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**DMP2039UFDE4**

**25V P-CHANNEL ENHANCEMENT MODE MOSFET**

### Product Summary

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

### 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.

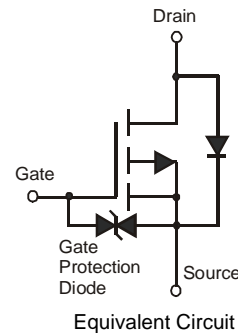
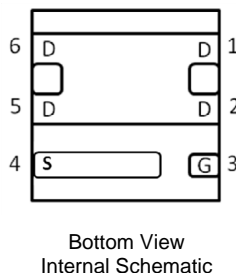
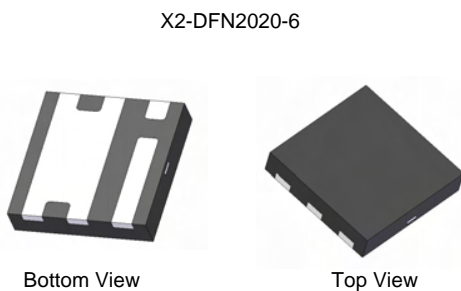
- Load Switching
- Battery Management Application
- Power Management Functions

### 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**

### 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)

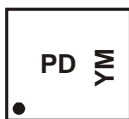


### Ordering Information (Note 3)

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** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	-25	V
Gate-Source Voltage			$V_{GSS}$	$\pm 8$	V
Continuous Drain Current (Note 5) $V_{GS} = -4.5\text{V}$	Steady State	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	$I_D$	-7.3 -5.8	A
	$t < 5\text{s}$	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	$I_D$	-9.2 -7.3	A
Continuous Drain Current (Note 5) $V_{GS} = -1.8\text{V}$	Steady State	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	$I_D$	-6.0 -4.7	A
	$t < 5\text{s}$	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	$I_D$	-7.6 -6.0	A
Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%)			$I_{DM}$	-60	A
Continuous Source-Drain Diode Current			$I_S$	-2.0	A

**Thermal Characteristics** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 4)	$T_A = 25^\circ\text{C}$	$P_D$	0.69	W
	$T_A = 70^\circ\text{C}$		0.44	
Thermal Resistance, Junction to Ambient (Note 4)	Steady state	$R_{\theta JA}$	182	$^\circ\text{C/W}$
	$t < 5\text{s}$		113	
Total Power Dissipation (Note 5)	$T_A = 25^\circ\text{C}$	$P_D$	2.4	W
	$T_A = 70^\circ\text{C}$		1.5	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	52	$^\circ\text{C/W}$
	$t < 5\text{s}$		33	
Thermal Resistance, Junction to Case (Note 5)	Steady state	$R_{\theta JC}$	9.1	$^\circ\text{C/W}$
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

**Electrical Characteristics** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 6)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	-25	—	—	V	$V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	-1	$\mu\text{A}$	$V_{DS} = -25\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 8.0\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 6)</b>						
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	$R_{DS(on)}$	—	19	26	m $\Omega$	$V_{GS} = -4.5\text{V}, I_D = -6.4\text{A}$
		—	24	33		$V_{GS} = -2.5\text{V}, I_D = -4.8\text{A}$
		—	29	40		$V_{GS} = -1.8\text{V}, I_D = -2.5\text{A}$
		—	35	70		$V_{GS} = -1.5\text{V}, I_D = -1.5\text{A}$
		—	—	—		—
Forward Transfer Admittance	$ Y_{fs} $	—	14	—	mS	$V_{DS} = -5\text{V}, I_D = -4\text{A}$
Diode Forward Voltage (Note 5)	$V_{SD}$	—	-0.7	-1.0	V	$V_{GS} = 0\text{V}, I_S = -1\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 7)</b>						
Input Capacitance	$C_{iss}$	—	2530	—	pF	$V_{DS} = -15\text{V}, V_{GS} = 0\text{V}$ $f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	203	—	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	177	—	pF	
Gate Resistance	$R_g$	—	9.1	—	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Total Gate Charge	$Q_g$	—	28.2	—	nC	$V_{DS} = -15\text{V}, I_D = -4.0\text{A}$
Gate-Source Charge	$Q_{gs}$	—	48.7	—		
Gate-Drain Charge	$Q_{gd}$	—	3.2	—		
Turn-On Delay Time	$t_{D(on)}$	—	5.0	—	nS	$V_{DD} = -15\text{V}, V_{GS} = -4.5\text{V}, R_G = 1\Omega,$ $I_D = -4.0\text{A}$
Turn-On Rise Time	$t_r$	—	15.1	—		
Turn-Off Delay Time	$t_{D(off)}$	—	23.5	—		
Turn-Off Fall Time	$t_f$	—	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.



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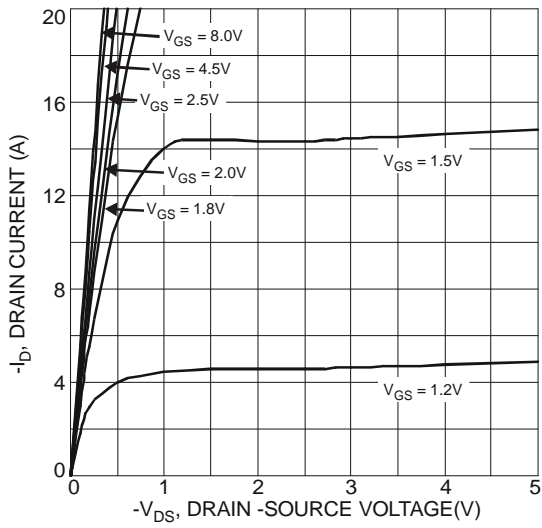


Fig. 1 Typical Output Characteristics

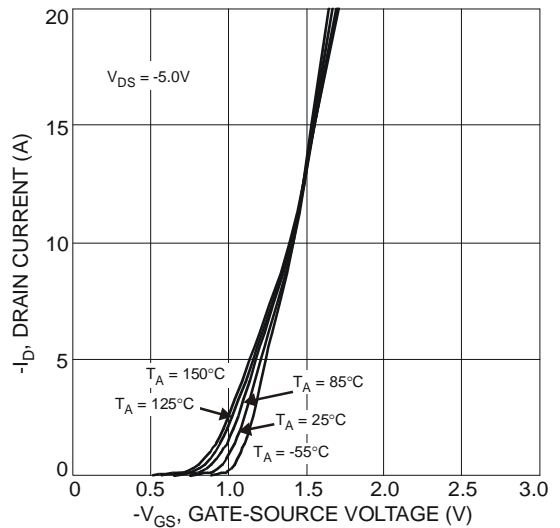


Fig. 2 Typical Transfer Characteristics

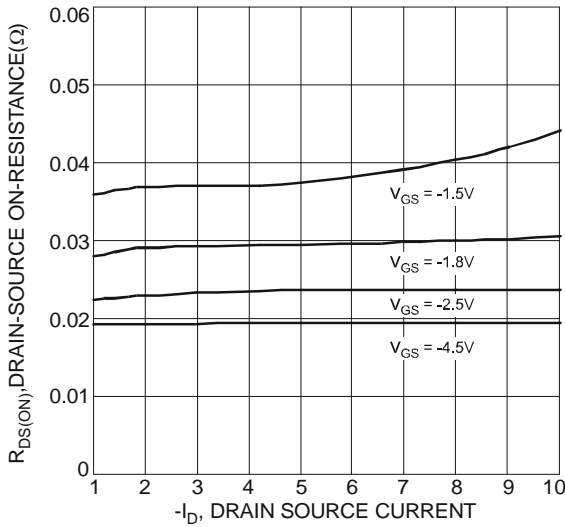


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

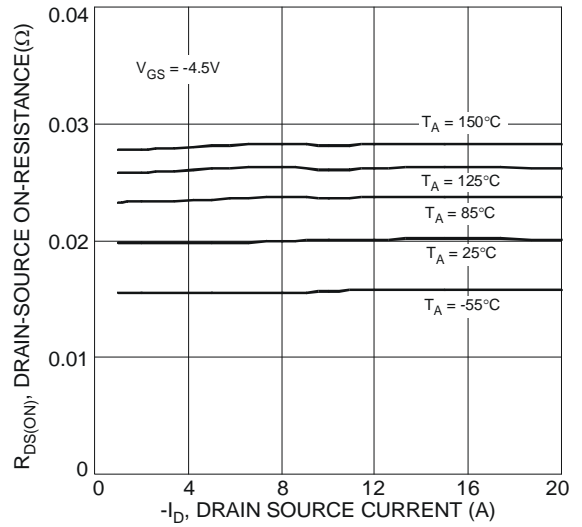


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

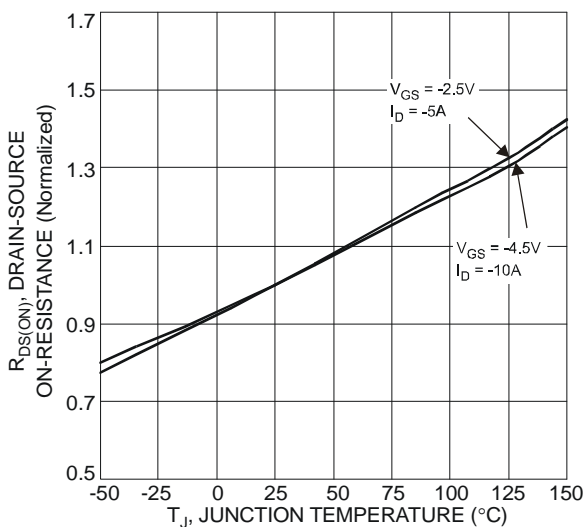


Fig. 5 On-Resistance Variation with Temperature

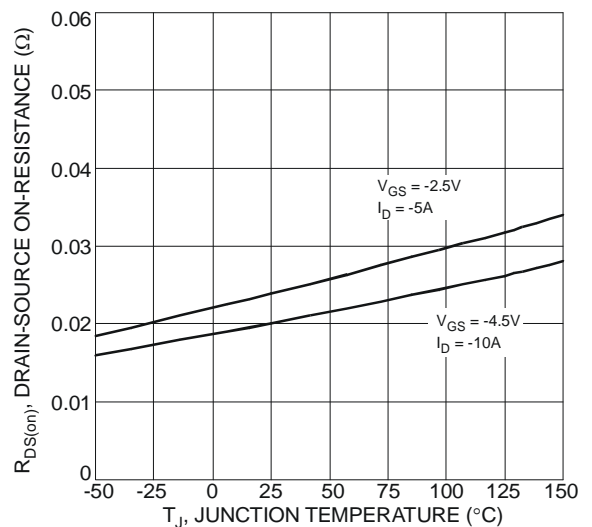


Fig. 6 On-Resistance Variation with Temperature



**DMP2039UFDE4**

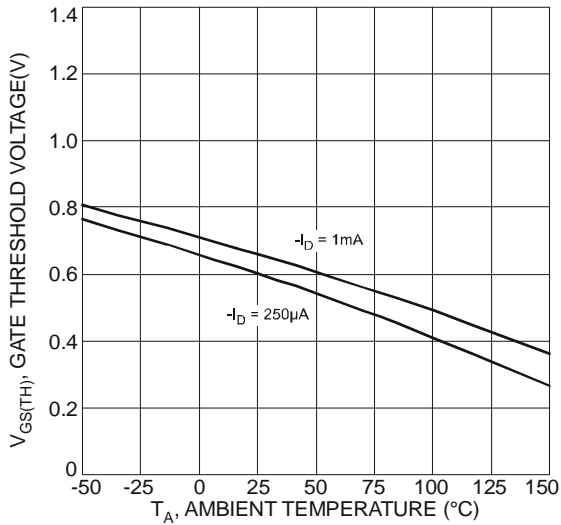


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

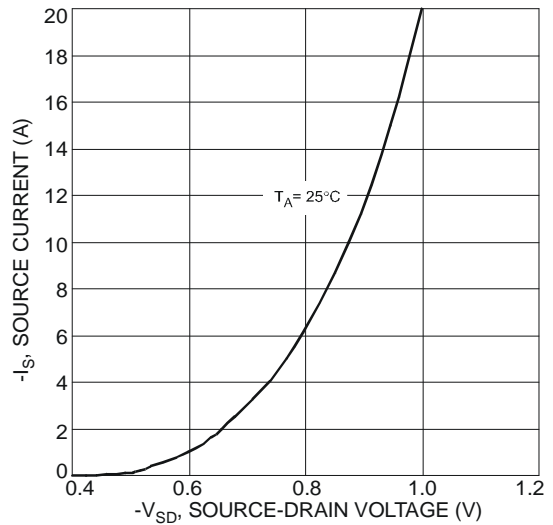


Fig. 8 Diode Forward Voltage vs. Current

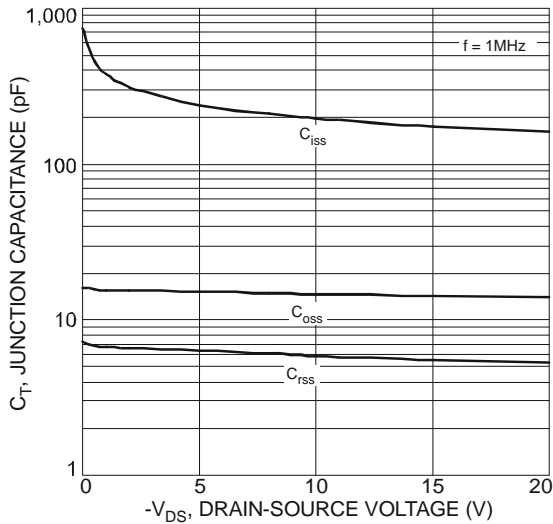


Fig. 9 Typical Junction Capacitance

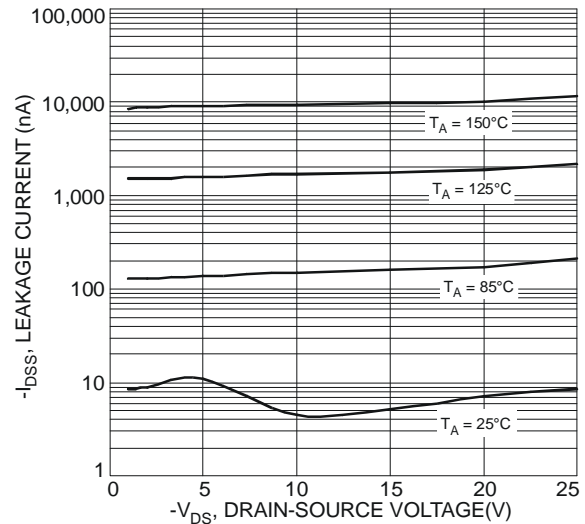


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

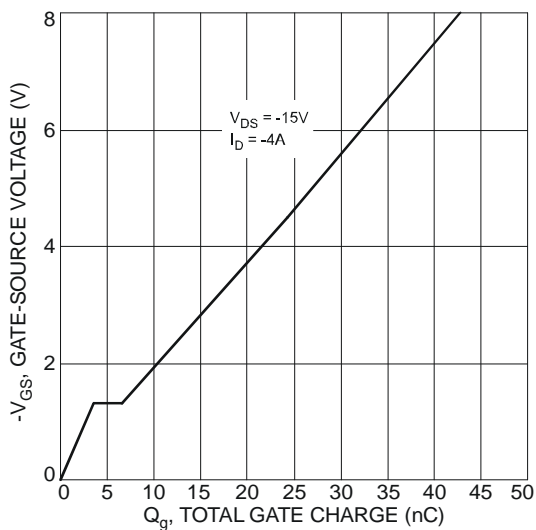


Fig. 11 Gate-Charge Characteristics

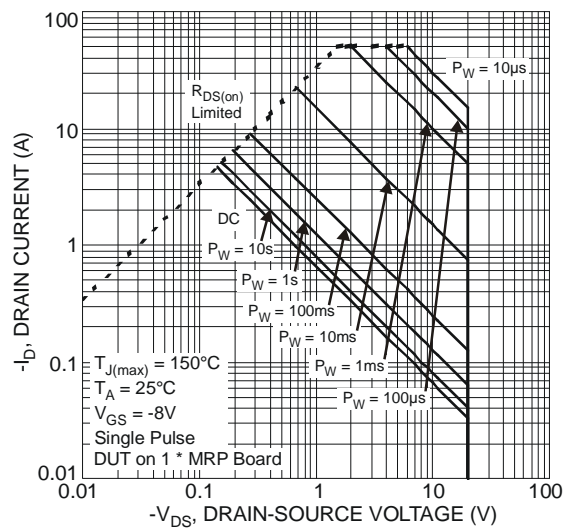
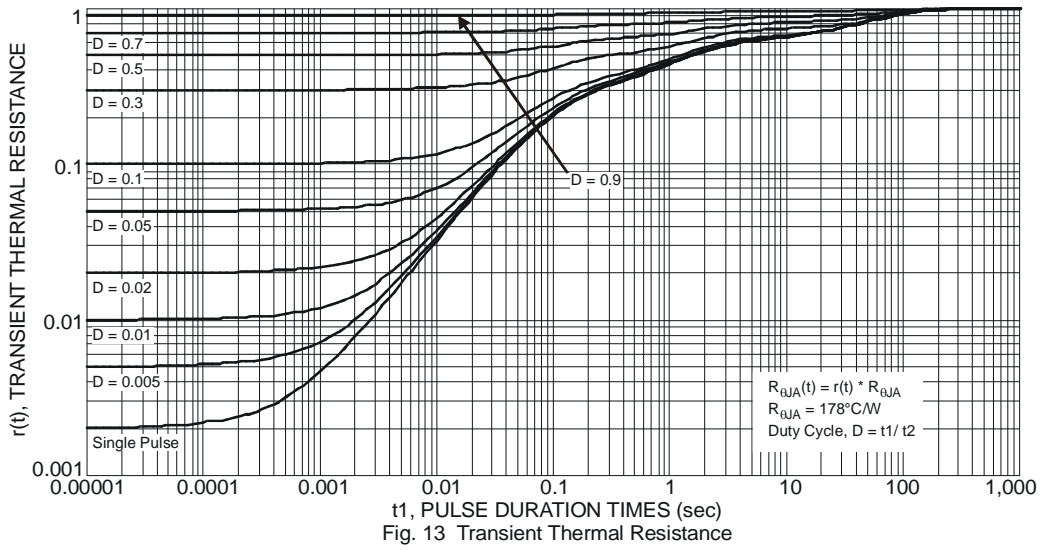
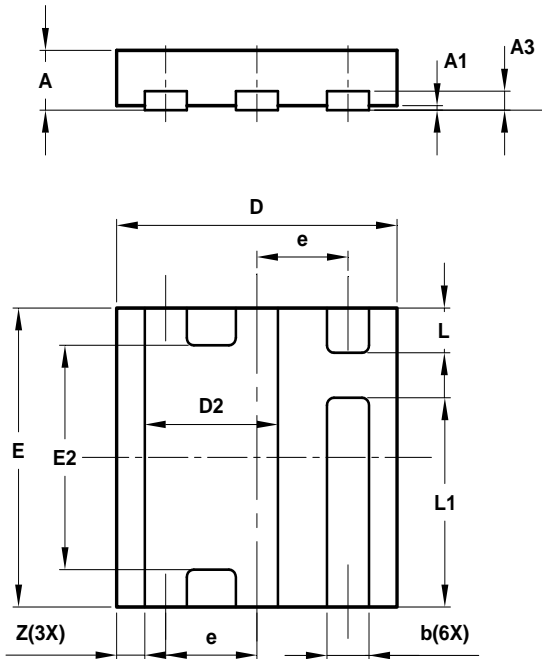


Fig. 12 SOA, Safe Operation Area

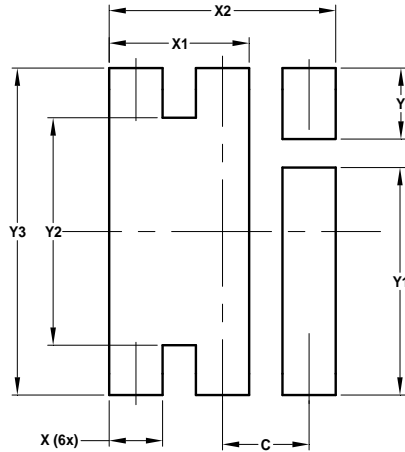


**Package Outline Dimensions**



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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