



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	12V	34mΩ @ V _{GS} = 4.5V	5.1A
		40mΩ @ V _{GS} = 2.5V	4.7A
		50mΩ @ V _{GS} = 1.8V	4.2A
		70mΩ @ V _{GS} = 1.5V	3.6A
Q2 P-Channel	-12V	59mΩ @ V _{GS} = -4.5V	-3.9A
		81mΩ @ V _{GS} = -2.5V	-3.3A
		115mΩ @ V _{GS} = -1.8V	-2.8A
		215mΩ @ V _{GS} = -1.5V	-2.0A

Description

This 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

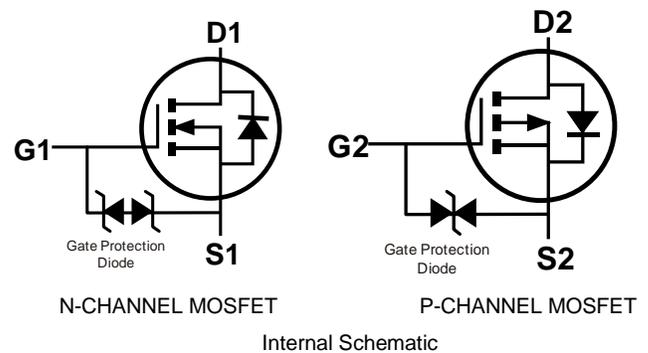
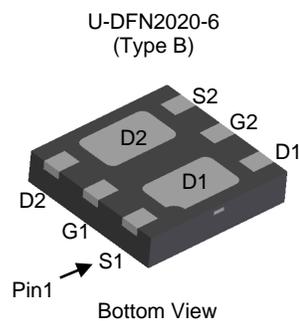
- Load Switch
- Power Management Functions
- Portable Power Adaptors

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 
- Terminals Connections: See Diagram Below
- Weight: 0.0065 grams (Approximate)



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

Characteristic			Symbol	Q1 N-CHANNEL	Q2 P-CHANNEL	Unit
Drain-Source Voltage			V _{DSS}	12	-12	V
Gate-Source Voltage			V _{GSS}	±8	±8	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	5.1 4.1	-3.9 -3.1	A
	t < 5s	T _A = +25°C T _A = +70°C	I _D	6.6 5.3	-5.0 -4.0	A
Maximum Continuous Body Diode Forward Current (Note 5)			I _S	2	-1.7	A
Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)			I _{DM}	35	-25	A

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	Steady State	P _D	1.36	W
	t < 5s		1.89	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R _{θJA}	92	°C/W
	t < 5s		66	
Thermal Resistance, Junction to Case (Note 5)		R _{θJC}	18	
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}	12	—	—	V	V _{GS} = 0V, I _D = 250μA	
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	—	—	1.0	μA	V _{DS} = 12V, 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)}	0.4	—	1	V	V _{DS} = V _{GS} , I _D = 250μA	
Static Drain-Source On-Resistance	R _{DS(ON)}	—	17	34	mΩ	V _{GS} = 4.5V, I _D = 4.6A	
		—	20	40		V _{GS} = 2.5V, I _D = 4.2A	
		—	24	50		V _{GS} = 1.8V, I _D = 3.8A	
		—	28	70		V _{GS} = 1.5V, I _D = 1.5A	
Diode Forward Voltage	V _{SD}	—	0.7	1.2	V	V _{GS} = 0V, I _S = 4.8A	
DYNAMIC CHARACTERISTICS (Note 7)							
Input Capacitance	C _{ISS}	—	1003	—	pF	V _{DS} = 6V, V _{GS} = 0V, f = 1.0MHz	
Output Capacitance	C _{OSS}	—	132	—	pF		
Reverse Transfer Capacitance	C _{RSS}	—	115	—	pF		
Gate Resistance	R _G	—	11.3	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz	
Total Gate Charge (V _{GS} = 4.5V)	Q _G	—	12.2	—	nC	V _{DS} = 10V, I _D = 6.8A	
Total Gate Charge (V _{GS} = 8V)		—	23.1	—	nC		
Gate-Source Charge		Q _{GS}	—	1.3	—		nC
Gate-Drain Charge		Q _{GD}	—	1.5	—		nC
Turn-On Delay Time	t _{D(ON)}	—	4.4	—	ns	V _{DD} = 6V, V _{GS} = 4.5V, R _L = 1.1Ω, R _G = 1Ω	
Turn-On Rise Time	t _R	—	7.4	—	ns		
Turn-Off Delay Time	t _{D(OFF)}	—	18.8	—	ns		
Turn-Off Fall Time	t _F	—	4.9	—	ns		
Body Diode Reverse Recovery Time	t _{RR}	—	7.6	—	ns	I _S = 5.4A, dI/dt = 100A/μs	
Body Diode Reverse Recovery Charge	Q _R	—	0.9	—	nC	I _S = 5.4A, dI/dt = 100A/μs	

Notes: 5. Device mounted on 1" × 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.

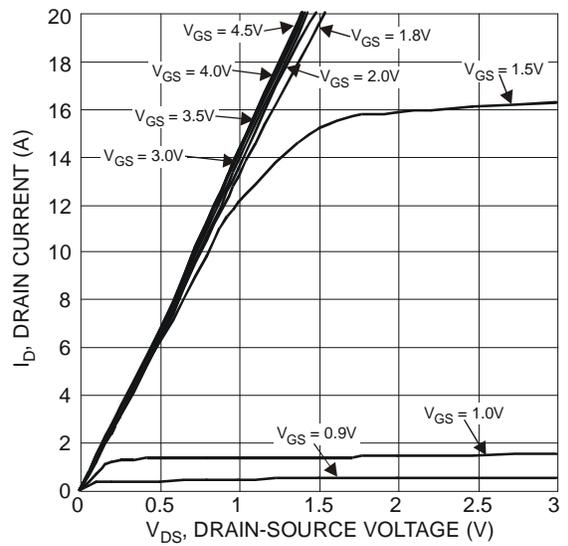


Figure 1 Typical Output Characteristics

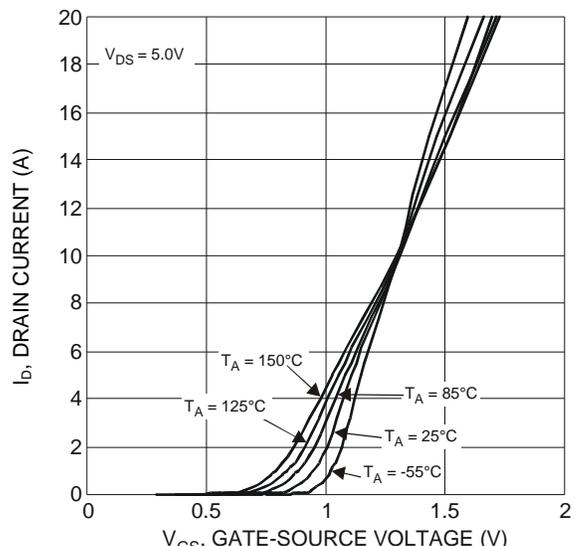


Figure 2 Typical Transfer Characteristics

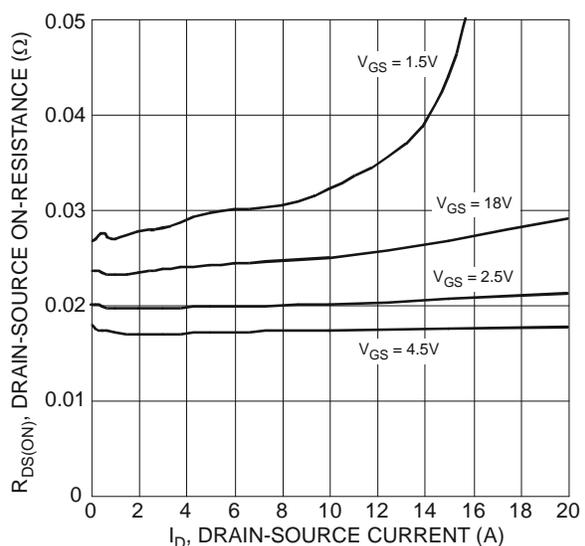


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

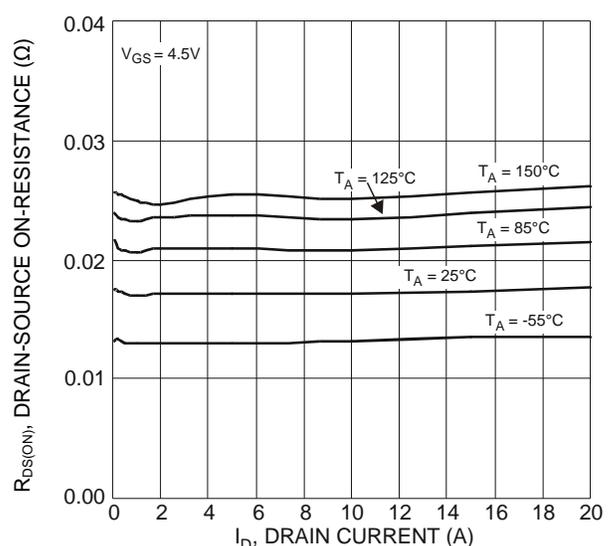


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

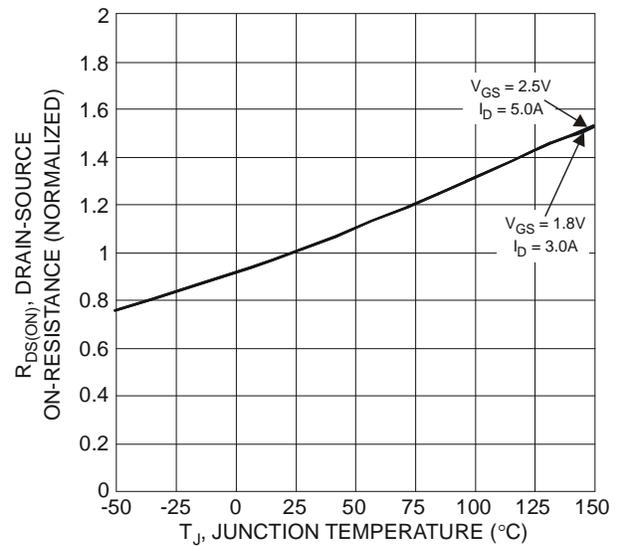


Figure 5 On-Resistance Variation with Temperature

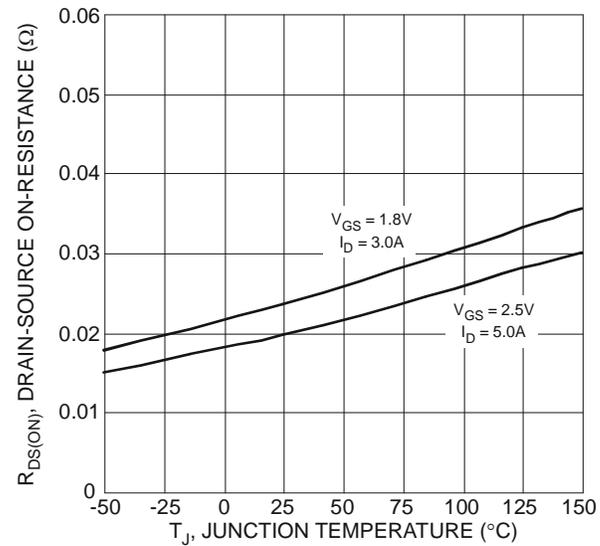


Figure 6 On-Resistance Variation with Temperature

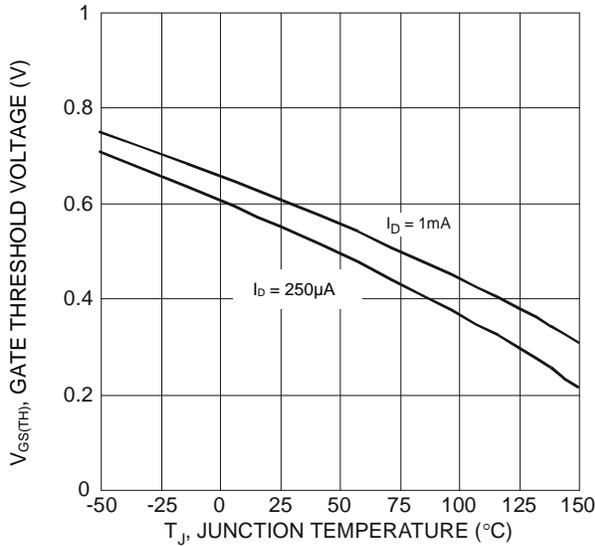


Figure 7 Gate Threshold Variation vs. Junction Temperature

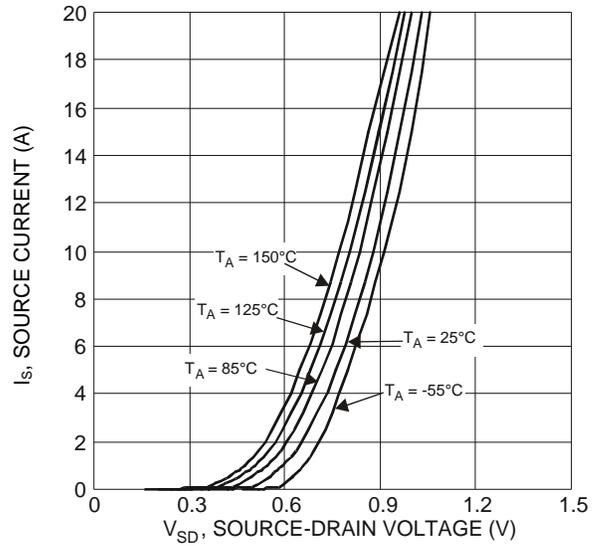


Figure 8 Diode Forward Voltage vs. Current

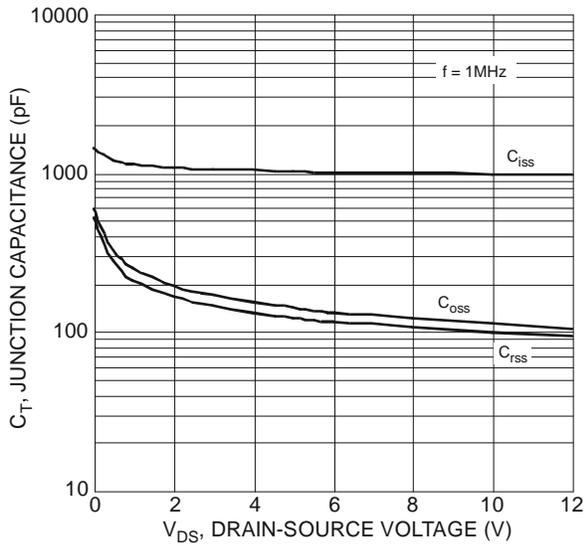


Figure 9 Typical Junction Capacitance

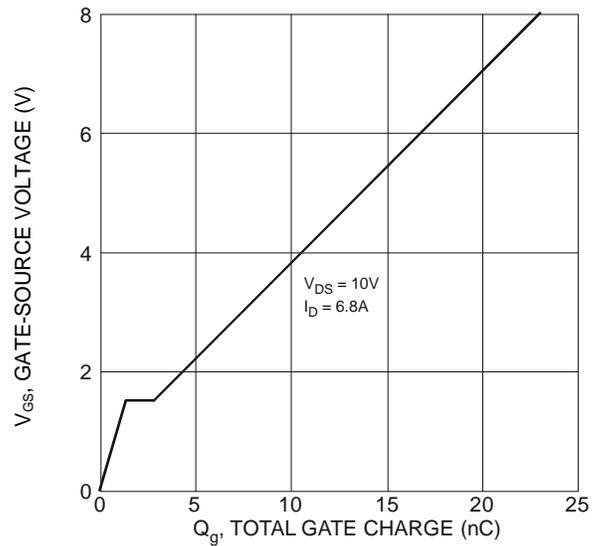


Figure 10 Gate Charge

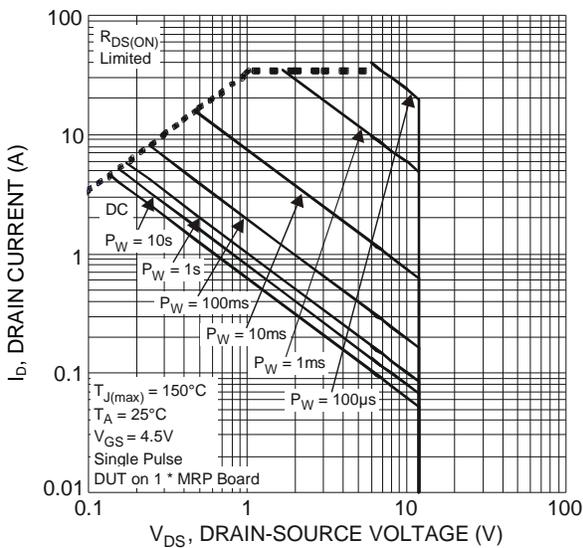


Figure 11 SOA Safe Operation Area

Electrical Characteristics Q2 P-CHANNEL (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	-12	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	I_{DSS}	—	—	-1.0	μA	$V_{DS} = -12V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	± 10	μA	$V_{GS} = \pm 8V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.4	—	-1	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	37	59	m Ω	$V_{GS} = -4.5V, I_D = -3.6A$
		—	48	81		$V_{GS} = -2.5V, I_D = -3.1A$
		—	69	115		$V_{GS} = -1.8V, I_D = -2.6A$
		—	88	215		$V_{GS} = -1.5V, I_D = -0.5A$
Diode Forward Voltage	V_{SD}	—	-0.7	-1.2	V	$V_{GS} = 0V, I_S = -3.7A$
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	1028	—	pF	$V_{DS} = -6V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	285	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	254	—	pF	
Gate Resistance	R_g	—	19.6	—	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$
Total Gate Charge ($V_{GS} = -4.5V$)	Q_g	—	13	—	nC	$V_{DS} = -10V, I_D = -4.7A$
Total Gate Charge ($V_{GS} = -8V$)		—	20.8	—	nC	
Gate-Source Charge	Q_{gs}	—	1.8	—	nC	
Gate-Drain Charge	Q_{gd}	—	4.5	—	nC	
Turn-On Delay Time	$t_{d(ON)}$	—	5.6	—	ns	$V_{DD} = -6V, V_{GS} = -4.5V,$ $R_L = 1.6\Omega, R_G = 1\Omega$
Turn-On Rise Time	t_r	—	12.8	—	ns	
Turn-Off Delay Time	$t_{d(OFF)}$	—	30.7	—	ns	
Turn-Off Fall Time	t_f	—	25.4	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	31.6	—	ns	$I_S = -3.6A, dI/dt = 100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{RR}	—	7.8	—	nC	$I_S = -3.6A, dI/dt = 100A/\mu s$

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

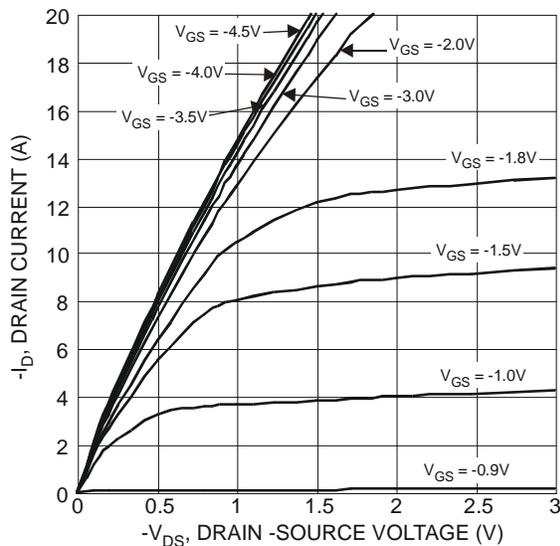


Figure 12 Typical Output Characteristics

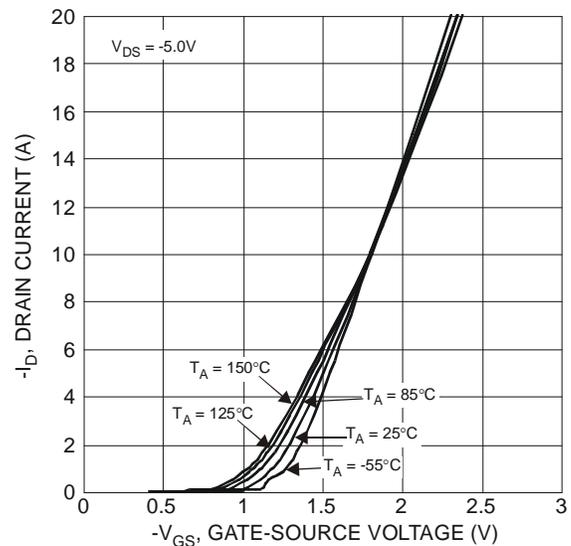


Figure 13 Typical Transfer Characteristics

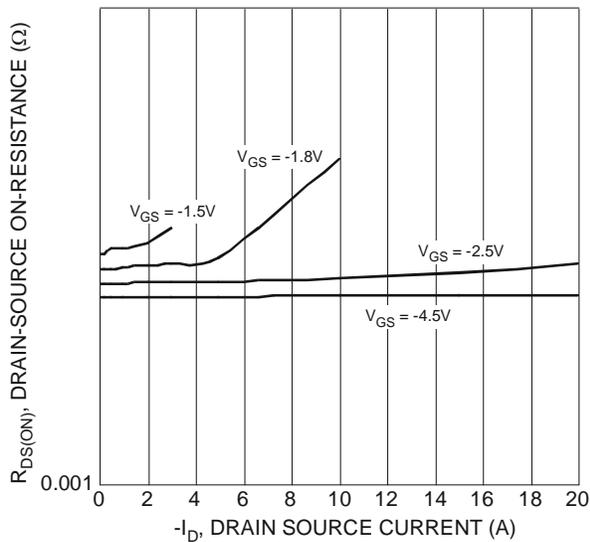


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

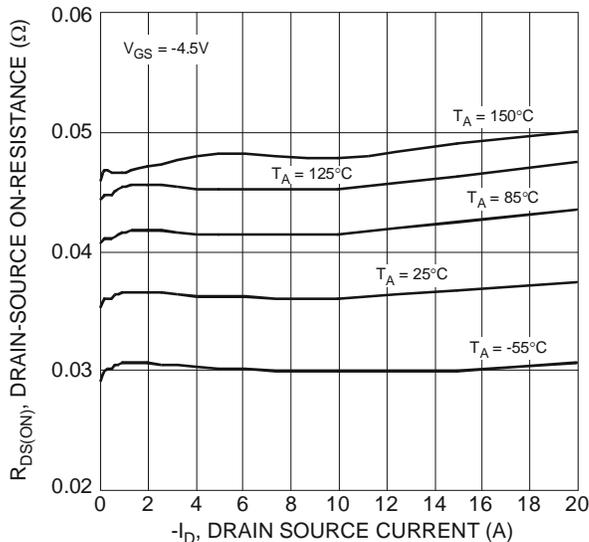


Figure 15 Typical On-Resistance vs. Drain Current and Temperature

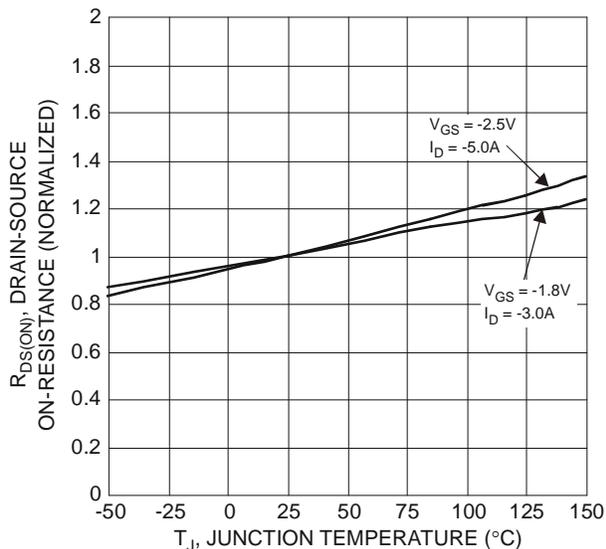


Figure 16 On-Resistance Variation with Temperature

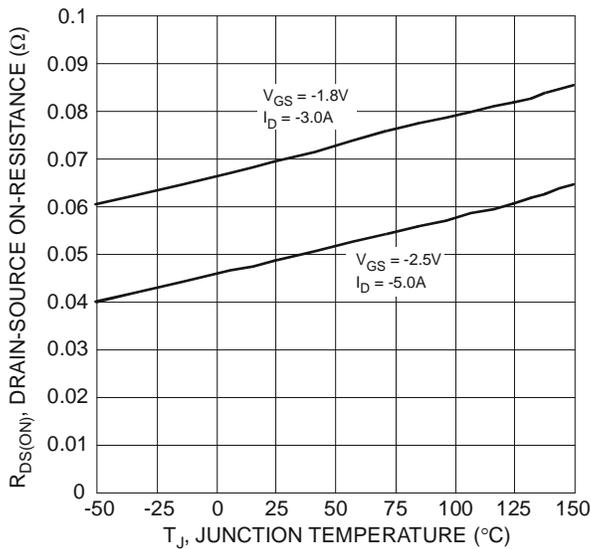


Figure 17 On-Resistance Variation with Temperature

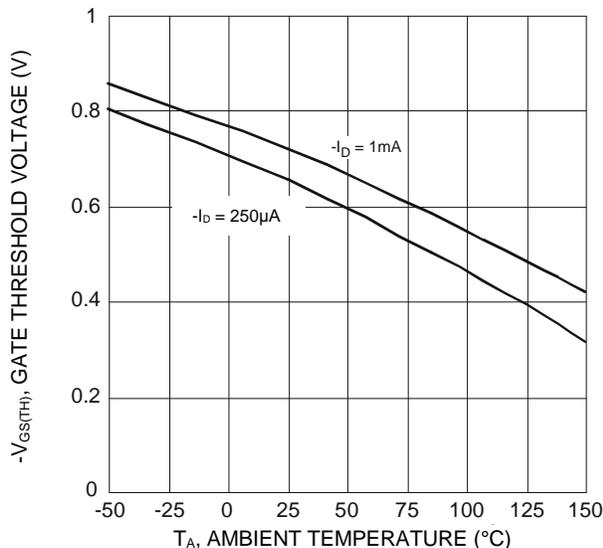


Figure 18 Gate Threshold Variation vs. Ambient Temperature

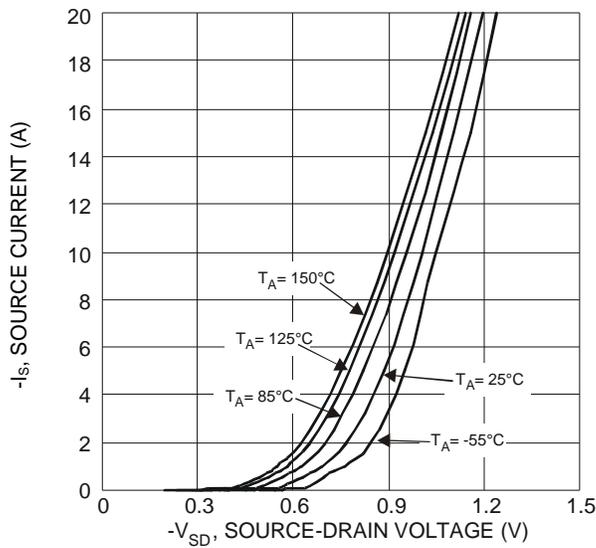
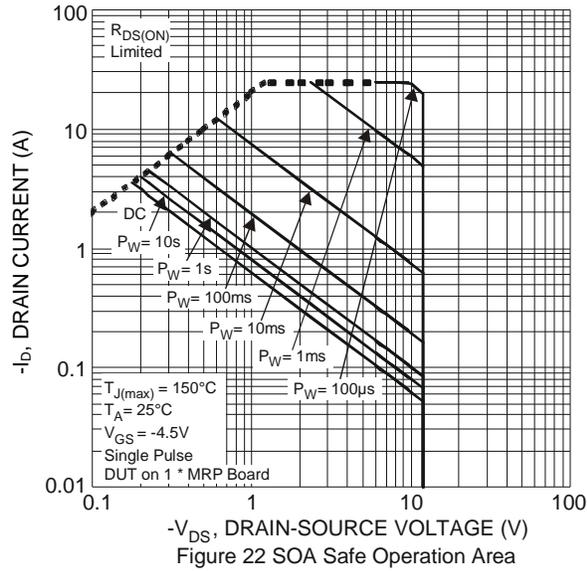
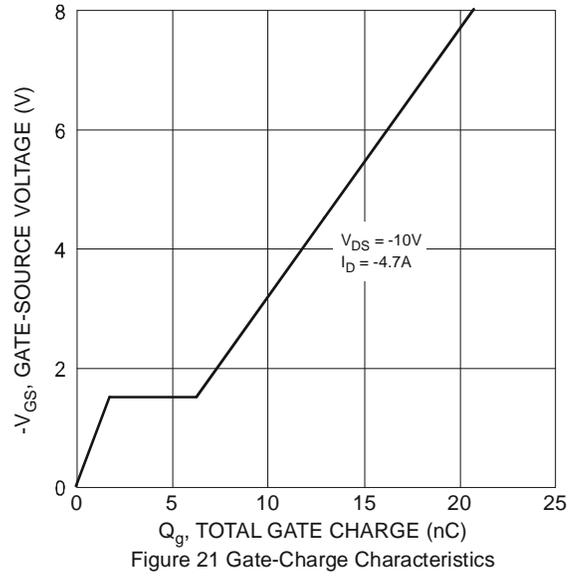
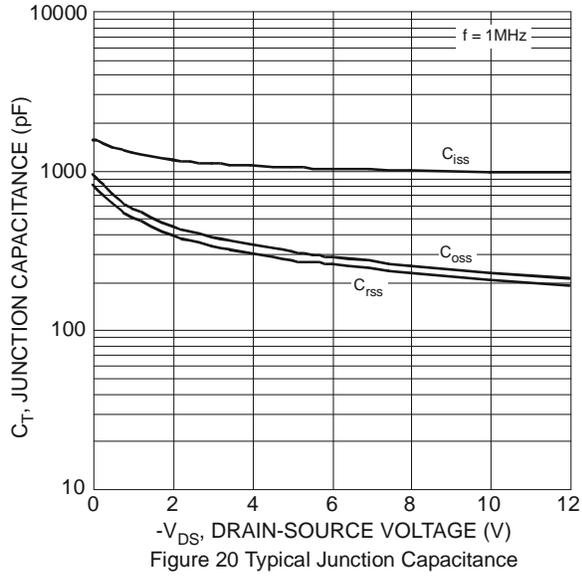


Figure 19 Diode Forward Voltage vs. Current



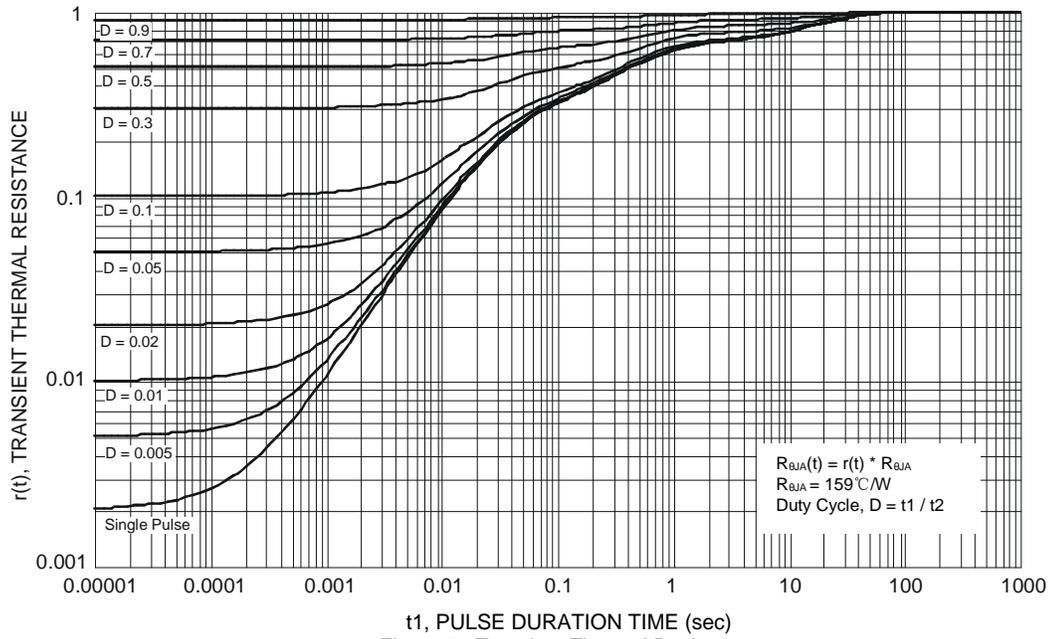
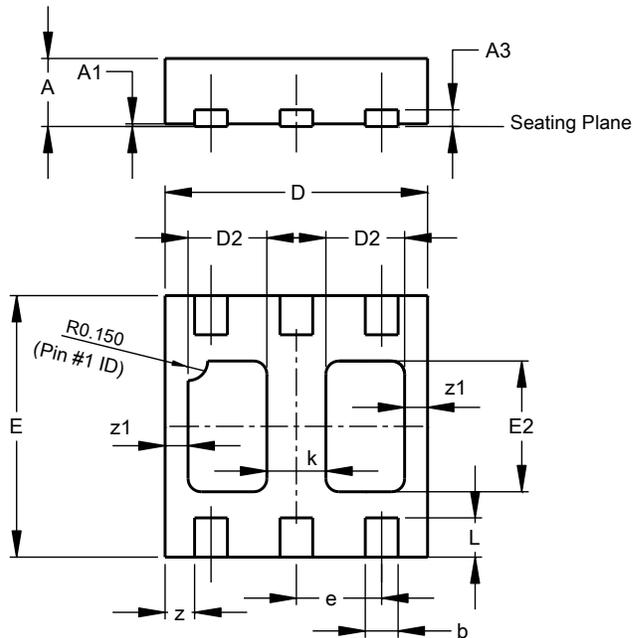


Figure 23 Transient Thermal Resistance

Package Outline Dimensions

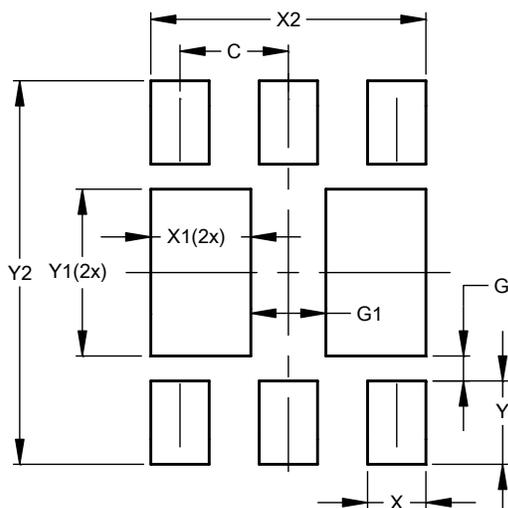
U-DFN2020-6 (Type B)



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