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DMP2023UFDF

20V P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max $T_A = +25^\circ C$
-20V	27mΩ @ $V_{GS} = -4.5V$	-7.6A
	32mΩ @ $V_{GS} = -2.5V$	-6.7A
	50mΩ @ $V_{GS} = -1.8V$	-5.2A
	90mΩ @ $V_{GS} = -1.5V$	-3.9A

Description

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

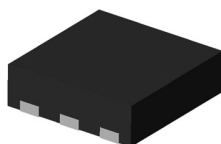
Features

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm²
- Low Gate Threshold Voltage
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

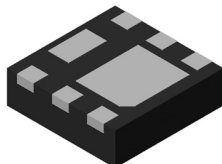
Mechanical Data

- Case: U-DFN2020-6 (Type F)
- 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 (e4)
- Weight: 0.007 Grams (Approximate)

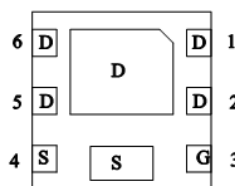
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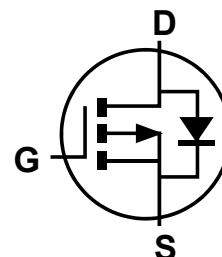
Top View



Bottom View



Pin Out
Bottom View



Internal Schematic

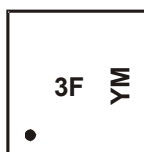
Ordering Information (Note 4)

Part Number	Marking	Reel size (inches)	Quantity per reel
DMP2023UFDF-7	3F	7	3,000
DMP2023UFDF-13	3F	13	10,000

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 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/products/packages.html>.

Marking Information

U-DFN2020-6



3F = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: B = 2014)
 M = Month (ex: 9 = September)

Date Code Key

Year	2014	2015	2016	2017	2018	2019	2020	2021
Code	B	C	D	E	F	G	H	I

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}	-20	V	
Gate-Source Voltage	V_{GSS}	± 8	V	
Continuous Drain Current (Note 6) $V_{GS} = -4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	-7.6 -6.1	A
	$t < 5\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	-9.5 -7.6	A
Pulsed Drain Current (10 μs pulse, duty cycle = 1%)	I_{DM}	-40	A	
Continuous Source-Drain Diode Current	I_S	-2	A	
Avalanche Current (Note 7) $L = 0.1\text{mH}$	I_{AS}	-23	A	
Repetitive Avalanche Energy (Note 7) $L = 0.1\text{mH}$	E_{AS}	27	mJ	

Thermal Characteristics

Characteristic	Symbol	Value	Units	
Total Power Dissipation (Note 5)	P_D	$T_A = +25^\circ\text{C}$	0.73	W
		$T_A = +70^\circ\text{C}$	0.47	
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	Steady State	171	$^\circ\text{C/W}$
		$t < 5\text{s}$	112	
Total Power Dissipation (Note 6)	P_D	$T_A = +25^\circ\text{C}$	2.03	W
		$T_A = +70^\circ\text{C}$	1.30	
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	Steady State	62	$^\circ\text{C/W}$
		$t < 5\text{s}$	40	
Thermal Resistance, Junction to Case (Note 6)	$R_{\theta JC}$	9.3	$^\circ\text{C/W}$	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$	

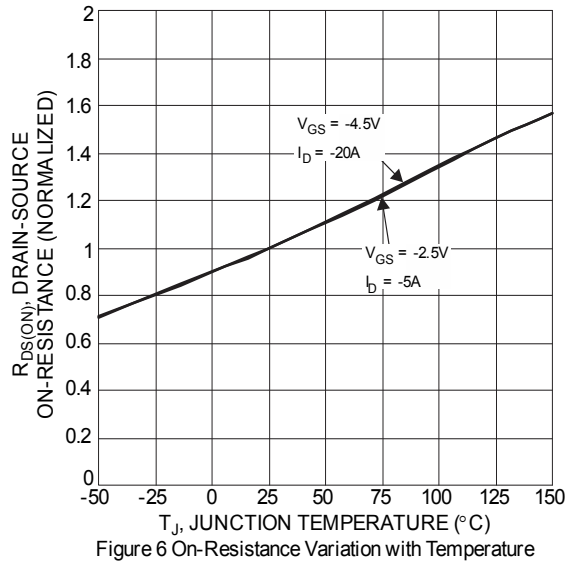
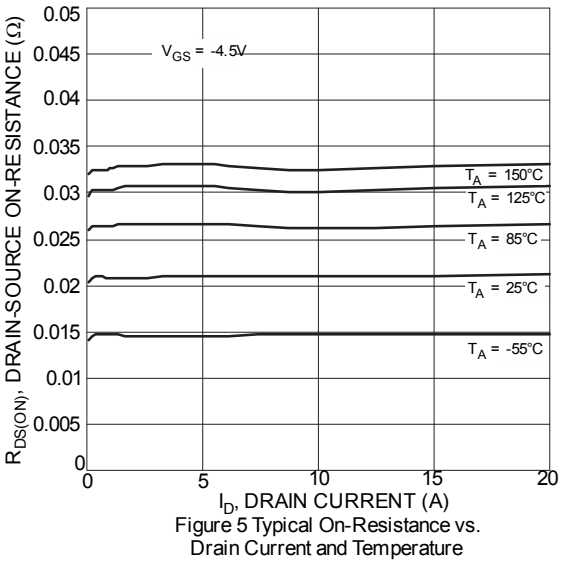
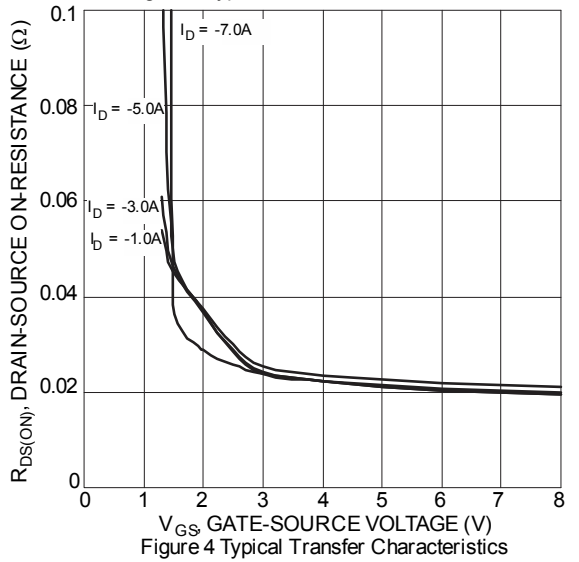
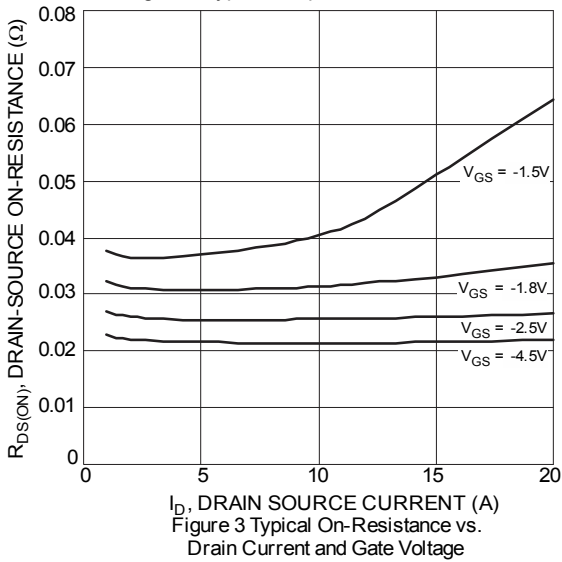
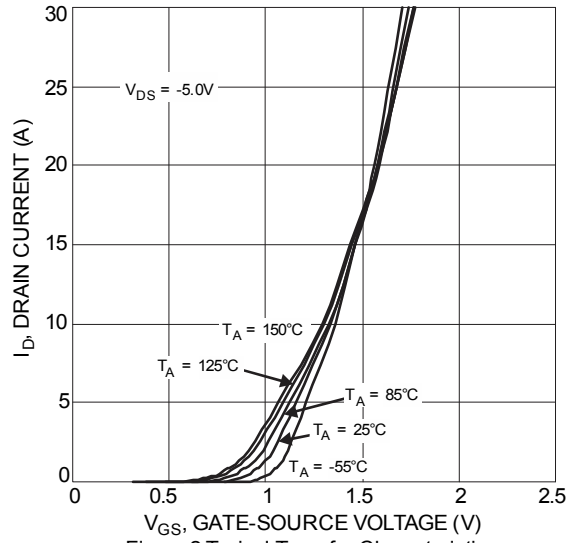
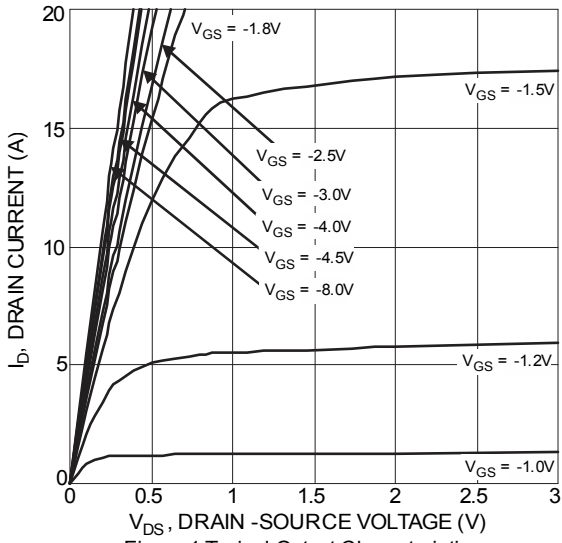
Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
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	μA	$V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 5\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 8)						
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	$R_{DS(on)}$	—	—	27	m Ω	$V_{GS} = -4.5\text{V}, I_D = -7.0\text{A}$
			—	32		$V_{GS} = -2.5\text{V}, I_D = -5.0\text{A}$
			—	50		$V_{GS} = -1.8\text{V}, I_D = -3.0\text{A}$
			—	90		$V_{GS} = -1.5\text{V}, I_D = -1.0\text{A}$
Diode Forward Voltage	V_{SD}	—	-0.8	-1.2	V	$V_{GS} = 0\text{V}, I_S = -1.0\text{A}$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	1837	—	pF	$V_{DS} = -15\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	131	—		
Reverse Transfer Capacitance	C_{rss}	—	115	—		
Gate Resistance	R_g	—	14.8	—	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	—	27	—	nC	$V_{DS} = -15\text{V}, V_{GS} = -4.5\text{V}, I_D = -4.0\text{A}$
Gate-Source Charge	Q_{gs}	—	2.8	—		
Gate-Drain Charge	Q_{gd}	—	3.1	—		
Turn-On Delay Time	$t_{D(on)}$	—	5.8	—	ns	$V_{DS} = -15\text{V}, V_{GS} = -4.5\text{V}, R_G = 1\Omega, I_D = -4.0\text{A}$
Turn-On Rise Time	t_r	—	19.3	—		
Turn-Off Delay Time	$t_{D(off)}$	—	168.5	—		
Turn-Off Fall Time	t_f	—	77.3	—		
Reverse Recovery Time	t_{rr}	—	46.5	—	ns	$I_F = -1.0\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge	Q_{rr}	—	33.8	—	nC	$I_F = -1.0\text{A}, di/dt = 100\text{A}/\mu\text{s}$

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 - I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep $T_J = +25^\circ\text{C}$.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.



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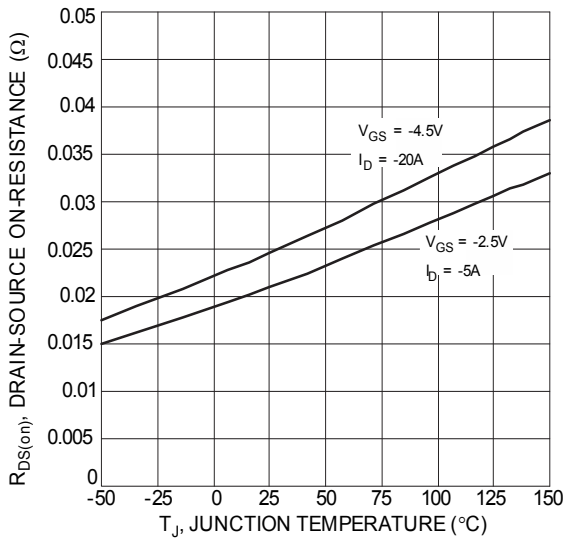


Figure 7 On-Resistance Variation with Temperature

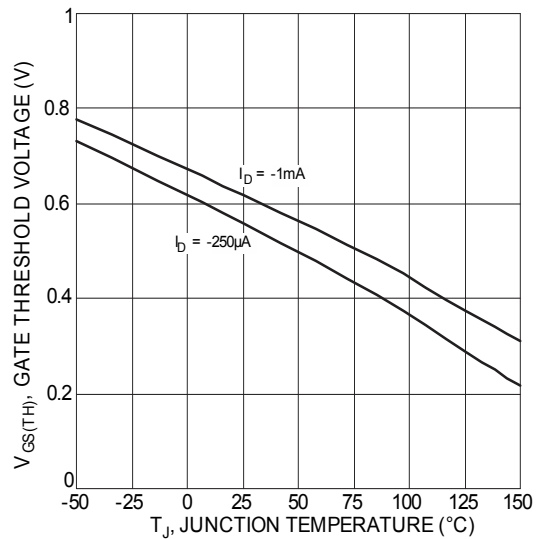


Figure 8 Gate Threshold Variation vs. Ambient Temperature

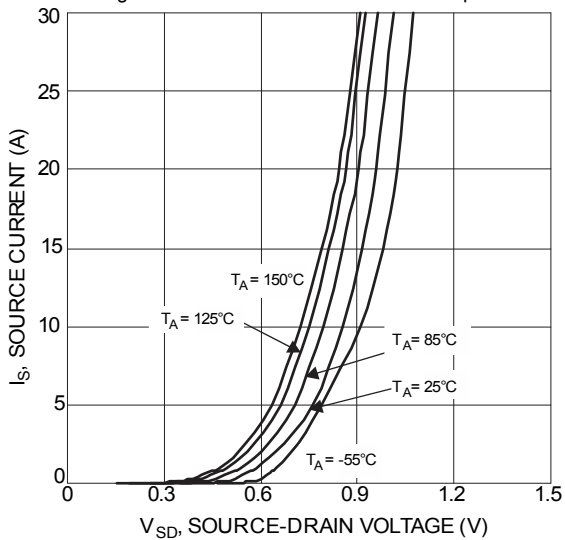


Figure 9 Diode Forward Voltage vs. Current

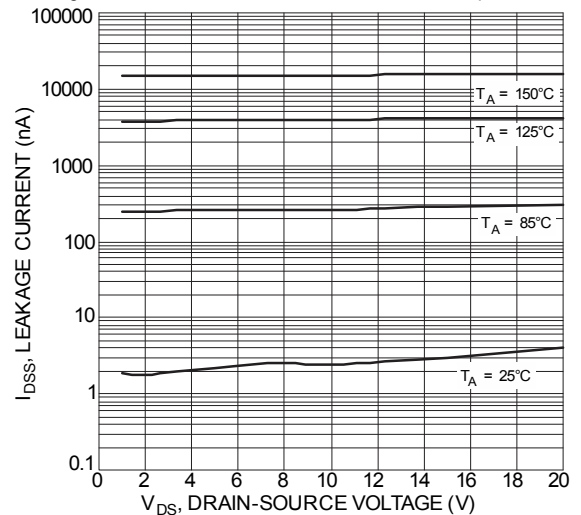


Figure 10 Typical Drain-Source Leakage Current vs. Voltage

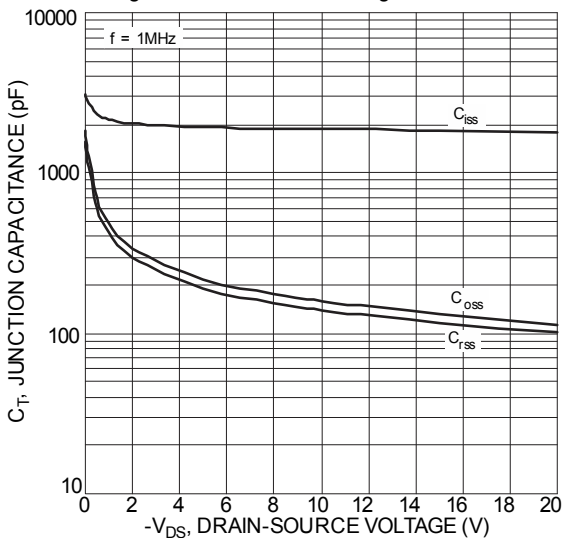


Figure 11 Typical Junction Capacitance

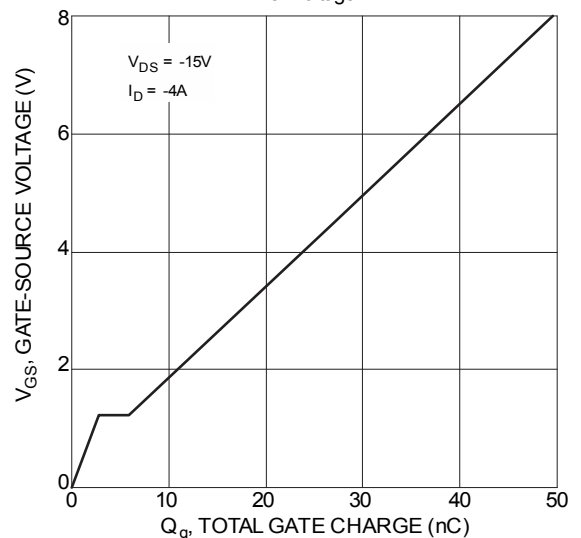


Figure 12 Gate-Charge Characteristics



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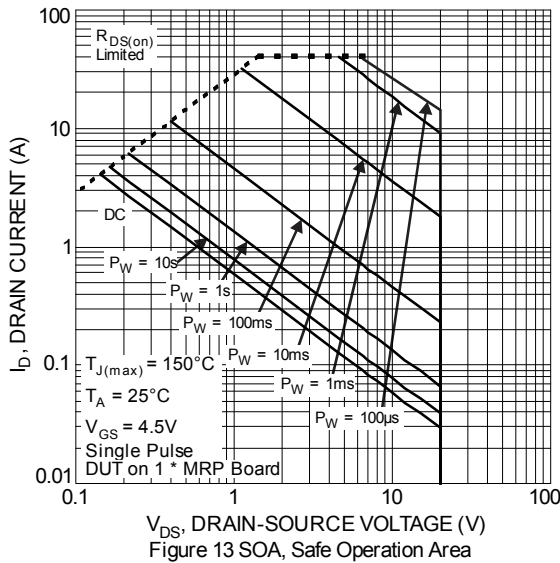


Figure 13 SOA, Safe Operation Area

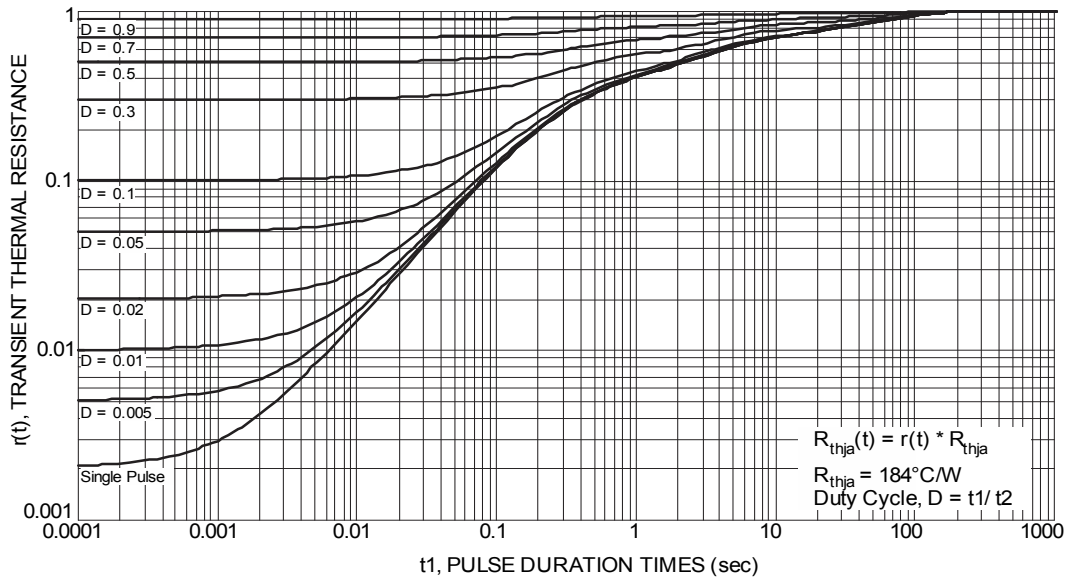
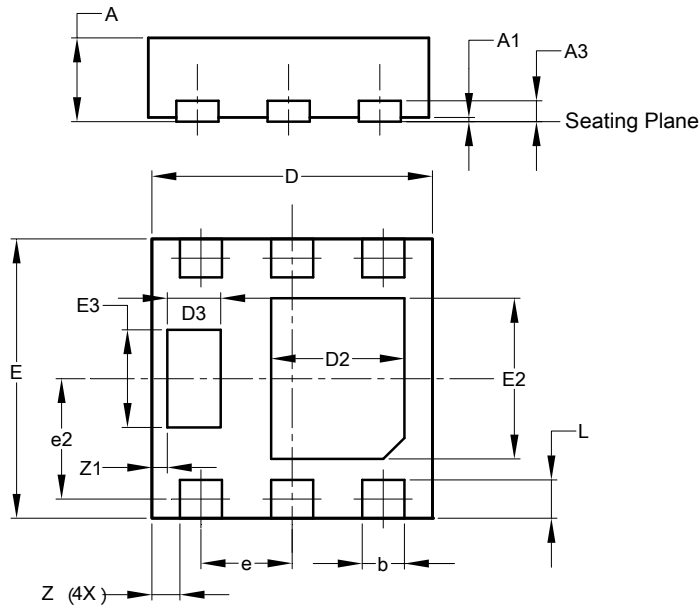


Figure 14 Transient Thermal Resistance

Package Outline Dimensions

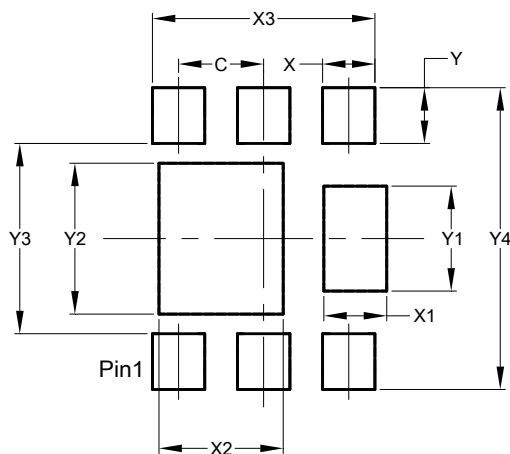
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



U-DFN2020-6 (Type F)			
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
D	1.95	2.05	2.00
D2	0.85	1.05	0.95
D3	0.33	0.43	0.38
e	0.65 BSC		
e2	0.863 BSC		
E	1.95	2.05	2.00
E2	1.05	1.25	1.15
E3	0.65	0.75	0.70
L	0.225	0.325	0.275
Z	0.20 BSC		
Z1	0.110 BSC		
All Dimensions in mm			

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
C	0.650
X	0.400
X1	0.480
X2	0.950
X3	1.700
Y	0.425
Y1	0.800
Y2	1.150
Y3	1.450
Y4	2.300

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