

## Product Summary

$V_{(BR)DSS}$	$R_{DS(on) \max}$	$I_D$ $T_A = 25^\circ\text{C}$
-25V	26m $\Omega$ @ $V_{GS} = -4.5\text{V}$	-7.3
	40m $\Omega$ @ $V_{GS} = -1.8\text{V}$	-6.0

## Features and Benefits

- Low  $R_{DS(ON)}$  – ensures on state losses are minimized
- 0.4mm profile – ideal for low profile applications
- PCB footprint of 4mm<sup>2</sup>
- Low Input Capacitance
- **ESD Protected Gate**
- **Lead, Halogen, and Antimony Free, RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Description and Applications

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.

- Load Switching
- Battery Management Application
- Power Management Functions

## Mechanical Data

- Case: X2-DFN2020-6
- 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
- Weight: 0.006 grams (approximate)



## Ordering Information (Note 3)

Part Number	Case	Packaging
DMP2039UFDE4-7	X2-DFN2020-6	3,000/Tape & Reel

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. No purposely added lead. Halogen and Antimony free.
  2. Diodes Inc.'s "Green" policy can be found on our website at <http://www.diodes.com>.
  3. For packaging details, go to our website at <http://www.diodes.com>.

## Marking Information



PD = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: Y = 2011)  
 M = Month (ex: 9 = September)  
 Dot Denotes Pin 1

### 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>	-7.3 -5.8	A
	t < 5s	T <sub>A</sub> = 25°C T <sub>A</sub> = 70°C	I <sub>D</sub>	-9.2 -7.3	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>	-6.0 -4.7	A
	t < 5s	T <sub>A</sub> = 25°C T <sub>A</sub> = 70°C	I <sub>D</sub>	-7.6 -6.0	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** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 4)	T <sub>A</sub> = 25°C	P <sub>D</sub>	0.69	W
	T <sub>A</sub> = 70°C		0.44	
Thermal Resistance, Junction to Ambient (Note 4)	Steady state	R <sub>θJA</sub>	182	°C/W
	t < 5s		113	
Total Power Dissipation (Note 5)	T <sub>A</sub> = 25°C	P <sub>D</sub>	2.4	W
	T <sub>A</sub> = 70°C		1.5	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	R <sub>θJA</sub>	52	°C/W
	t < 5s		33	
Thermal Resistance, Junction to Case (Note 5)	Steady state	R <sub>θJC</sub>	9.1	°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 6)</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 6)</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>	—	19	26	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -6.4A
		—	24	33		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -4.8A
		—	29	40		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -2.5A
		—	35	70		V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -1.5A
		—	—	—		—
Forward Transfer Admittance	Y <sub>fs</sub>	—	14	—	mS	V <sub>DS</sub> = -5V, I <sub>D</sub> = -4A
Diode Forward Voltage (Note 5)	V <sub>SD</sub>	—	-0.7	-1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A
<b>DYNAMIC CHARACTERISTICS (Note 7)</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	Q <sub>g</sub>	—	28.2	—	nC	V <sub>DS</sub> = -15V, I <sub>D</sub> = -4.0A
Gate-Source Charge	Q <sub>gs</sub>	—	48.7	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	3.2	—		
Turn-On Delay Time	t <sub>D(on)</sub>	—	5.0	—	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>	—	15.1	—		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	23.5	—		
Turn-Off Fall Time	t <sub>f</sub>	—	137.6	—		

- 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 vias 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.

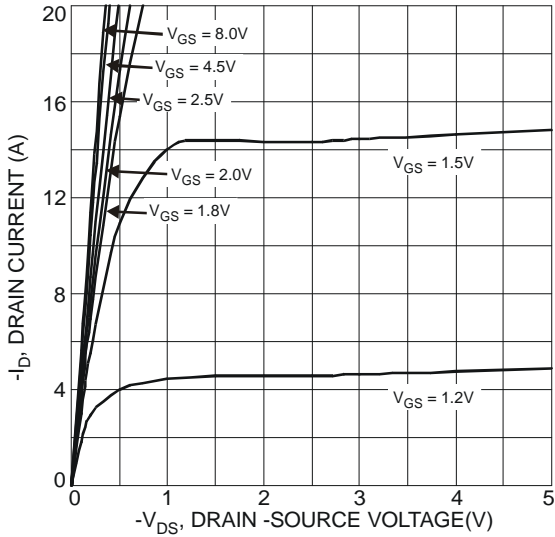


Fig. 1 Typical Output Characteristics

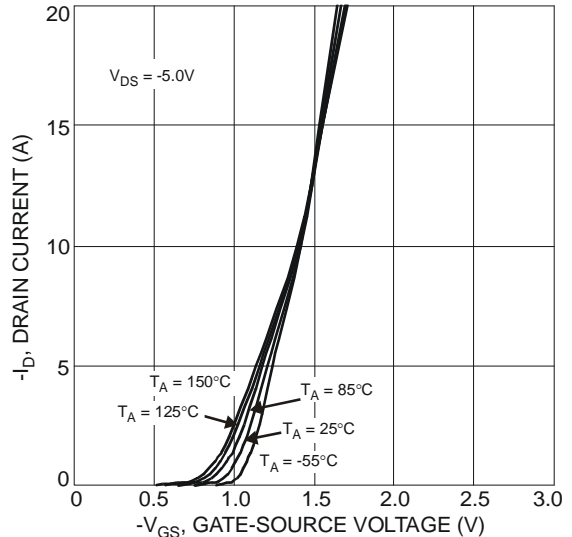


Fig. 2 Typical Transfer Characteristics

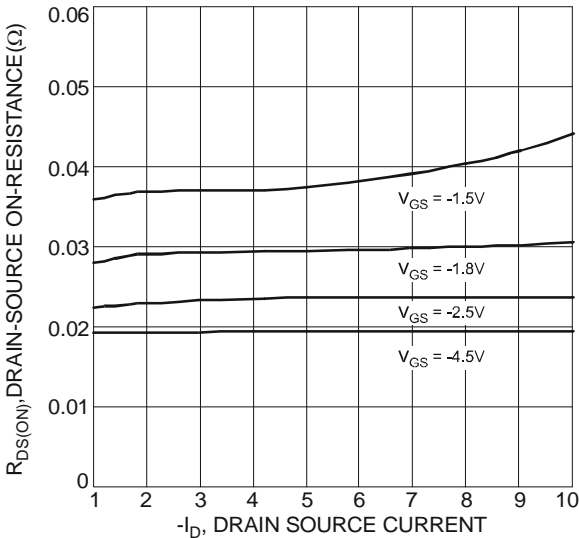


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

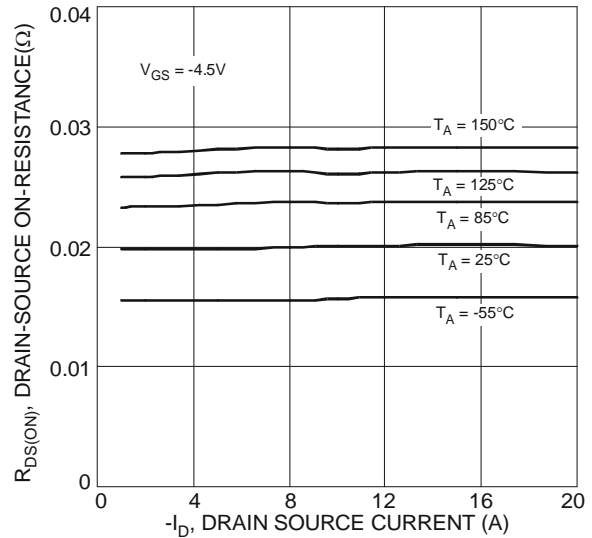


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

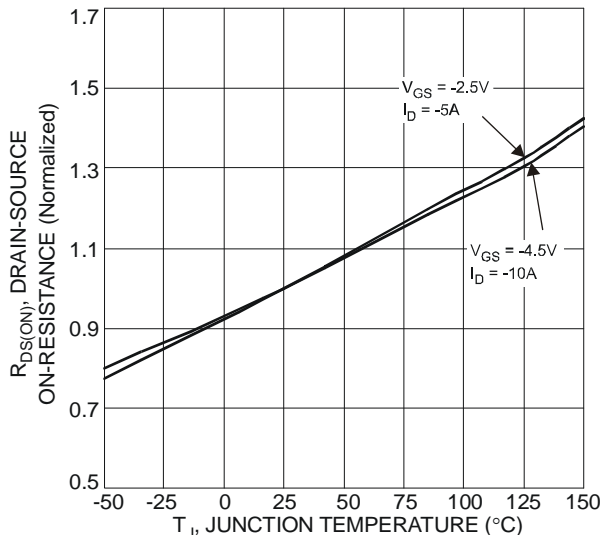


Fig. 5 On-Resistance Variation with Temperature

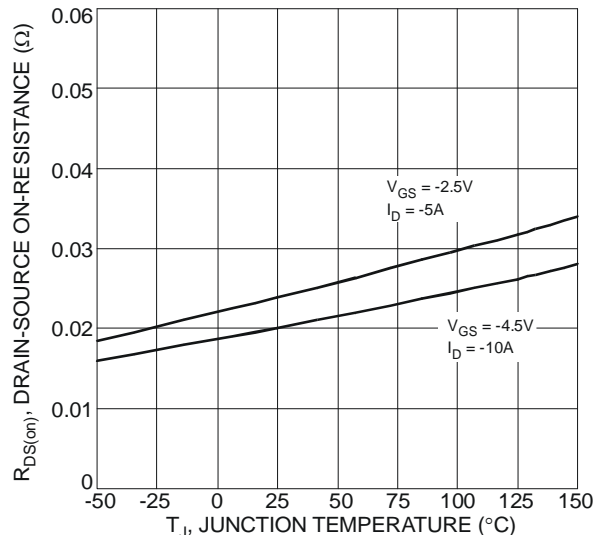


Fig. 6 On-Resistance Variation with Temperature

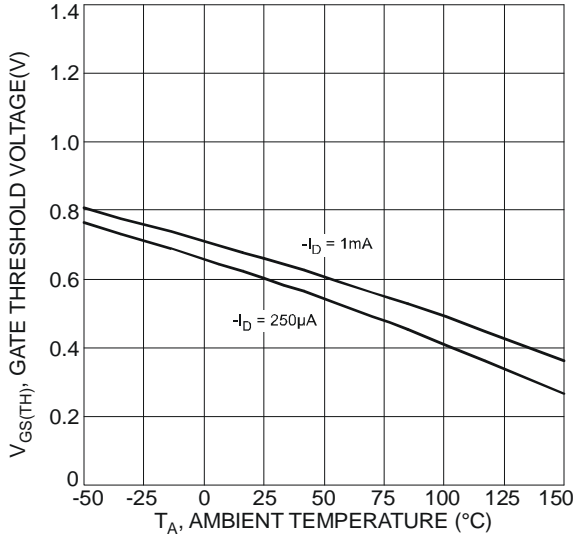


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

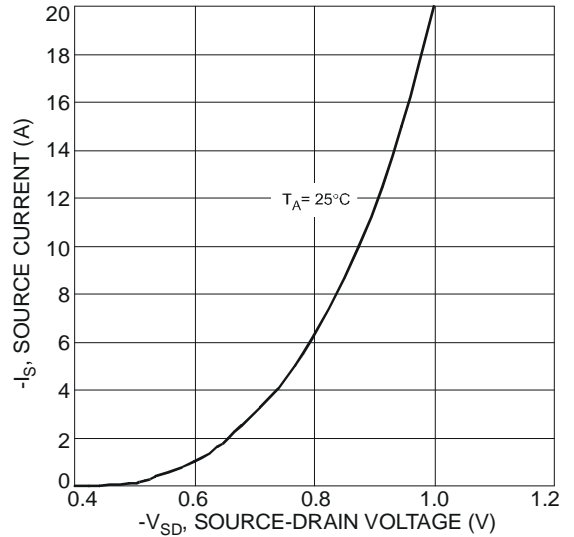


Fig. 8 Diode Forward Voltage vs. Current

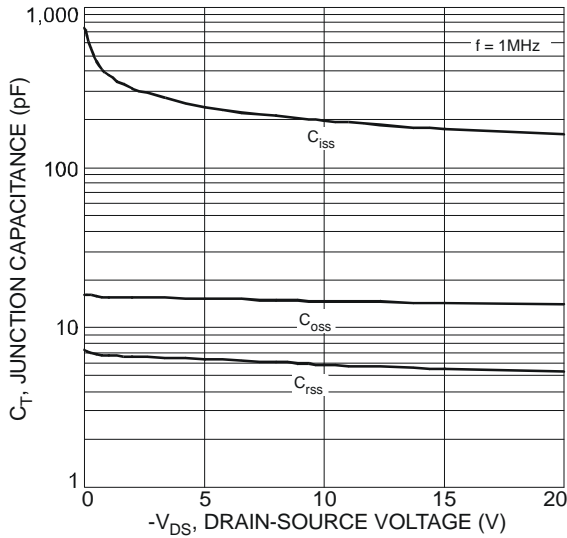


Fig. 9 Typical Junction Capacitance

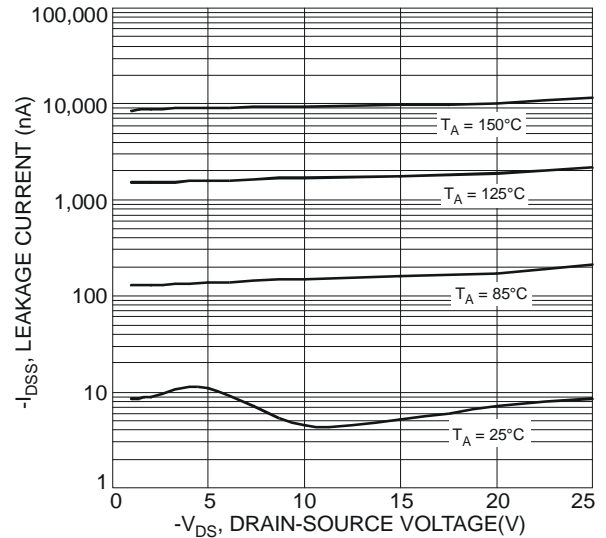


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

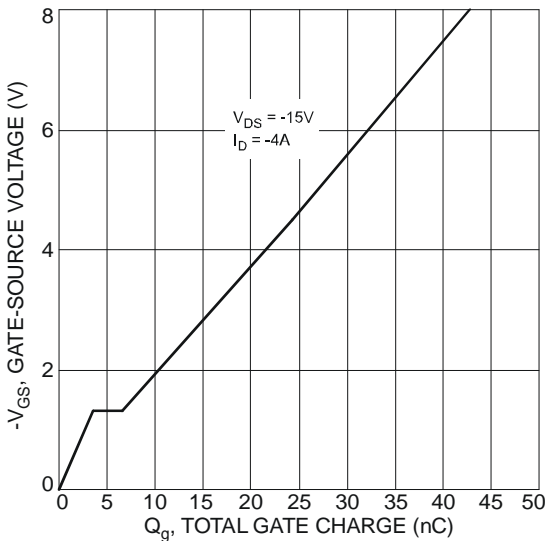


Fig. 11 Gate-Charge Characteristics

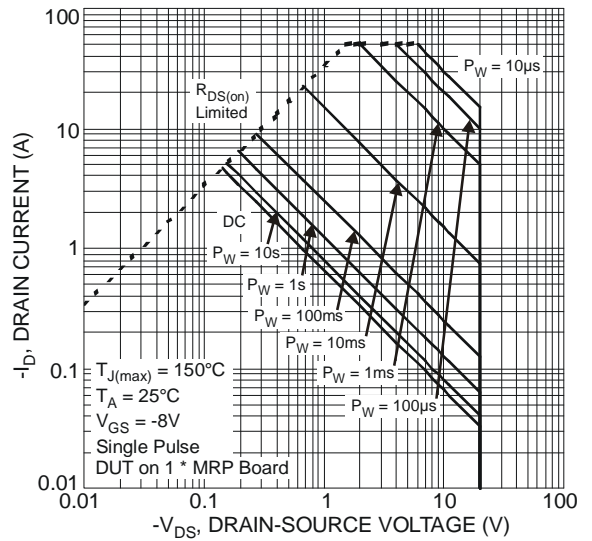
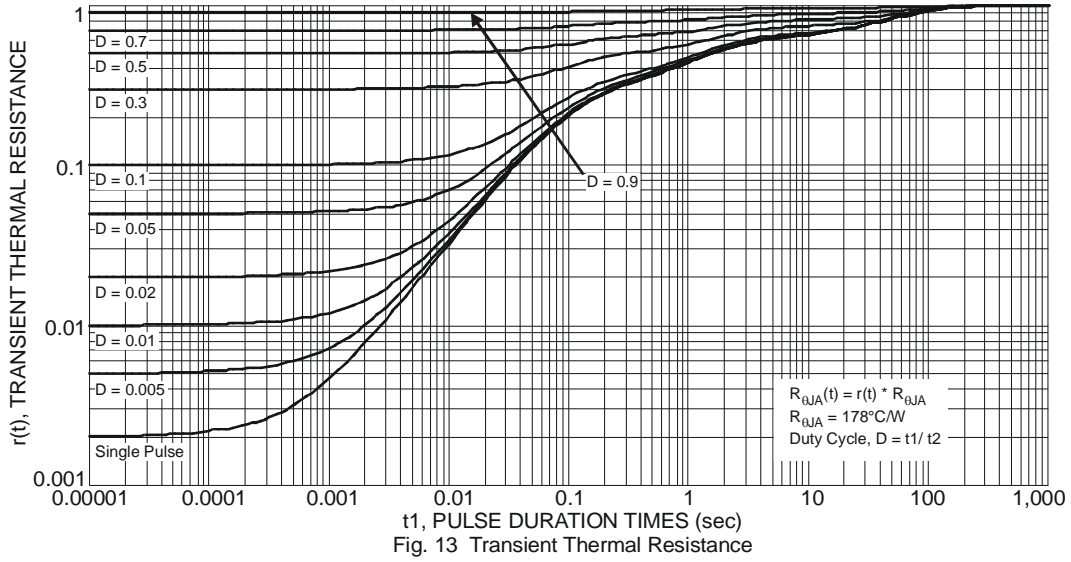
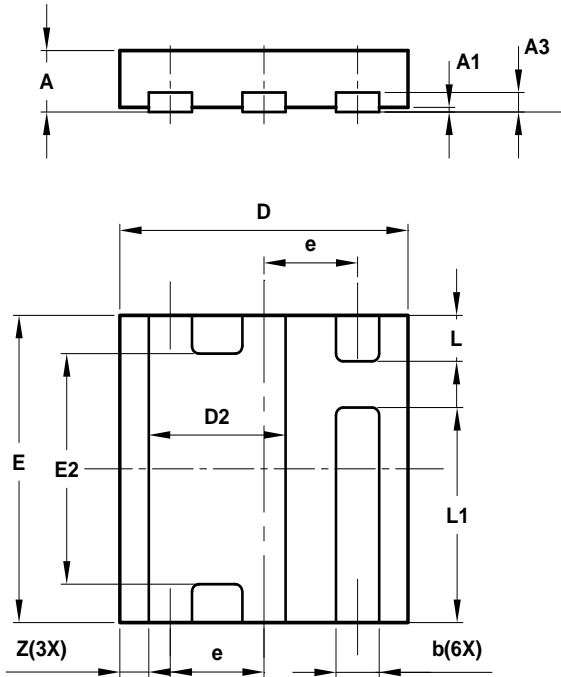


Fig. 12 SOA, Safe Operation Area

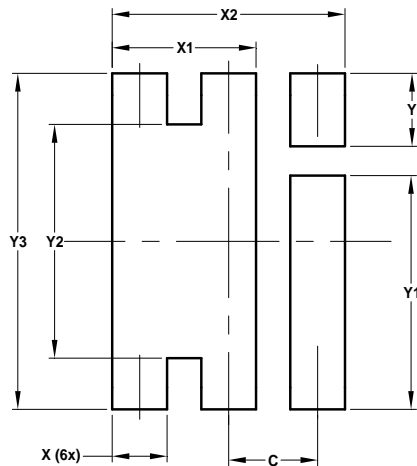


**Package Outline Dimensions**



X2-DFN2020-6			
Dim	Min	Max	Typ
A	-	0.40	-
A1	0	0.05	0.03
A3	-	-	0.13
b	0.25	0.35	0.30
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	1.35	1.45	1.40
Z	-	-	0.20
All Dimensions in mm			

## Suggested Pad Layout



Dimensions	Value (in mm)
C	0.650
X	0.400
X1	1.050
X2	1.700
Y	0.500
Y1	1.600
Y2	1.600
Y3	2.300

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