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

BV_{DSS}	**$R_{DS(ON)}$ Max**	**I_D Max T_A = +25°C**
-20V	16mΩ @ V_{GS} = -4.5V	-9.0A
	22mΩ @ V_{GS} = -2.5V	-7.7A

Features and Benefits

- 0.6mm Profile – Ideal for Low Profile Applications
- Low Gate Threshold Voltage
- Low On-Resistance
- ESD Protected Gate

Description and Applications

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.

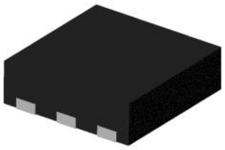
- Battery Management Application
- Power Management Functions
- DC-DC Converters

Mechanical Data

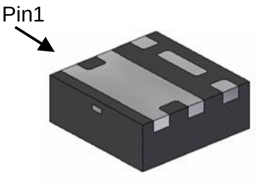
- Case: U-DFN2020-6
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe. Solderable per MIL-STD-202, Method 208 ⓔ4
- Weight: 0.007 grams (Approximate)

U-DFN2020-6 (Type E)

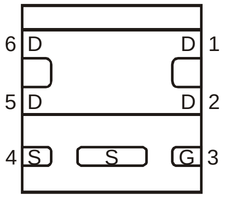
ESD PROTECTED



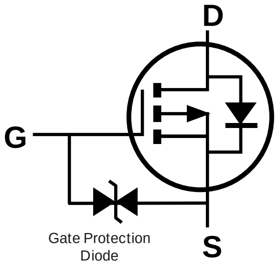
Top View



Bottom View



Pin Out
Bottom View



Equivalent Circuit

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	±10	V
Continuous Drain Current (Note 6) V_{GS} = -4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	-9.0 -7.2	A
	t<10s	T_A = +25°C T_A = +70°C	I_D	-11.1 -8.9	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	-60	A
Continuous Source-Drain Diode Current (Note 6)		T_A = +25°C	I_S	-2.4	A
Avalanche Current (Note 7) L = 0.1mH			I_{AS}	-27	A
Avalanche Energy (Note 7) L = 0.1mH			E_{AS}	38	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	0.76	W
	T_A = +70°C		0.48	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	165	°C/W
	t<10s		116	
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	1.90	W
	T_A = +70°C		1.20	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	67	°C/W
	t<10s		47	
Thermal Resistance, Junction to Case (Note 6)	Steady state	$R_{\theta JC}$	18	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Electrical Characteristics (@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}	-20	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	-1	µA	V_{DS} = -20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	µA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.35	—	-1.0	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	12	16	mΩ	V_{GS} = -4.5V, I_D = -7.0A
			15	22		V_{GS} = -2.5V, I_D = -5.0A
			19	40		V_{GS} = -1.8V, I_D = -3.0A
			21	80		V_{GS} = -1.5V, I_D = -1.0A
Diode Forward Voltage	V_{SD}	—	-0.8	-1.2	V	V_{GS} = 0V, I_S = -1.0A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	2,760	—	pF	V_{DS} = -15V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	262	—		
Reverse Transfer Capacitance	C_{rss}	—	220	—		
Gate Resistance	R_g	—	16	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	34	—	nC	V_{DS} = -15V, I_D = -4.0A
Total Gate Charge (V_{GS} = -8V)	Q_g	—	59	—		
Gate-Source Charge	Q_{gs}	—	3.5	—		
Gate-Drain Charge	Q_{gd}	—	8.3	—		
Turn-On Delay Time	$t_{D(ON)}$	—	7.5	—	ns	V_{DS} = -15V, V_{GS} = -4.5V, R_G = 1Ω, I_D = -4.0A
Turn-On Rise Time	t_R	—	25	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	125	—		
Turn-Off Fall Time	t_F	—	96	—		
Reverse Recovery Time	t_{RR}	—	48	—	ns	I_F = -1.0A, di/dt = 100A/µs
Reverse Recovery Charge	Q_{RR}	—	33	—	nC	I_F = -1.0A, 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. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

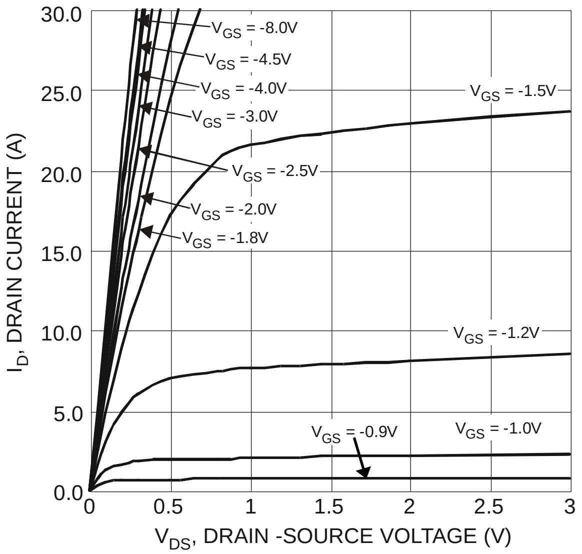


Figure 1 Typical Output Characteristics

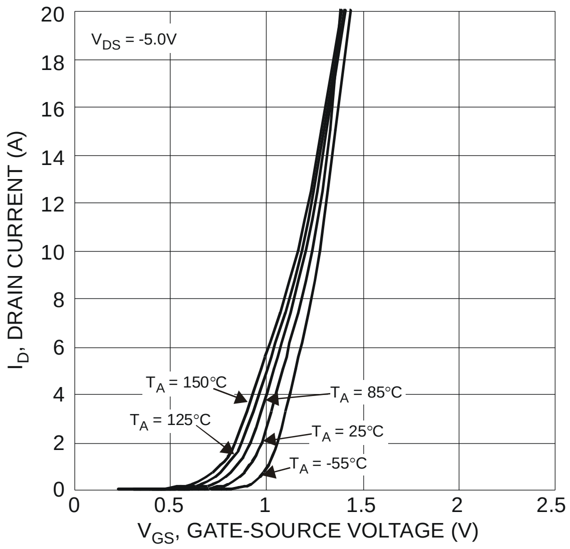


Figure 2 Typical Transfer Characteristics

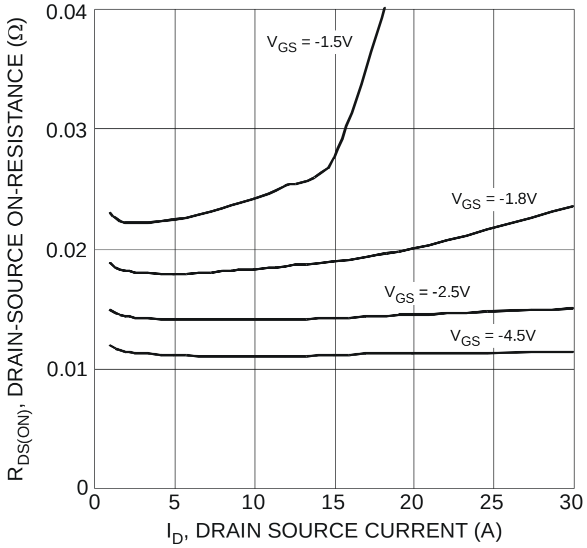


Figure 3 Typical On-Resistance vs.
Drain Current and Gate Voltage

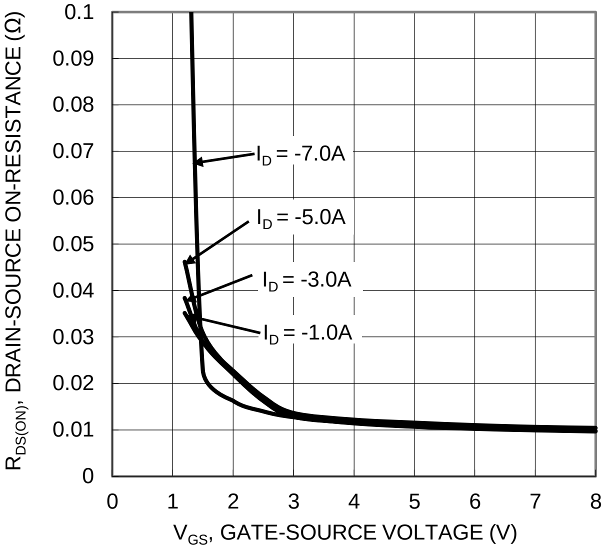


Figure 4 Typical Transfer Characteristic

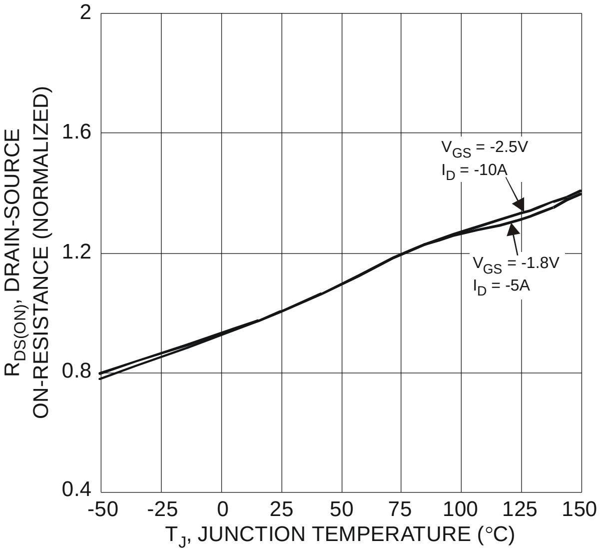


Figure 5 On-Resistance Variation with Temperature

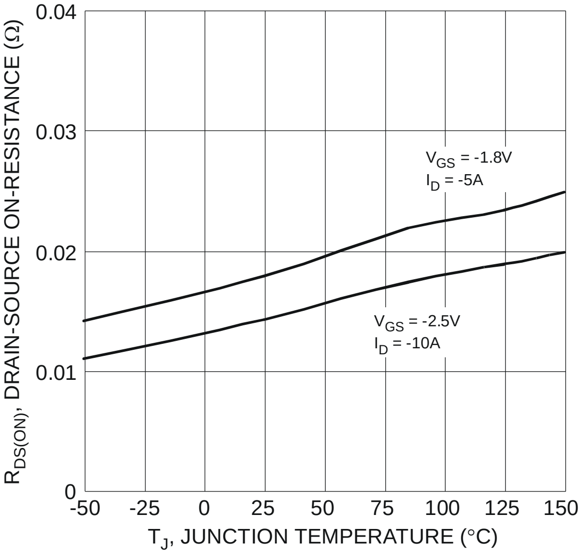


Figure 6 On-Resistance Variation with Temperature

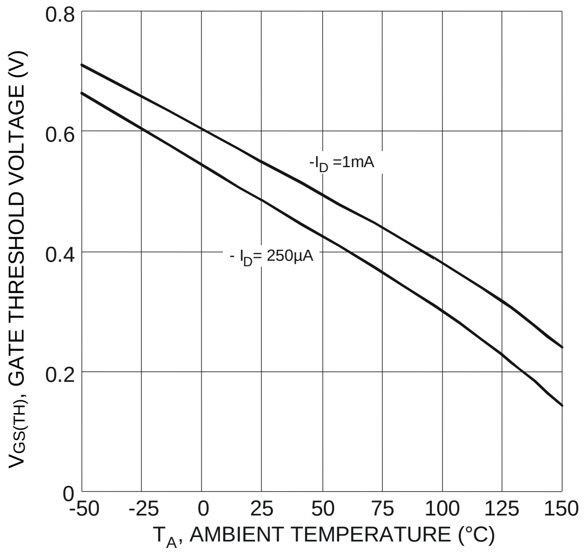


Figure 7 Gate Threshold Variation vs. Ambient Temperature

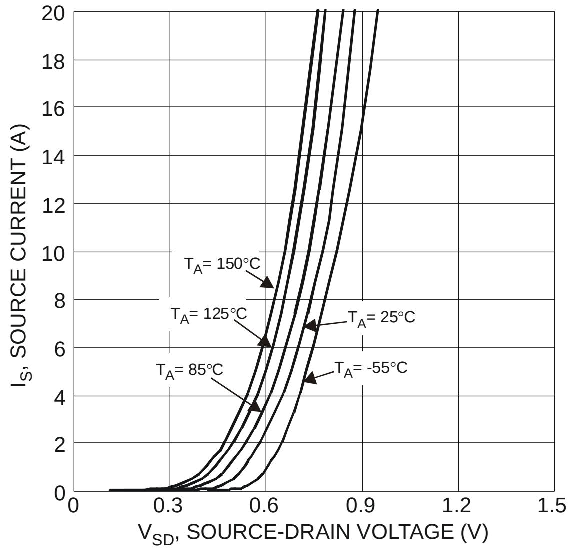


Figure 8 Diode Forward Voltage vs. Current

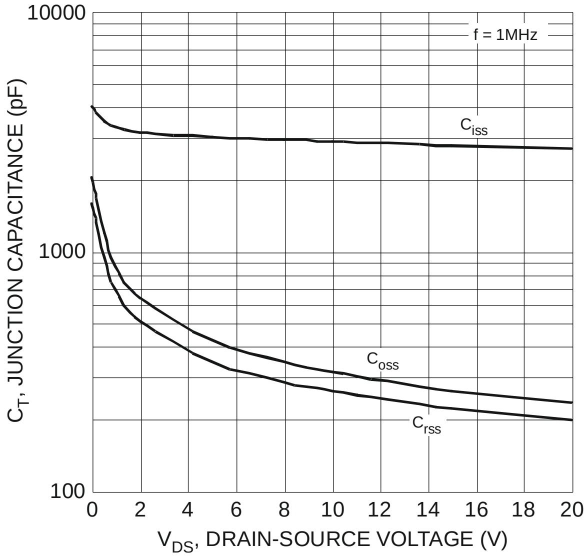


Figure 9 Typical Junction Capacitance

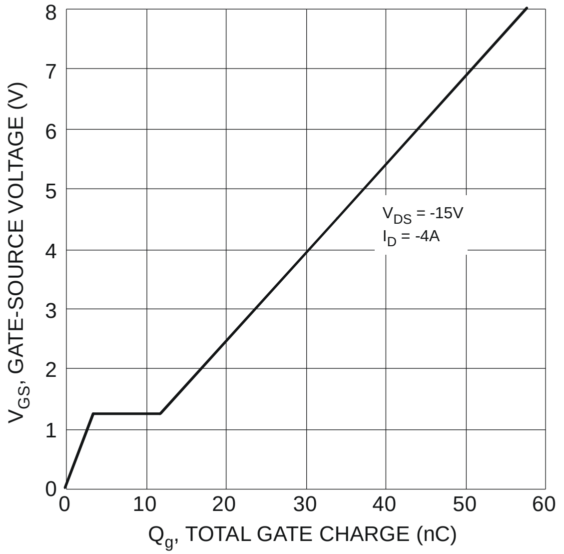


Figure 10 Gate-Charge Characteristics

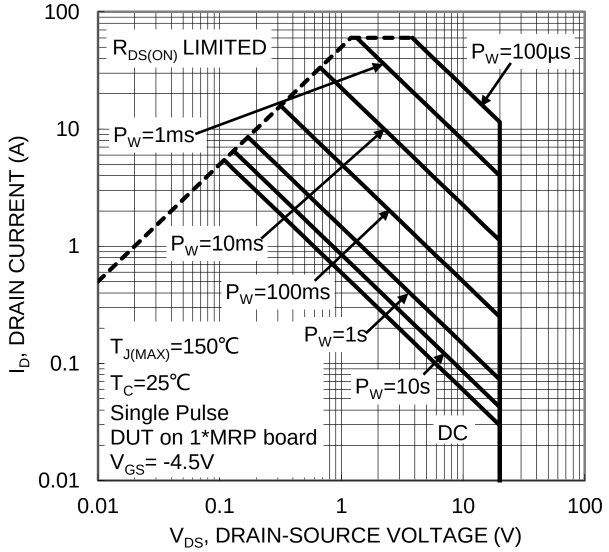


Figure 11 SOA, Safe Operation Area

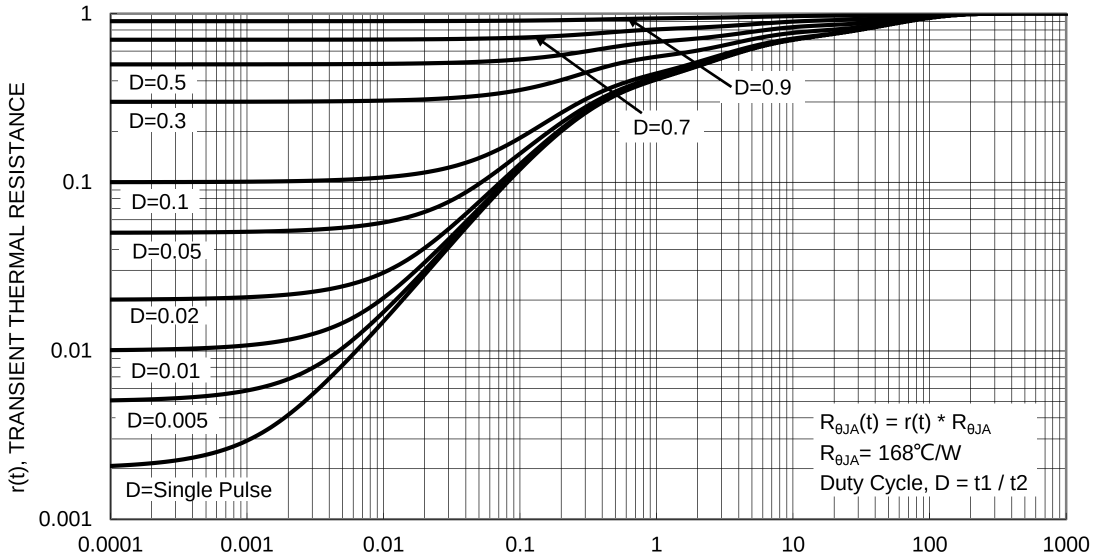
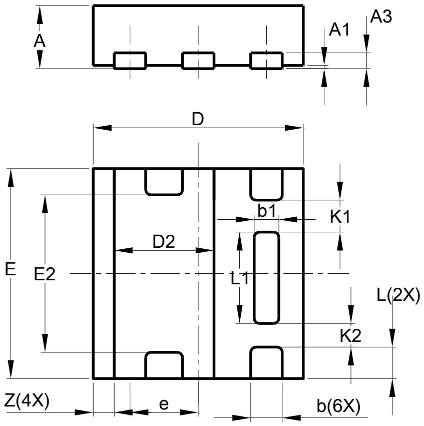


Figure 12 Transient Thermal Resistance

Package Outline Dimensions

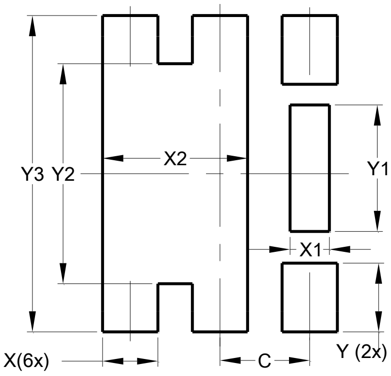
U-DFN2020-6 (Type E)



U-DFN2020-6 Type E			
Dim	**Min**	**Max**	**Typ**
A	0.57	0.63	0.60
A1	0	0.05	0.03
A3	–	–	0.15
b	0.25	0.35	0.30
b1	0.185	0.285	0.235
D	1.95	2.05	2.00
D2	0.85	1.05	0.95
E	1.95	2.05	2.00
E2	1.40	1.60	1.50
e	–	–	0.65
L	0.25	0.35	0.30
L1	0.82	0.92	0.87
K1	–	–	0.305
K2	–	–	0.225
Z	–	–	0.20
All Dimensions in mm			

Suggested Pad Layout

U-DFN2020-6 (Type E)



Dimensions	Value (in mm)
C	0.650
X	0.400
X1	0.285
X2	1.050
Y	0.500
Y1	0.920
Y2	1.600
Y3	2.300