



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



企业QQ二维码

Product Summary

Device	BV _{DSS}	R _{DS(ON)} Max	I _D Max T _A = +25°C
Q1 N-Channel	20V	35mΩ @ V _{GS} = 4.5V	4.6A
		43mΩ @ V _{GS} = 2.5V	4.1A
Q2 P-Channel	-20V	75mΩ @ V _{GS} = -4.5V	-3.1A
		110mΩ @ V _{GS} = -2.5V	-2.6A

Features

- PCB Footprint of 4mm²
- Low On-Resistance
- Low Input Capacitance
- Low Profile, 0.6mm Maximum Height
-

Description and Applications

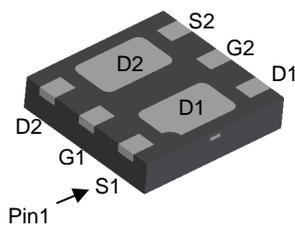
This MOSFET is designed to minimize the on-state resistance (R_{DS(ON)}) yet maintain superior switching performance, which makes it ideal for high-efficiency power management applications.

- Load switches
- Power management functions
- Portable power adaptors

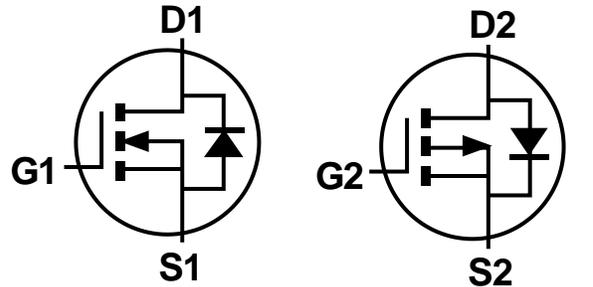
Mechanical Data

- Package: U-DFN2020-6
- Package 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 Lead-Frame. Solderable per MIL-STD-202, Method 208④
- Terminals Connections: See Diagram Below
- Weight: 0.0065 grams (Approximate)

U-DFN2020-6 (Type B)



Bottom View



N-Channel MOSFET

P-Channel MOSFET

Internal Schematic

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, 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 6) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	I_D	4.6	-3.1	A
		$T_A = +70^\circ\text{C}$		3.7	-2.5	
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	1.1	-1.05	A
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	24	-15	A

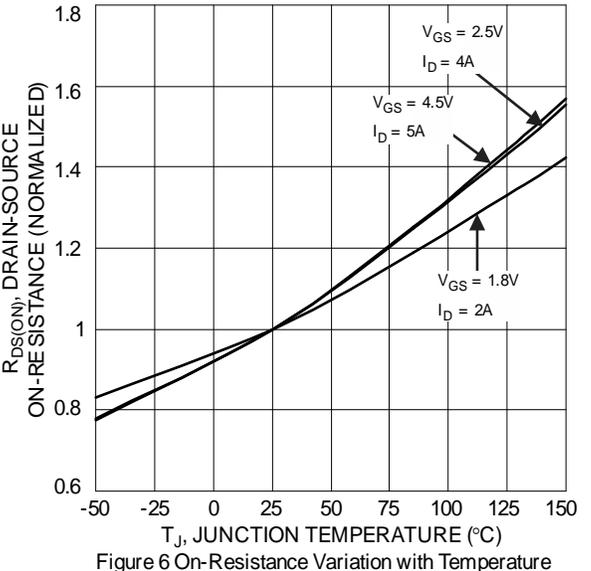
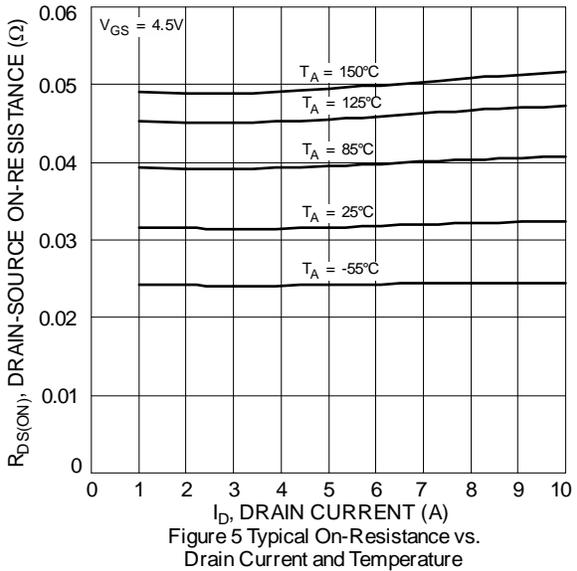
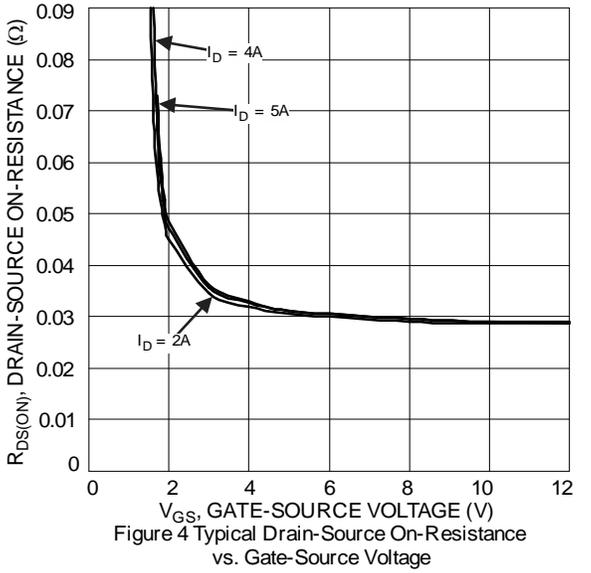
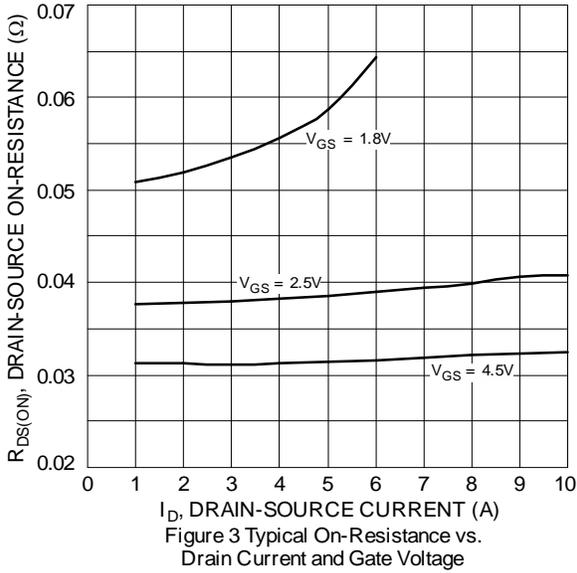
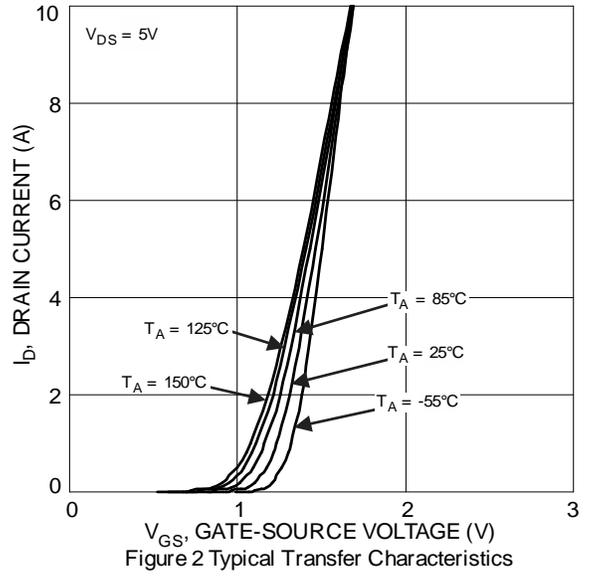
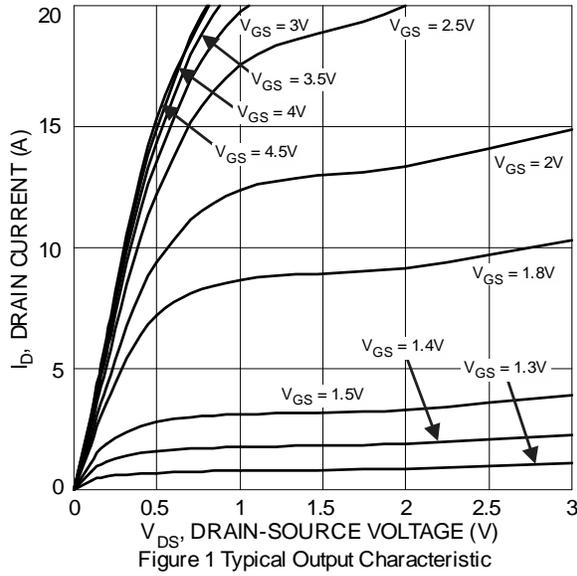
Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	P_D	0.82	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	153	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	1.14	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	110	$^\circ\text{C/W}$
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

Electrical Characteristics Q1 N-CHANNEL (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	I_{DSS}	—	—	1.0	μA	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 12\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.4	—	1.0	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	24	35	m Ω	$V_{GS} = 4.5\text{V}, I_D = 5\text{A}$
			30	43		$V_{GS} = 2.5\text{V}, I_D = 4\text{A}$
			44	56		$V_{GS} = 1.8\text{V}, I_D = 2\text{A}$
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	$V_{GS} = 0\text{V}, I_S = 1\text{A}$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	369	—	pF	$V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	54	—		
Reverse Transfer Capacitance	C_{rss}	—	32	—		
Gate Resistance	R_g	—	4.1	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_g	—	3.6	—	nC	$V_{DS} = 10\text{V}, I_D = 6\text{A}$
Total Gate Charge ($V_{GS} = 10\text{V}$)	Q_g	—	7.7	—		
Gate-Source Charge	Q_{gs}	—	0.4	—		
Gate-Drain Charge	Q_{gd}	—	1.0	—		
Turn-On Delay Time	$t_{D(ON)}$	—	2.6	—	ns	$V_{DS} = 10\text{V}, V_{GS} = 4.5\text{V}, R_g = 6\Omega, R_L = 10\Omega, I_D = 6\text{A}$
Turn-On Rise Time	t_r	—	3.0	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	12.5	—		
Turn-Off Fall Time	t_f	—	3.6	—		
Reverse Recovery Time	t_{RR}	—	6.0	—	ns	$I_F = 1\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge	Q_{RR}	—	0.9	—	nC	$I_F = 1\text{A}, di/dt = 100\text{A}/\mu\text{s}$

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



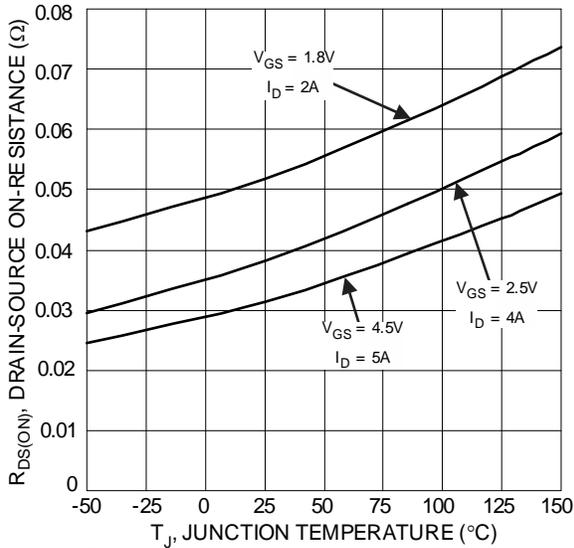


Figure 7 On-Resistance Variation with Temperature

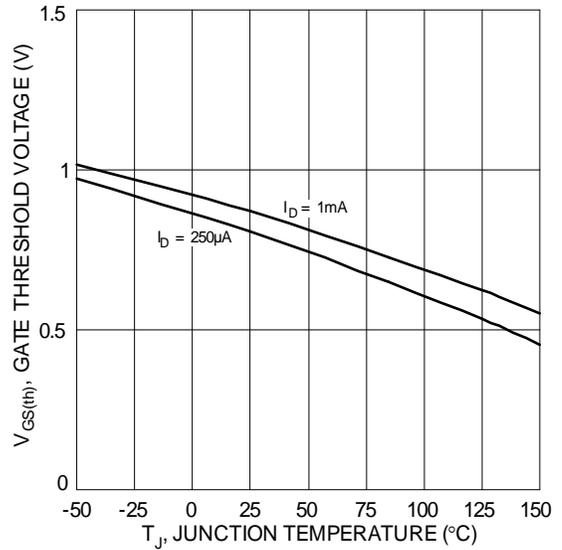


Figure 8 Gate Threshold Variation vs. Junction Temperature

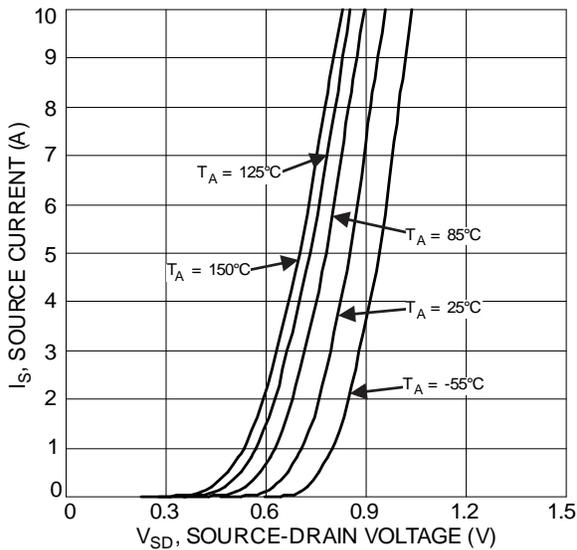


Figure 9 Diode Forward Voltage vs. Current

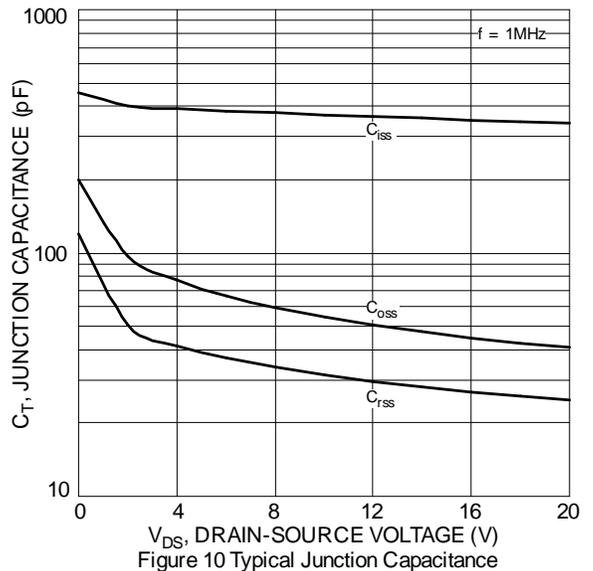


Figure 10 Typical Junction Capacitance

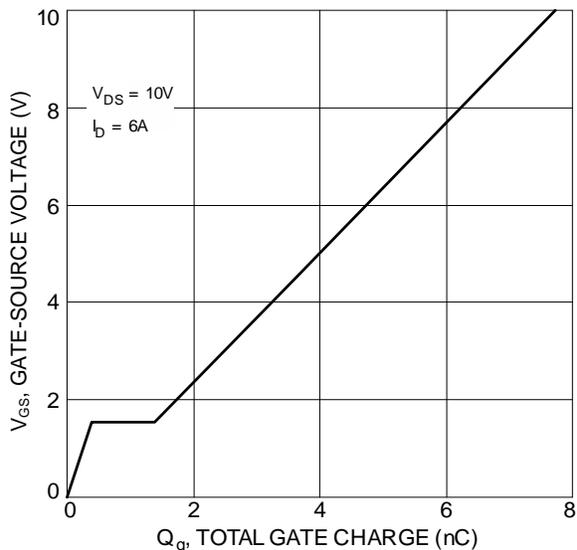


Figure 11 Gate Charge

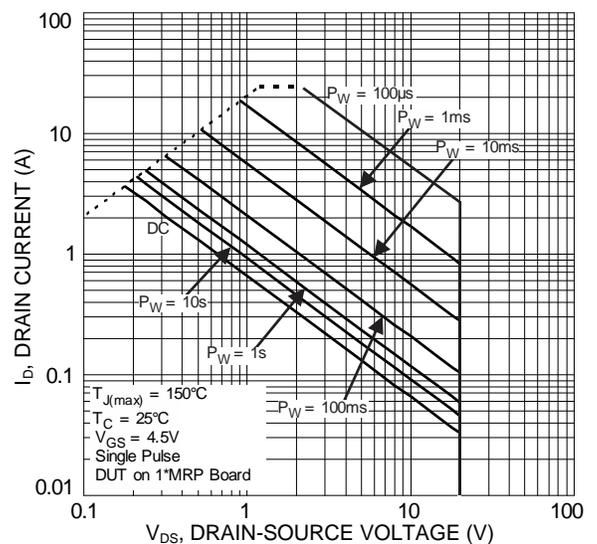
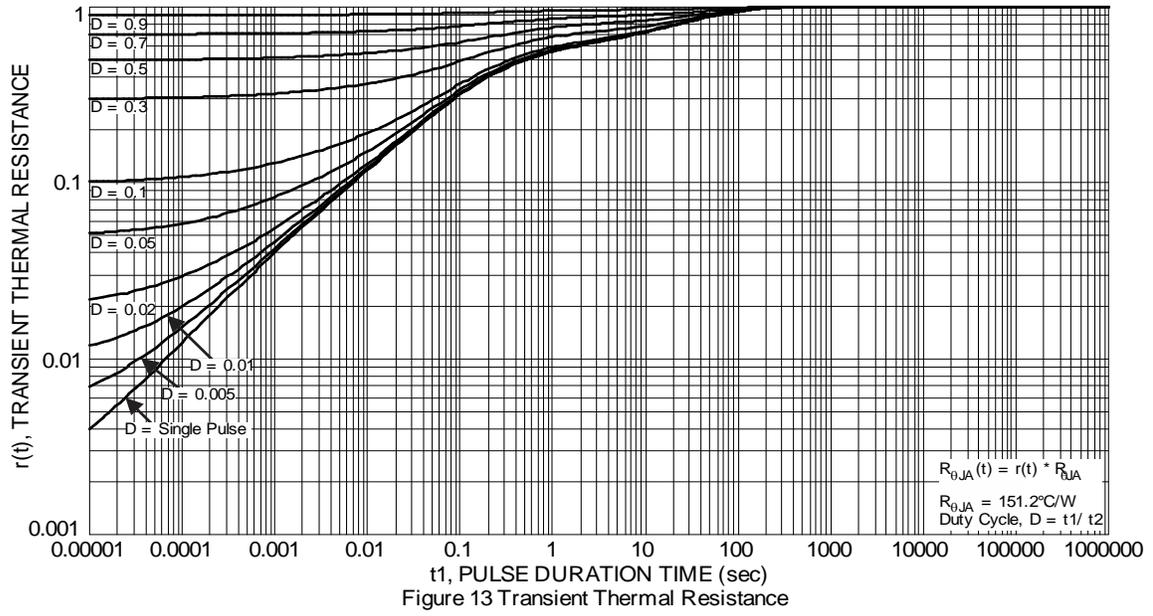


Figure 12 SOA, Safe Operation Area



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 7)							
Drain-Source Breakdown Voltage	BV_{DSS}	-20	—	—	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	$V_{DS} = -20V, V_{GS} = 0V$	
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 12V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 7)							
Gate Threshold Voltage	$V_{GS(TH)}$	-0.45	—	-1.0	V	$V_{DS} = V_{GS}, I_D = -250\mu A$	
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	57	75	m Ω	$V_{GS} = -4.5V, I_D = -3.5A$	
		—	73	110		$V_{GS} = -2.5V, I_D = -3.0A$	
		—	105	168		$V_{GS} = -1.8V, I_D = -2.0A$	
Diode Forward Voltage	V_{SD}	—	-0.7	-1.2	V	$V_{GS} = 0V, I_S = -1.0A$	
DYNAMIC CHARACTERISTICS (Note 8)							
Input Capacitance	C_{iss}	—	440	—	pF	$V_{DS} = -10V, V_{GS} = 0V,$ $f = 1.0MHz$	
Output Capacitance	C_{oss}	—	60	—	pF		
Reverse Transfer Capacitance	C_{rss}	—	48	—	pF		
Gate Resistance	R_g	—	8.5	—	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$	
Total Gate Charge ($V_{GS} = -4.5V$)	Q_g	—	5.9	—	nC	$V_{DS} = -4V, I_D = -3.5A$	
Total Gate Charge ($V_{GS} = -8V$)		—	12.7	—	nC		
Gate-Source Charge		Q_{gs}	—	0.6	—		nC
Gate-Drain Charge		Q_{gd}	—	2.1	—		nC
Turn-On Delay Time	$t_{D(ON)}$	—	3.2	—	ns	$V_{DS} = -4V, V_{GS} = -4.5V,$ $R_L = 4\Omega, R_g = 6\Omega$	
Turn-On Rise Time	t_R	—	7.8	—	ns		
Turn-Off Delay Time	$t_{D(OFF)}$	—	31	—	ns		
Turn-Off Fall Time	t_F	—	18	—	ns		
Body Diode Reverse Recovery Time	t_{RR}	—	10.5	—	ns	$I_S = -2.0A, dI/dt = 100A/\mu s$	
Body Diode Reverse Recovery Charge	Q_{RR}	—	3.0	—	nC	$I_S = -2.0A, dI/dt = 100A/\mu s$	

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

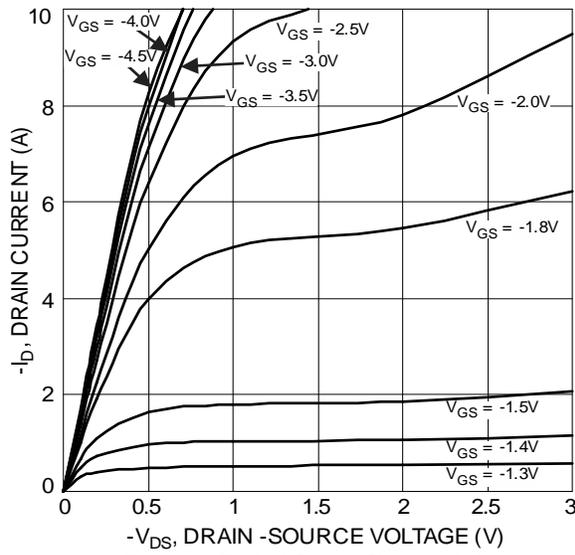


Figure 14 Typical Output Characteristics

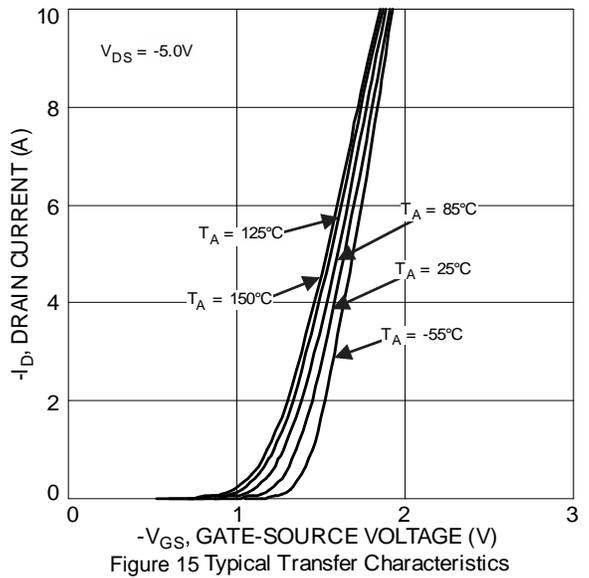


Figure 15 Typical Transfer Characteristics

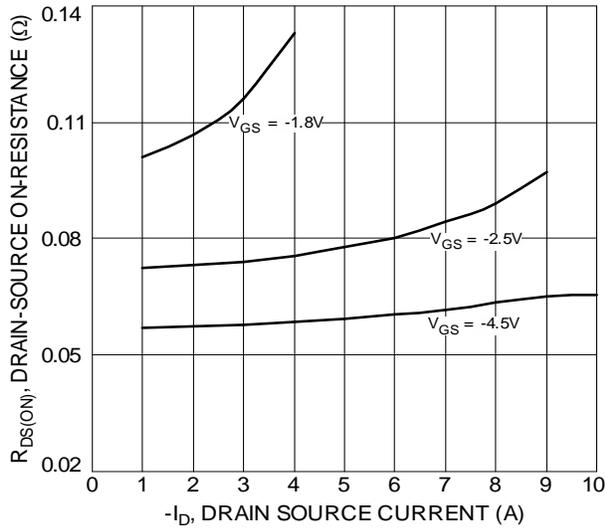


Figure 16 Typical On-Resistance vs. Drain Current and Gate Voltage

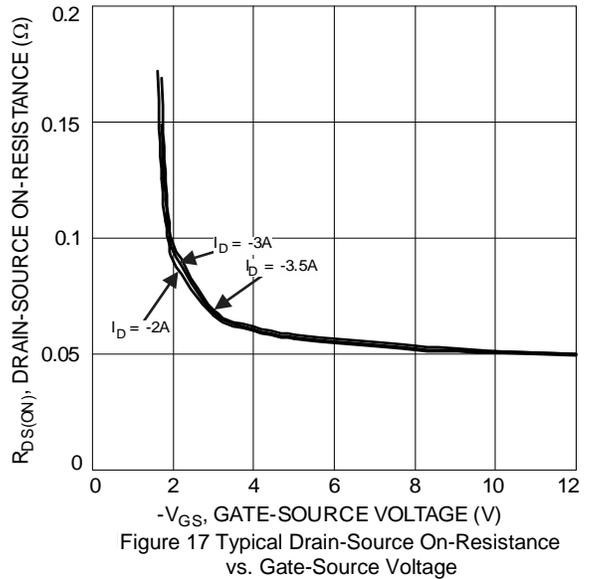


Figure 17 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

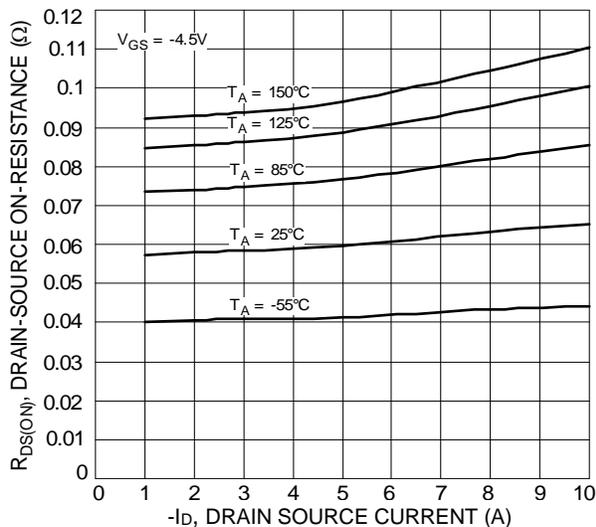


Figure 18 Typical On-Resistance vs. Drain Current and Temperature

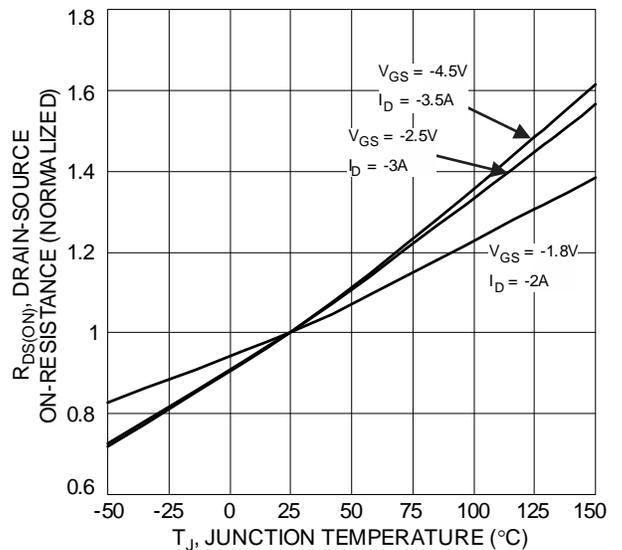


Figure 19 On-Resistance Variation with Temperature

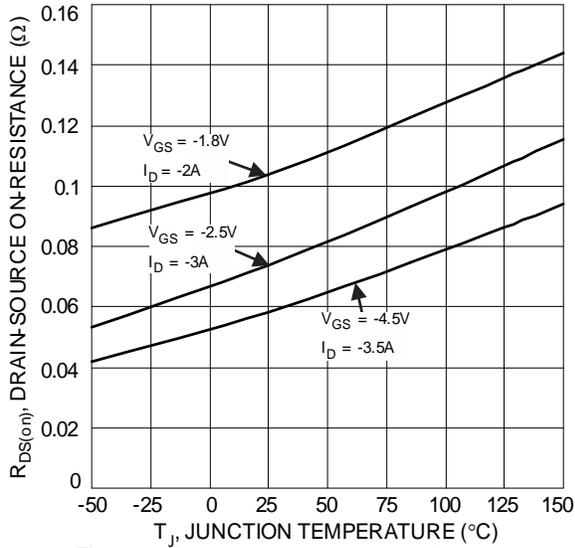


Figure 20 On-Resistance Variation with Temperature

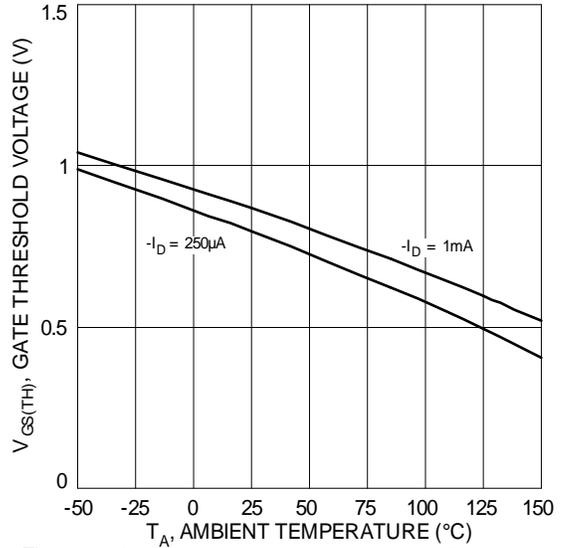


Figure 21 Gate Threshold Variation vs. Ambient Temperature

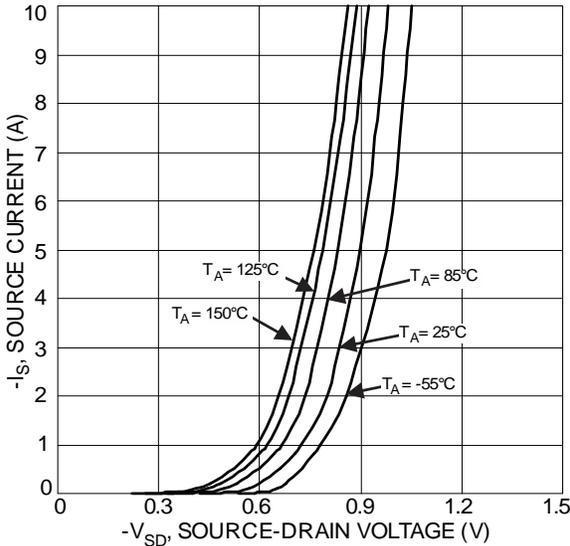


Figure 22 Diodes Forward Voltage vs. Current

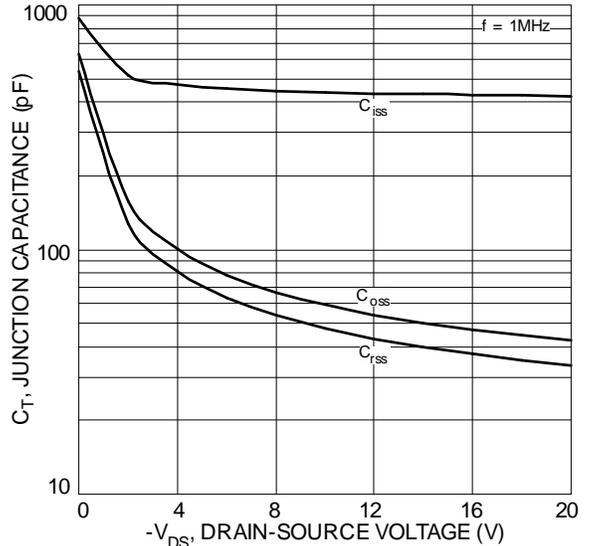


Figure 23 Typical Junction Capacitance

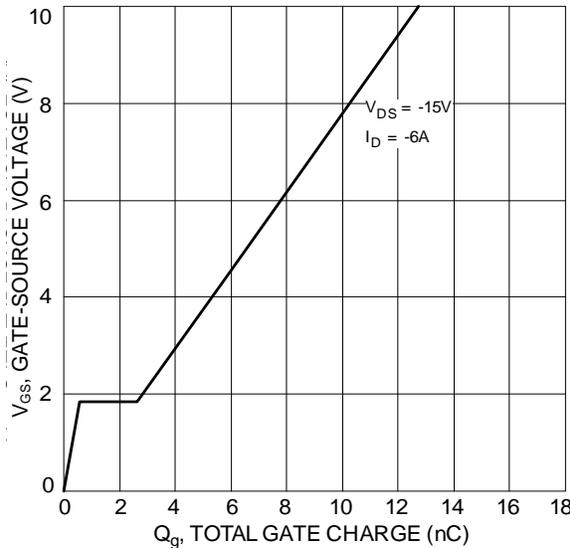


Figure 24 Gate Charge

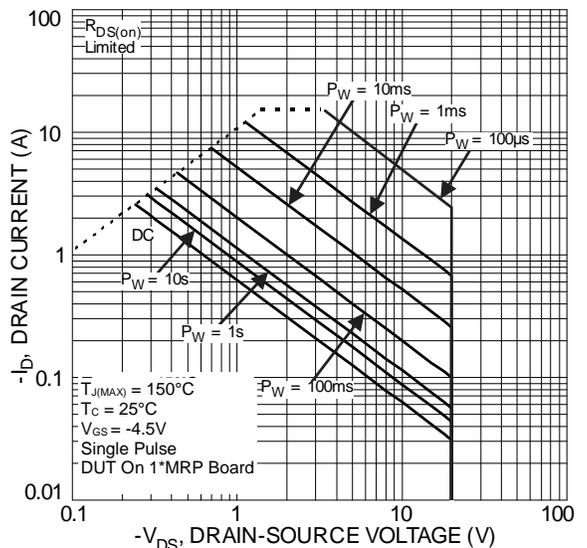
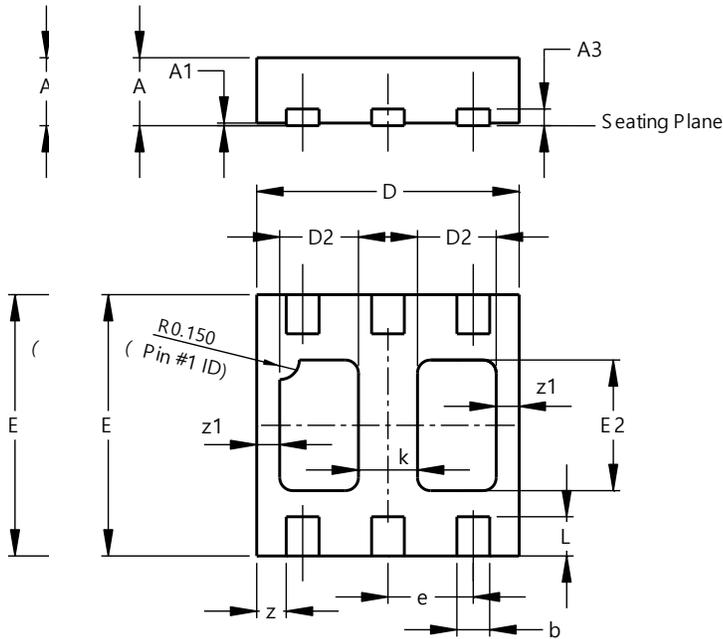


Figure 25 SOA, Safe Operation Area

Package Outline Dimensions

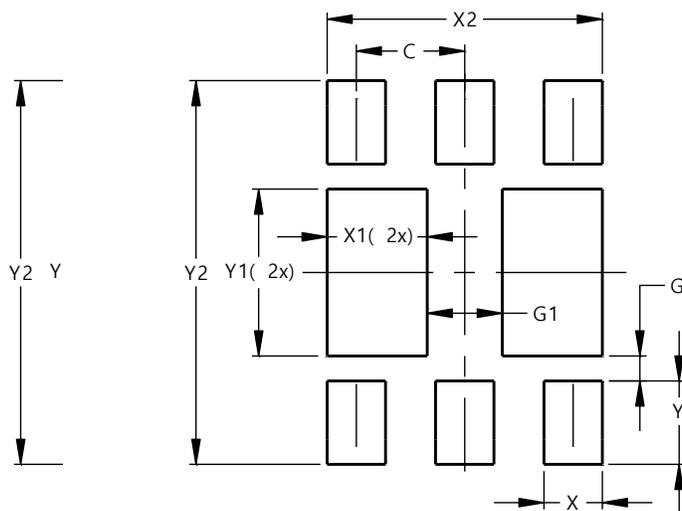
U-DFN2020-6 (Type B)



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