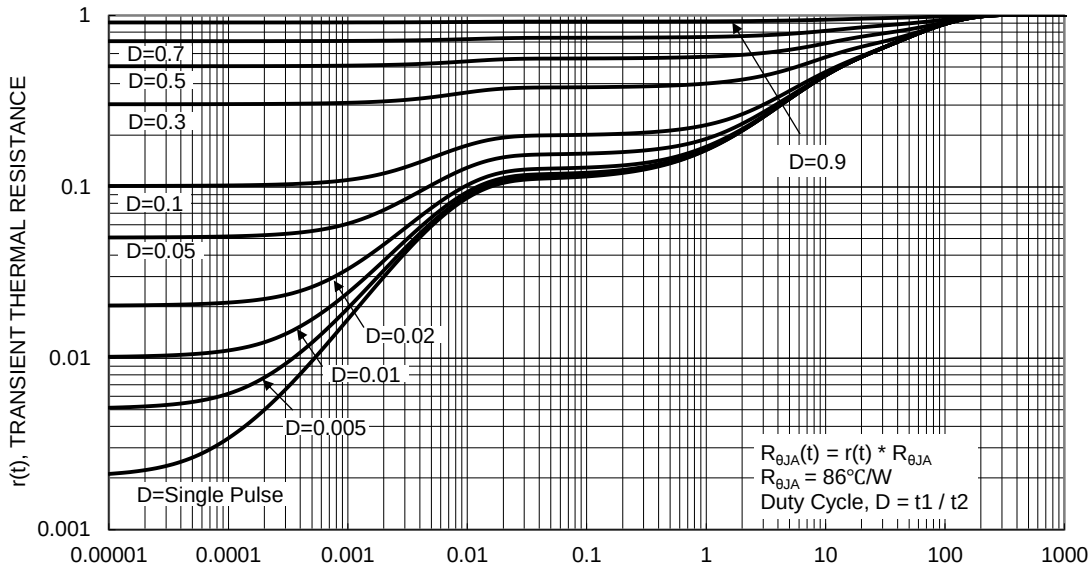
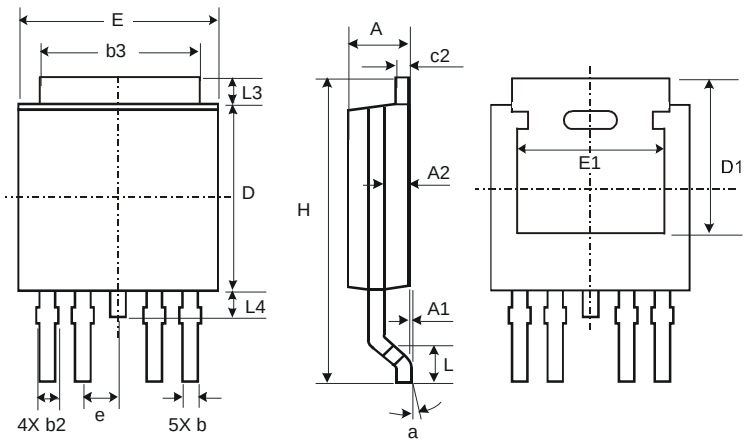


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

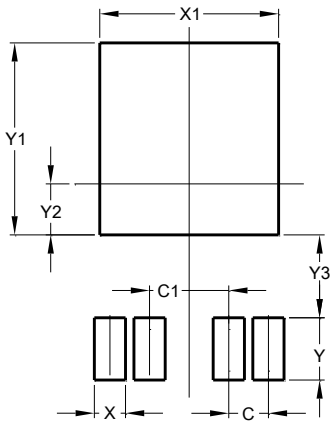
TO252-4



TO252-4			
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	0.51	0.71	0.583
b2	0.61	0.79	0.70
b3	5.21	5.46	5.33
c2	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	1.27
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

TO252-4



Dimensions	Value (in mm)
C	1.27
C1	2.54
X	1.00
X1	5.73
Y	2.00
Y1	6.17
Y2	1.64
Y3	2.66