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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企业微信二维码

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Product Summary

Device	BV_{DSS}	$R_{DS(ON)}$ MAX	I_D MAX T_A = +25°C
Q1 N-Channel	20V	40mΩ @ V_{GS} = 4.5V	4.7A
		65mΩ @ V_{GS} = 2.5V	3.7A
Q2 P-Channel	-20V	90mΩ @ V_{GS} = -4.5V	-3.2A
		137mΩ @ V_{GS} = -2.5V	-2.6A

Description

This 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.

Applications

- Load Switch
- Power Management Functions
- Portable Power Adaptors

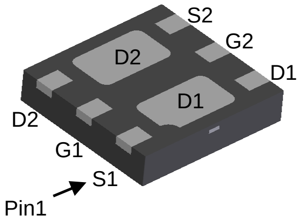
Features

- Low On-Resistance
- Low Input Capacitance
- Low Profile, 0.6mm Max Height
- ESD Protected Gate

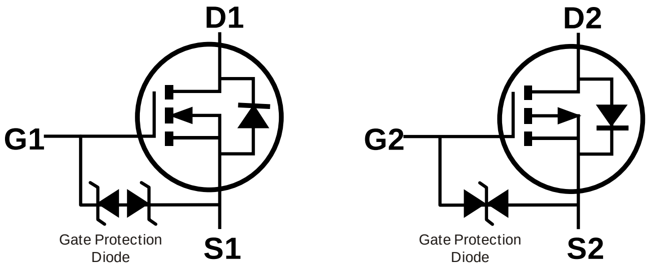
Mechanical Data

- Case: U-DFN2020-6
- Case Material: Molded Plastic, “Green” Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish NiPdAu over Copper Leadframe; Solderable per MIL-STD-202, Method 208 ⓔ4
- Terminal Connections: See Diagram Below
- Weight: 0.008 grams (Approximate)

U-DFN2020-6 (Type B)



Bottom View



Q1 N-CHANNEL MOSFET

O2 P-CHANNEL MOSFET

Internal Schematic

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

Characteristic			Symbol	Q1 N-CHANNEL	Q2 P-CHANNEL	Unit
Drain-Source Voltage			V_{DSS}	20	-20	V
Gate-Source Voltage			V_{GSS}	±12	±12	V
Continuous Drain Current (Note 5) N-Channel: V_{GS} = 4.5V P-Channel: V_{GS} = -4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	4.7 3.8	-3.2 -2.5	A
	t < 5s	T_A = +25°C T_A = +70°C	I_D	6.1 4.9	-4.1 -3.2	A
Maximum Continuous Body Diode Forward Current (Note 5)			I_S	2	-1.5	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	30	-18	A

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	Steady State	P_D	1.4	W
	t < 5s		2.2	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{θJA}$	92	°C/W
	t < 5s		55	
Thermal Resistance, Junction to Case (Note 5)		$R_{θJC}$	30	
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 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	1.0	µA	V_{DS} = 20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	µA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.35	—	1.4	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	23	40	mΩ	V_{GS} = 4.5V, I_D = 4.2A
		—	26	65		V_{GS} = 2.5V, I_D = 3.3A
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 4.4A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	713	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	80	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	68	—	pF	
Gate Resistance	R_g	—	15	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	8	—	nC	V_{DS} = 10V, I_D = 5.5A
Total Gate Charge (V_{GS} = 8V)		—	15	—	nC	
Gate-Source Charge	Q_{gs}	—	1.0	—	nC	
Gate-Drain Charge	Q_{gd}	—	1.1	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	3.6	—	ns	V_{DD} = 10V, V_{GS} = 4.5V, R_L = 2.3Ω, R_g = 1Ω
Turn-On Rise Time	t_R	—	15.9	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	16.0	—	ns	
Turn-Off Fall Time	t_F	—	2.6	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	6.6	—	ns	I_S = 4.4A, dI/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	1.2	—	nC	I_S = 4.4A, dI/dt = 100A/µs

Notes: 5. Device mounted on 1” x 1” FR-4 PCB with high coverage 2oz. Copper, single sided.
6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to product testing.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	-20	—	—	V	V_{GS} = 0V, I_D = -250μA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	-1.0	μA	V_{DS} = -20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	μA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.35	—	-1.4	V	V_{DS} = V_{GS}, I_D = -250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	59	90	mΩ	V_{GS} = -4.5V, I_D = -2.9A
		—	76	137		V_{GS} = -2.5V, I_D = -2.3A
Diode Forward Voltage	V_{SD}	—	-0.65	-1.2	V	V_{GS} = 0V, I_S = -3.0A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	881	—	pF	V_{DS} = -10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	84	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	67	—	pF	
Gate Resistance	R_g	—	14.3	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	11	—	nC	V_{DS} = -10V, I_D = -3.7A
Total Gate Charge (V_{GS} = -8V)		—	18	—	nC	
Gate-Source Charge	Q_{gs}	—	1.5	—	nC	
Gate-Drain Charge	Q_{gd}	—	2.3	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	5.0	—	ns	V_{DD} = -10V, V_{GS} = -4.5V, R_L = 3.3Ω, R_g = 1Ω
Turn-On Rise Time	t_R	—	9.5	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	29.7	—	ns	
Turn-Off Fall Time	t_F	—	20.4	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	23.6	—	ns	I_S = -3.0A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q_{RR}	—	11.4	—	nC	I_S = -3.0A, dI/dt = 100A/μs

Notes: 6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to product testing.

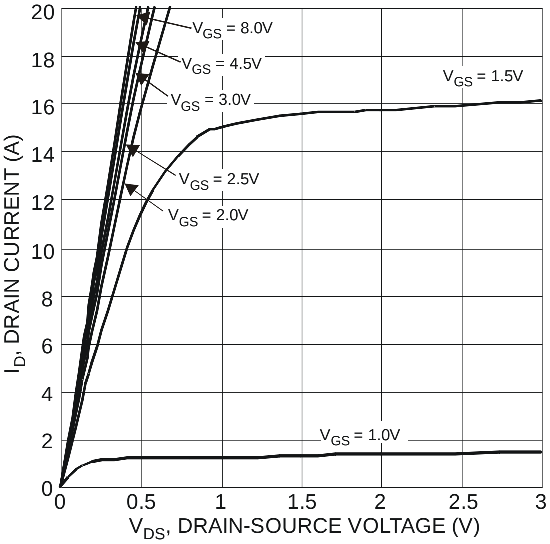


Figure 1 Typical Output Characteristics

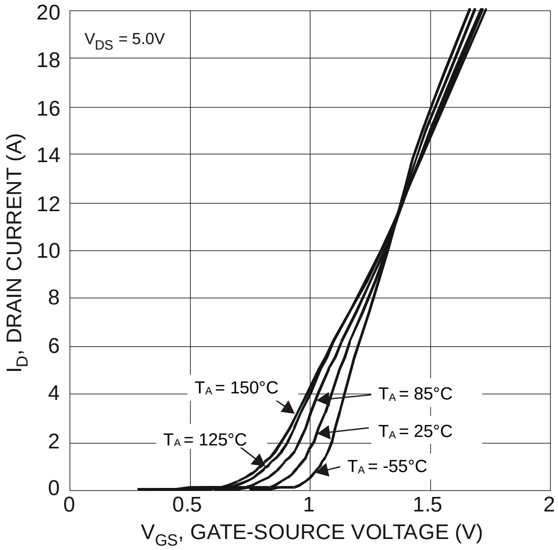


Figure 2 Typical Transfer Characteristics

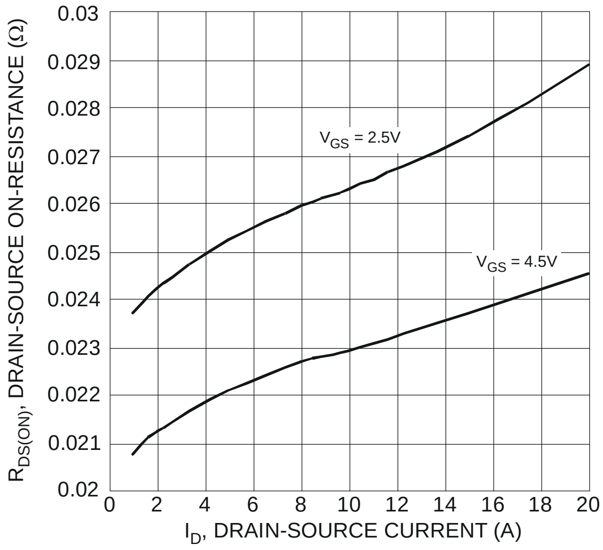


Figure 3 Typical On-Resistance vs.
Drain Current and Gate Voltage

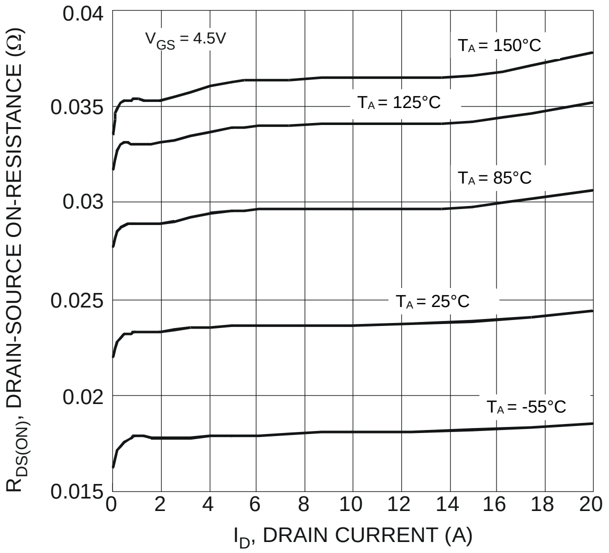


Figure 4 Typical On-Resistance vs.
Drain Current and Temperature

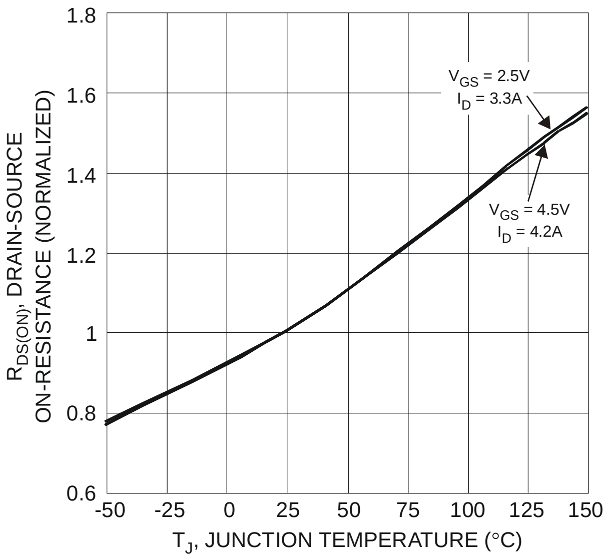


Figure 5 On-Resistance Variation with Temperature

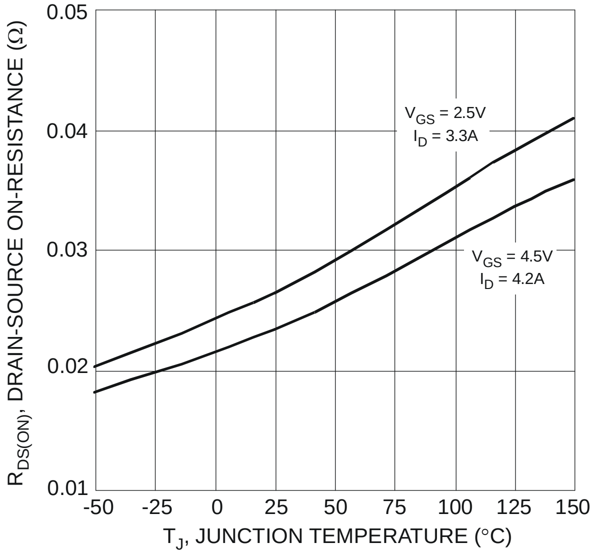


Figure 6 On-Resistance Variation with Temperature

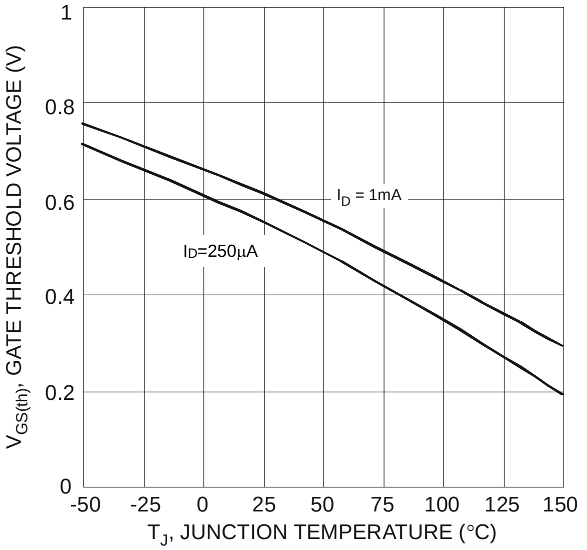


Figure 7 Gate Threshold Variation vs. Junction Temperature

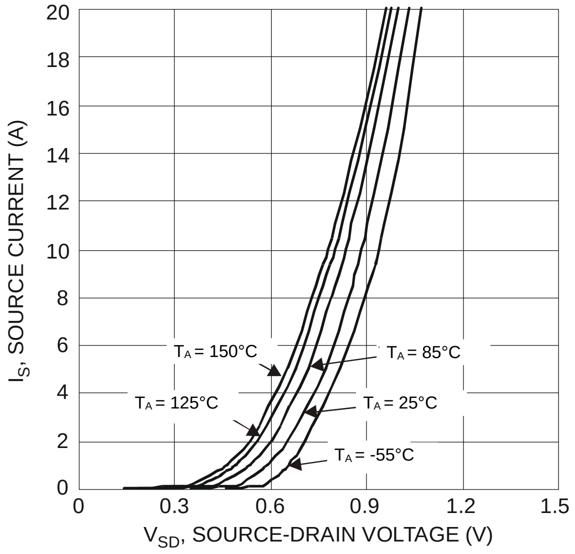


Figure 8 Diode Forward Voltage vs. Current

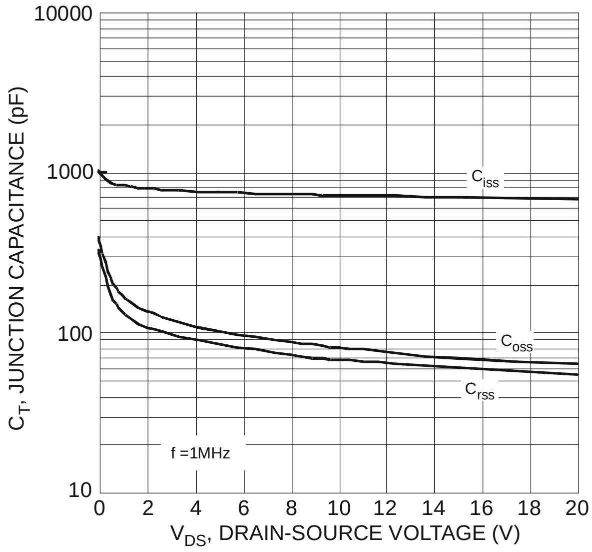


Figure 9 Typical Junction Capacitance

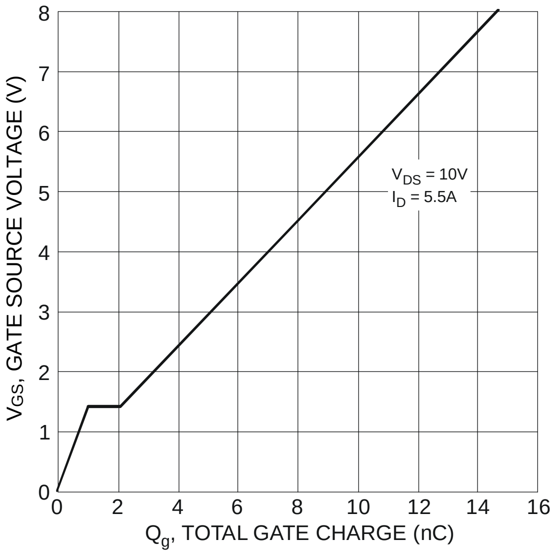


Figure 10 Gate Charge

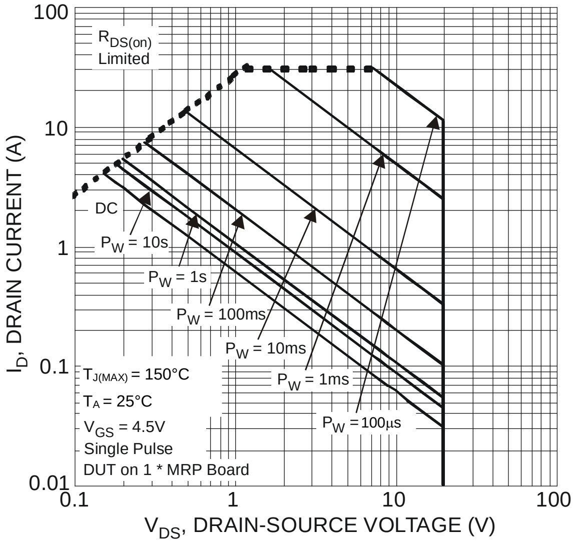


Figure 11 SOA, Safe Operation Area

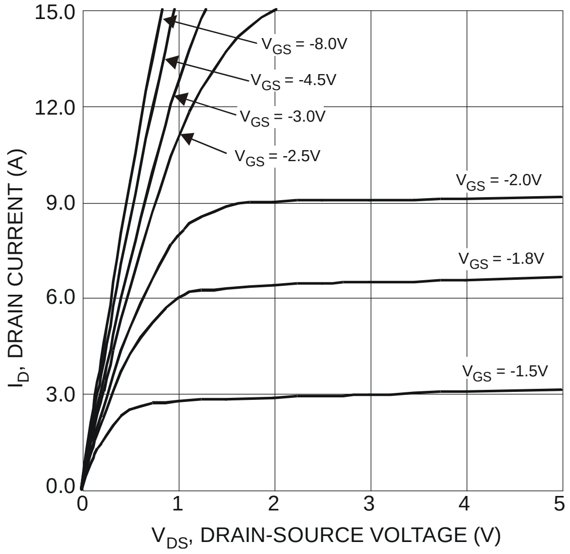


Figure 12 Typical Output Characteristics

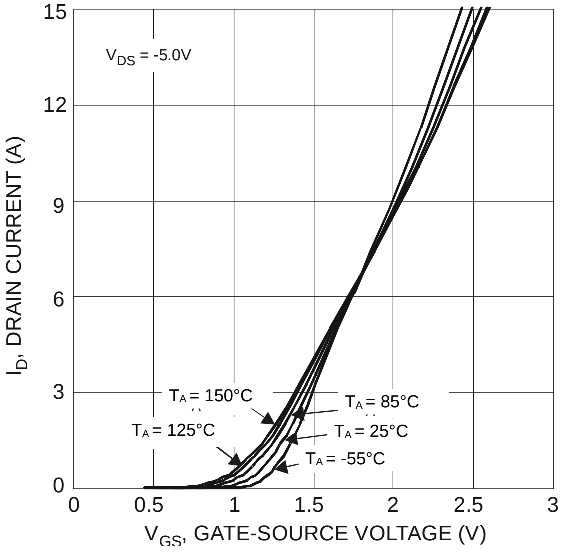


Figure 13 Typical Transfer Characteristics

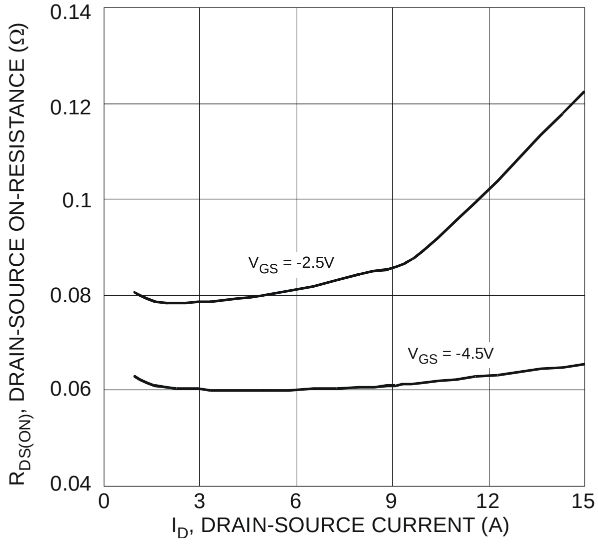


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

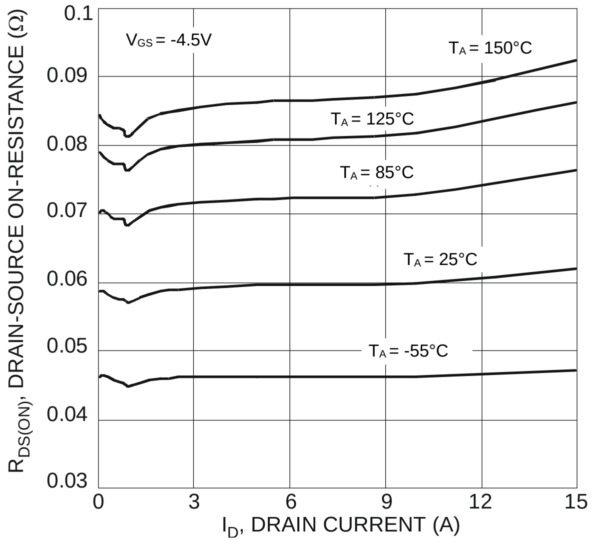


Figure 15 Typical On-Resistance vs. Drain Current and Temperature

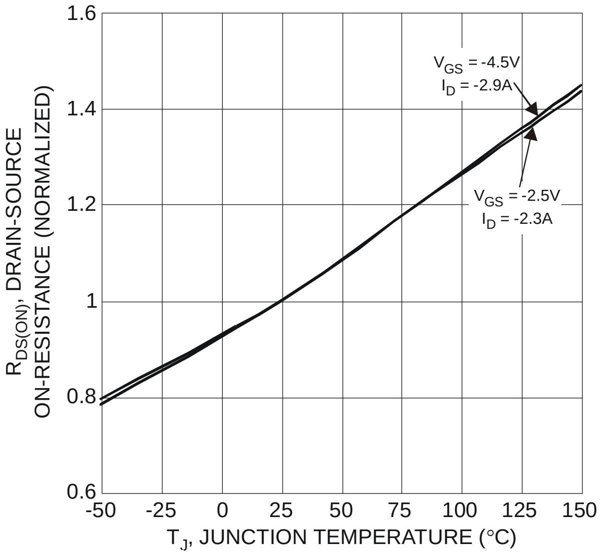


Figure 16 On-Resistance Variation with Temperature

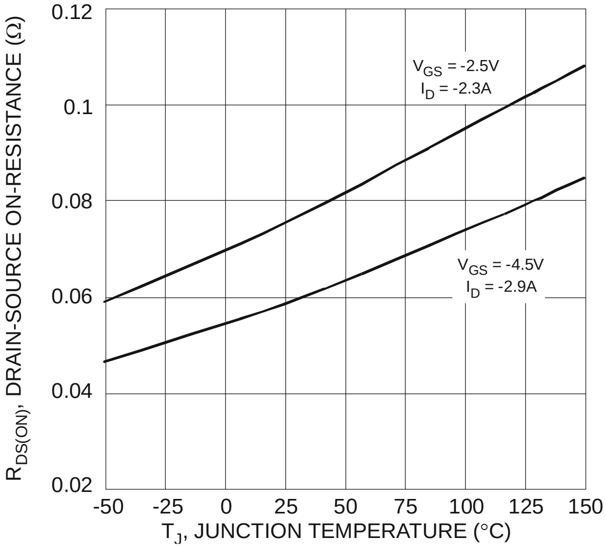


Figure 17 On-Resistance Variation with Temperature

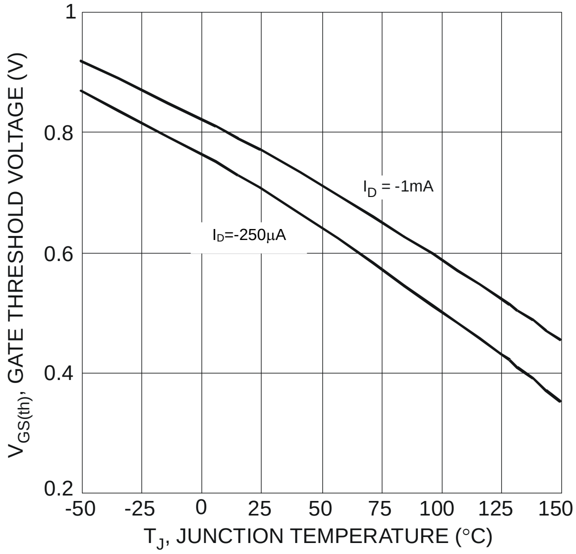


Figure 18 Gate Threshold Variation vs. Junction Temperature

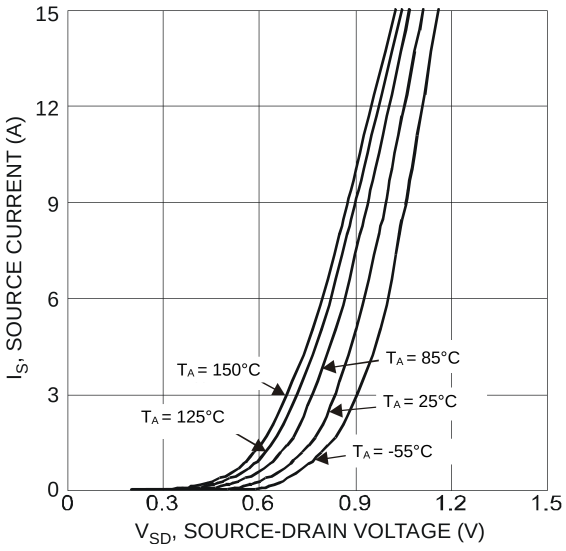


Figure 19 Diode Forward Voltage vs. Current

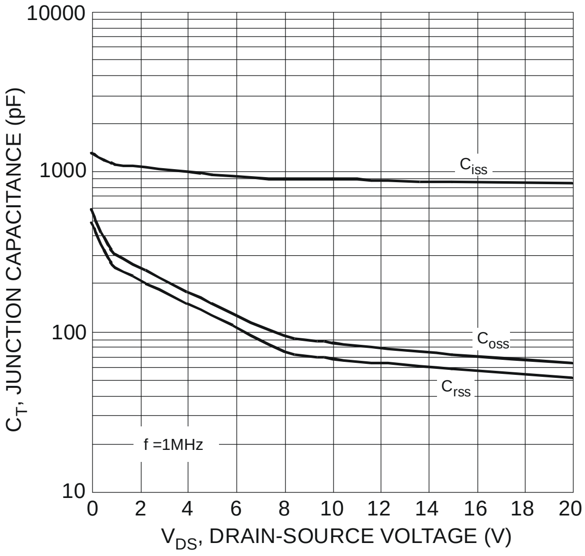


Figure 20 Typical Junction Capacitance

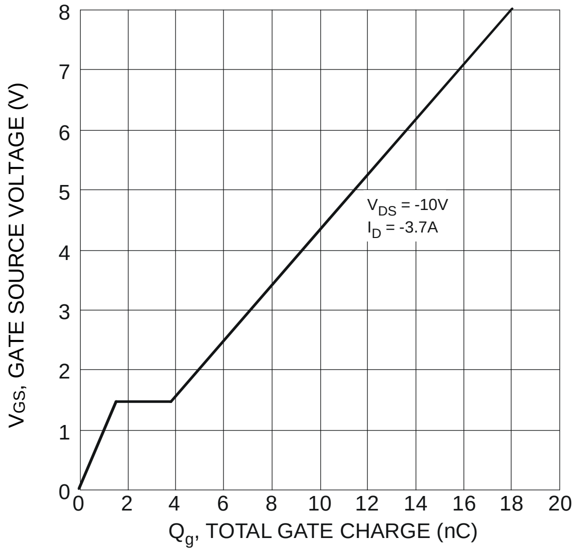


Figure 21 Gate Charge

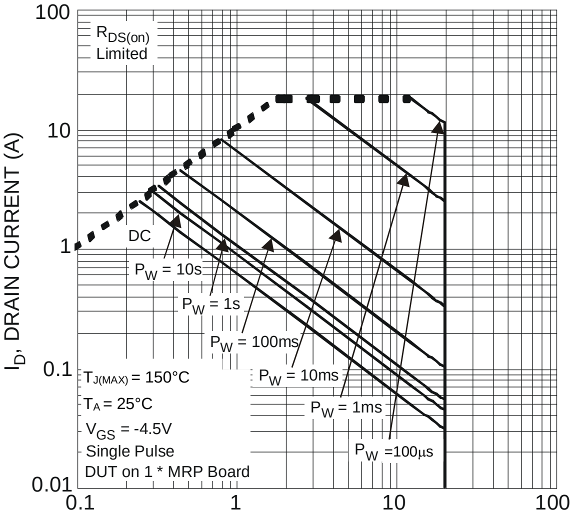


Figure 22 SOA, Safe Operation Area

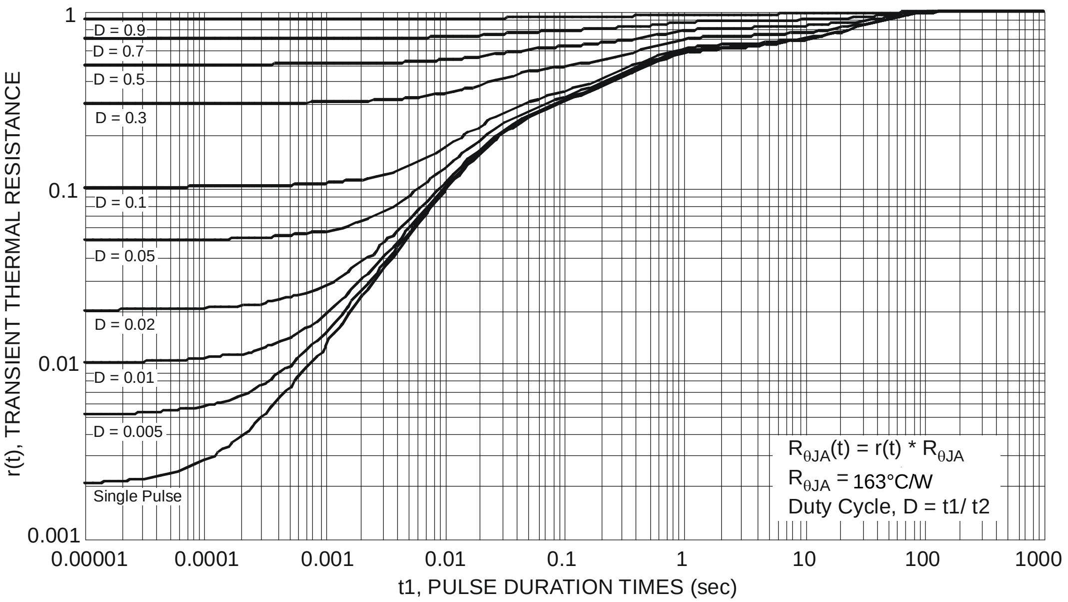


Figure 23 Transient Thermal Resistance

Package Outline Dimensions

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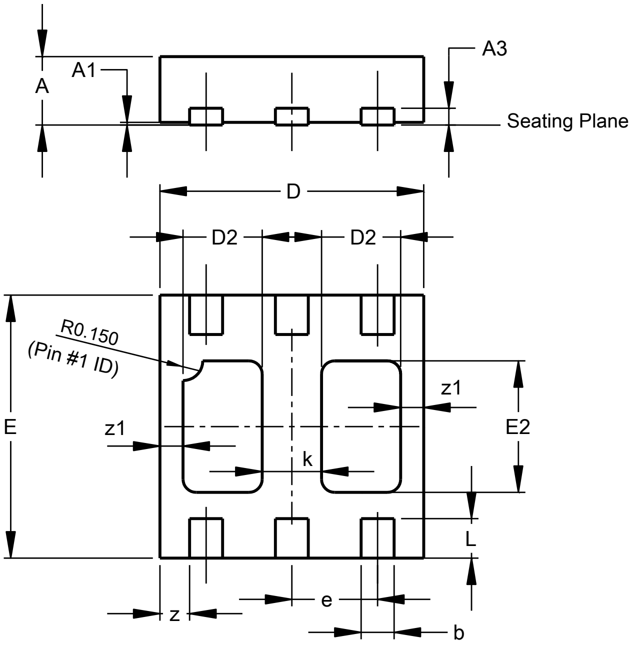
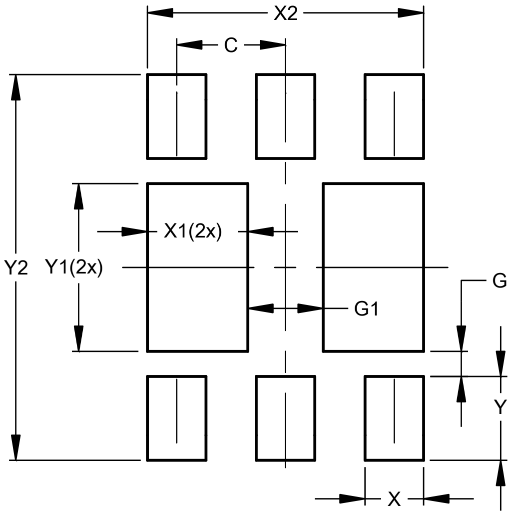
U-DFN2020-6 (Type B)



U-DFN2020-6 Type B			
Dim	**Min**	**Max**	**Typ**
A	0.545	0.605	0.575
A1	0.00	0.05	0.02
A3	-	-	0.13
b	0.20	0.30	0.25
D	1.95	2.075	2.00
D2	0.50	0.70	0.60
e	-	-	0.65
E	1.95	2.075	2.00
E2	0.90	1.10	1.00
k	-	-	0.45
L	0.25	0.35	0.30
z	-	-	0.225
z1	-	-	0.175
All Dimensions in mm			

Suggested Pad Layout

U-DFN2020-6 (Type B)



Dimensions	Value (in mm)
C	0.650
G	0.150
G1	0.450
X	0.350
X1	0.600
X2	1.650
Y	0.500
Y1	1.000
Y2	2.300