

## Product Summary

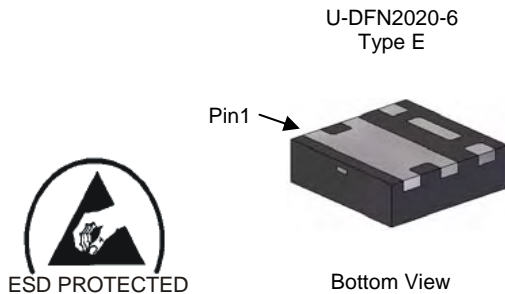
$V_{(BR)DSS}$	$R_{DS(ON) max}$	Package	$I_D$ $T_A = +25^\circ C$
-25V	27m $\Omega$ @ $V_{GS} = -4.5V$	U-DFN2020-6 Type E	-6.7A
	40m $\Omega$ @ $V_{GS} = -1.8V$		-5.4A

## Description

This new generation 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 Switching
- Battery Management Application
- Power Management Functions

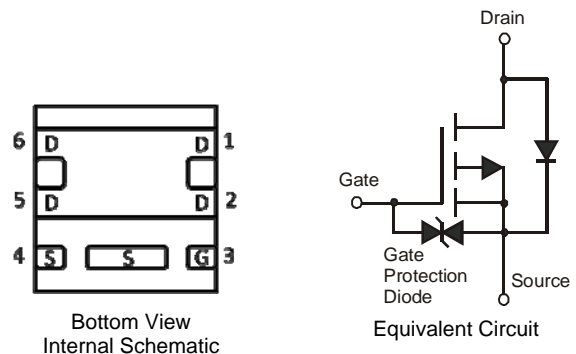


## Features

- Low  $R_{DS(ON)}$  – Ensures on State Losses are Minimized
- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm<sup>2</sup>
- **ESD Protected Gate**
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

- Case: U-DFN2020-6 Type E
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208 <sup>(3)</sup>
- Weight: 0.001 grams (approximate)

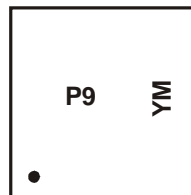


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMP2039UFDE-7	U-DFN2020-6 Type E	3,000/Tape & Reel

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
  2. See <http://www.diodes.com> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. For packaging details, go to our website at <http://www.diodes.com>.

## Marking Information



P9 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: Y = 2011)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2011	2012	2013	2014	2015	2016	2017
Code	Y	Z	A	B	C	D	E

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	-25	V
Gate-Source Voltage			V <sub>GSS</sub>	±8	V
Continuous Drain Current (Note 5) V <sub>GS</sub> = -4.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-6.7 -5.3	A
	t < 5s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-8.3 -6.6	A
Continuous Drain Current (Note 5) V <sub>GS</sub> = -1.8V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-5.4 -4.3	A
	t < 5s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-6.6 -5.2	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%)			I <sub>DM</sub>	-60	A
Continuous Source-Drain Diode Current			I <sub>S</sub>	-2.0	A

**Thermal Characteristics**

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	0.8	W
	T <sub>A</sub> = +70°C		1.2	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	R <sub>θJA</sub>	160	°C/W
	t < 5s		104	
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	2.0	W
	T <sub>A</sub> = +70°C		2.9	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	R <sub>θJA</sub>	63	°C/W
	t < 5s		42	
Thermal Resistance, Junction to Case (Note 6)	Steady state	R <sub>θJC</sub>	10.8	°C/W
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-25	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-1	μA	V <sub>DS</sub> = -25V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10	μA	V <sub>GS</sub> = ±8.0V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.4	—	-1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	—	20	27	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -6.4A
		—	24	34		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -4.8A
		—	28	40		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -2.5A
		—	33	70		V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -1.5A
Forward Transfer Admittance	Y <sub>fs</sub>	—	16	—	S	V <sub>DS</sub> = -5V, I <sub>D</sub> = -4A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.7	-1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iSS</sub>	—	2530	—	pF	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oSS</sub>	—	203	—	pF	
Reverse Transfer Capacitance	C <sub>rSS</sub>	—	177	—	pF	
Gate Resistance	R <sub>g</sub>	—	9.1	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge (V <sub>GS</sub> = -4.5V)	Q <sub>g</sub>	—	28.2	—	nC	V <sub>DS</sub> = -15V, I <sub>D</sub> = -4.0A
Total Gate Charge (V <sub>GS</sub> = -8V)	Q <sub>g</sub>	—	48.7	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	3.2	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	5.0	—	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	—	15.1	—	ns	V <sub>DD</sub> = -15V, V <sub>GS</sub> = -4.5V, R <sub>G</sub> = 1Ω, I <sub>D</sub> = -4.0A
Turn-On Rise Time	t <sub>r</sub>	—	23.5	—	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	—	137.6	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	80.5	—	ns	

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate
  - Short duration pulse test used to minimize self-heating effect
  - Guaranteed by design. Not subject to production testing.

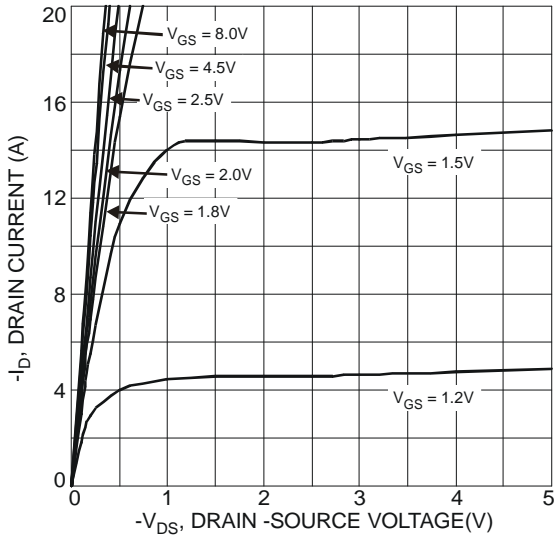


Fig. 1 Typical Output Characteristics

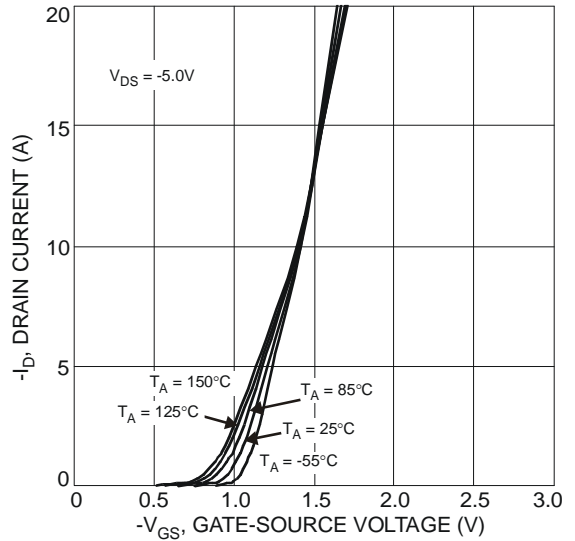


Fig. 2 Typical Transfer Characteristics

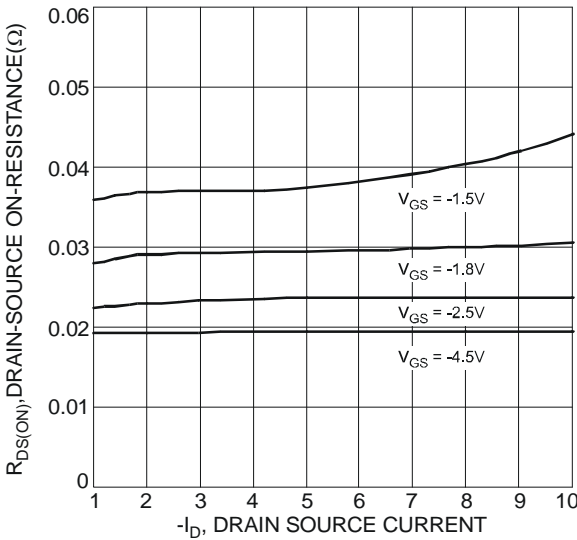


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

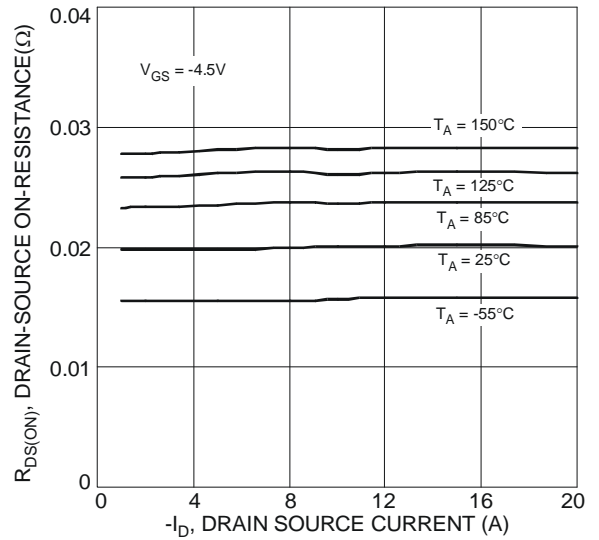


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

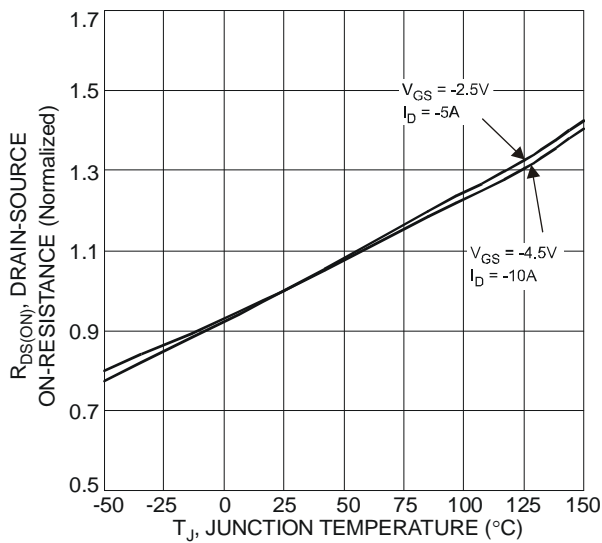


Fig. 5 On-Resistance Variation with Temperature

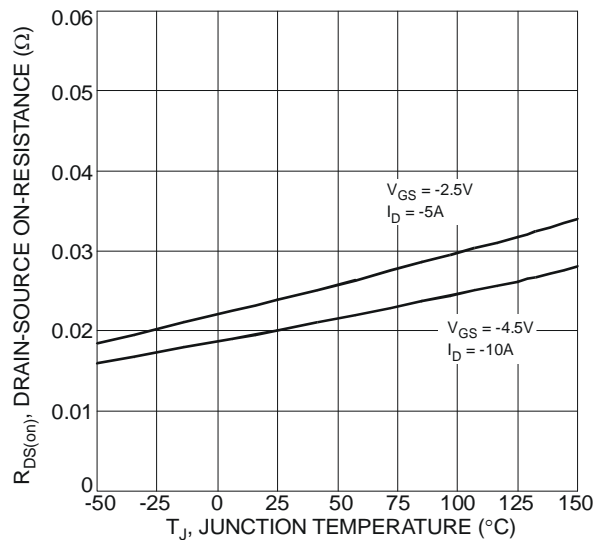


Fig. 6 On-Resistance Variation with Temperature

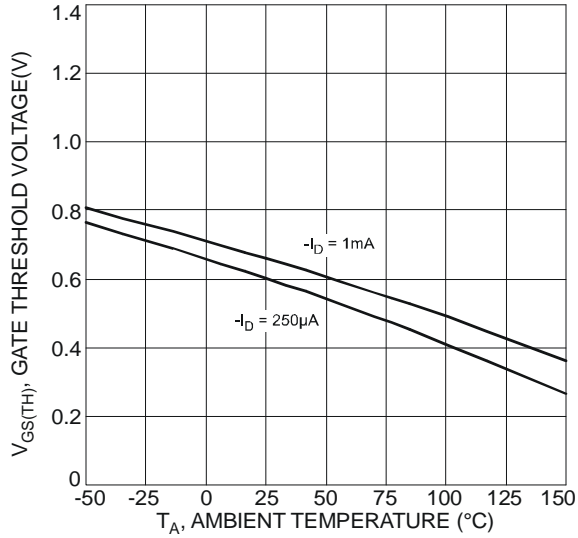


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

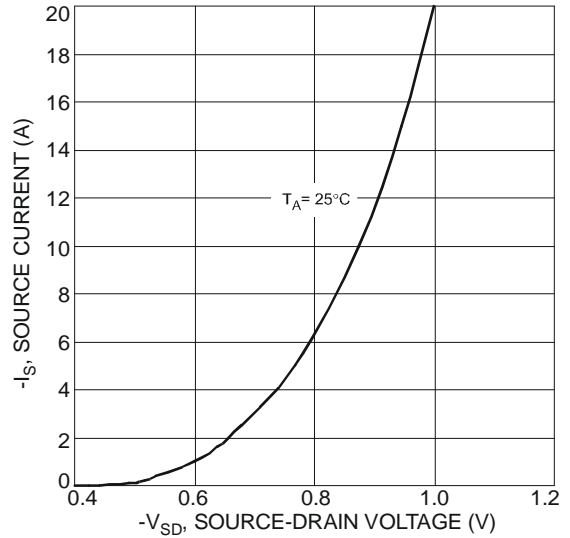


Fig. 8 Diode Forward Voltage vs. Current

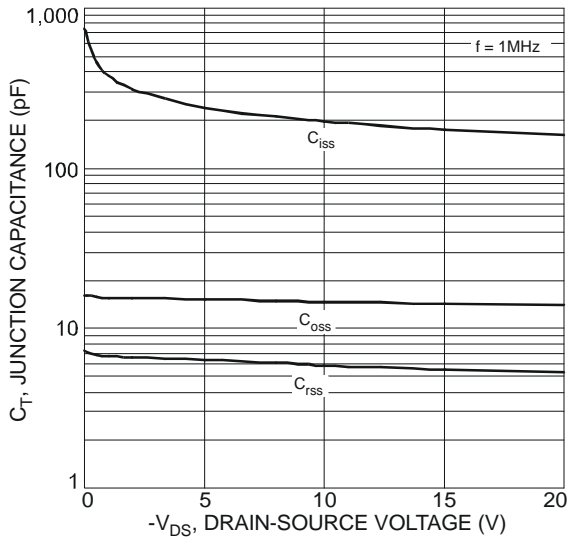


Fig. 9 Typical Junction Capacitance

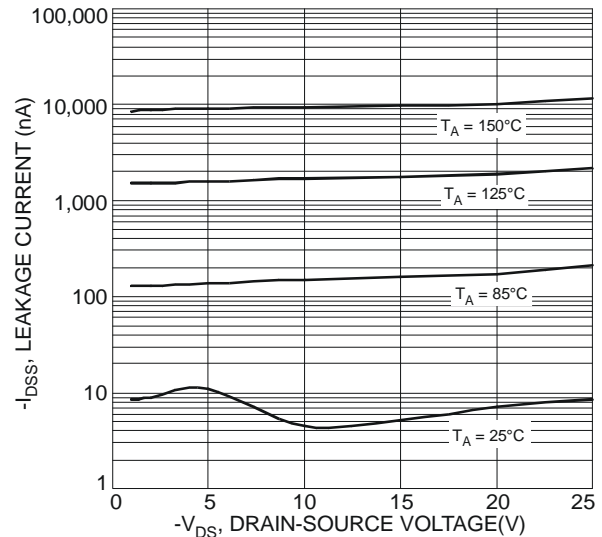


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

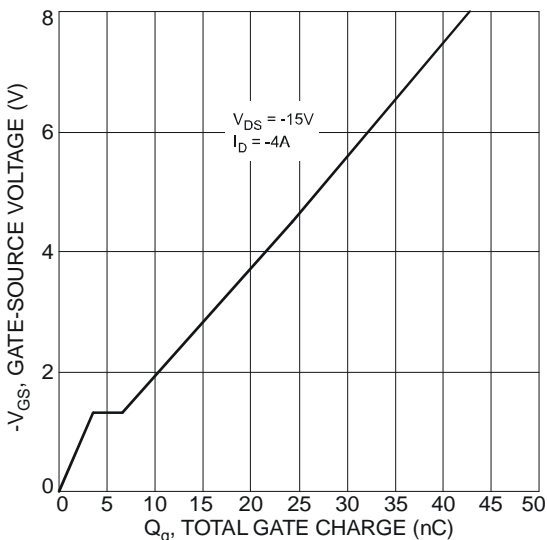


Fig. 11 Gate-Charge Characteristics

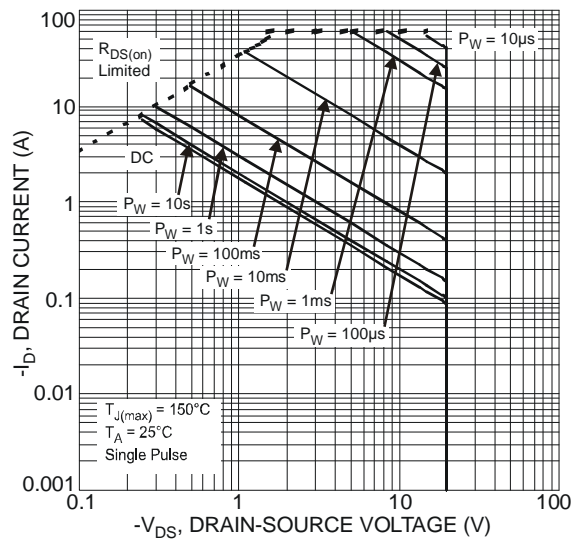
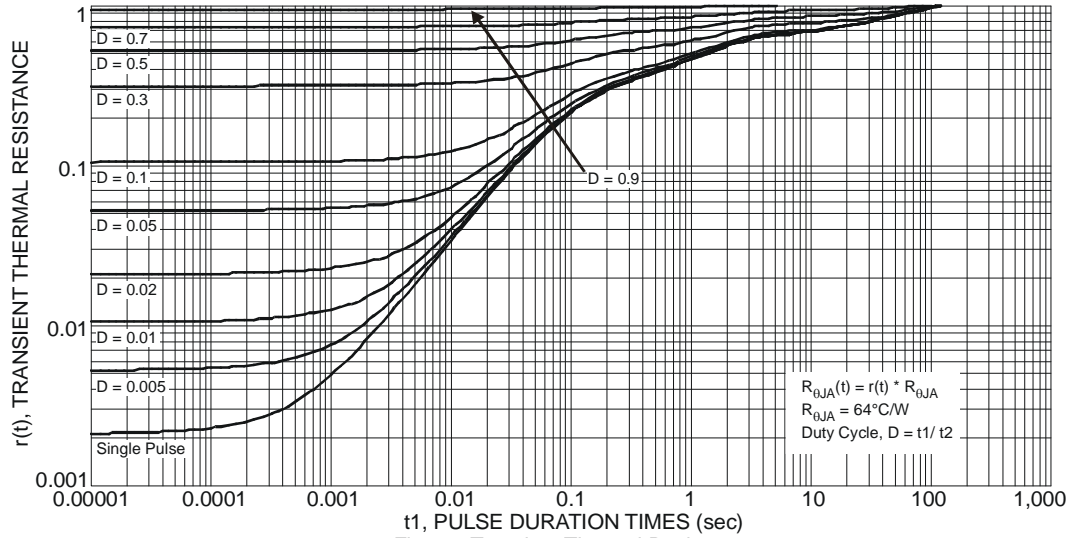
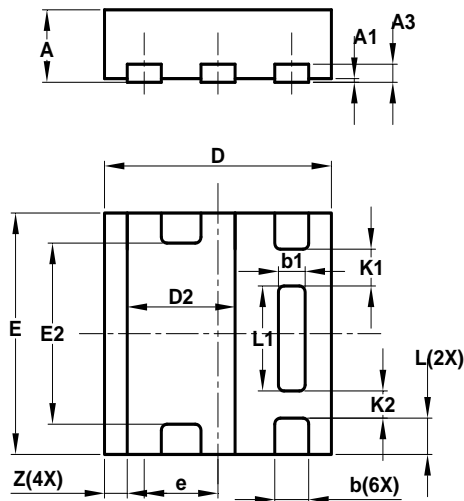


Fig. 12 SOA, Safe Operation Area



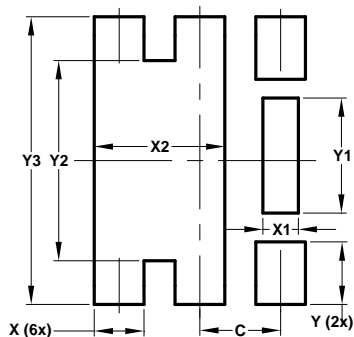
**Package Outline Dimensions**



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**



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

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