

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>A</sub> = +25°C
12V	4.8mΩ @ V <sub>GS</sub> = 4.5V	15A
	7.0mΩ @ V <sub>GS</sub> = 2.5V	12A

## Description

This new generation MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

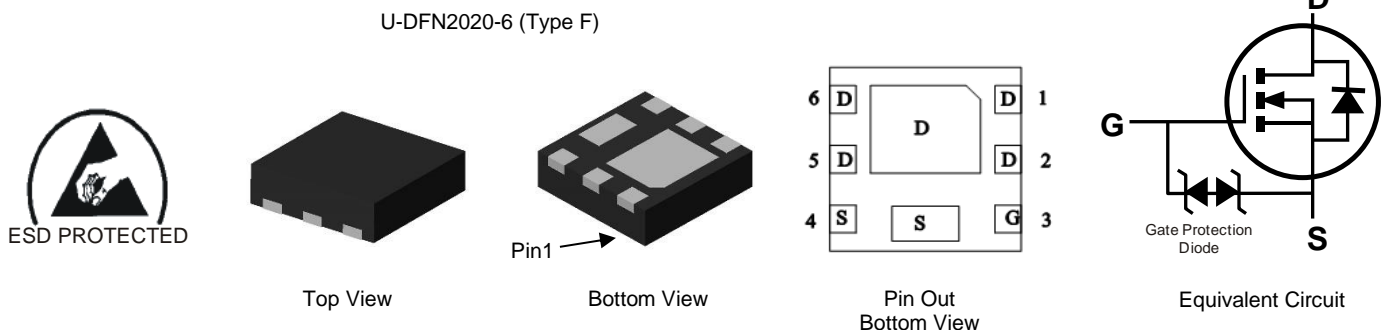
- General Purpose Interfacing Switch
- Power Management Functions

## Features

- 0.6mm Profile – Ideal for Low-Profile Applications
- PCB Footprint of 4mm<sup>2</sup>
- Low Gate Threshold Voltage
- Low On-Resistance
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at <https://www.diodes.com/products/automotive/automotive-products/>.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. <https://www.diodes.com/quality/product-definitions/>**

## 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 (e4)
- Weight: 0.007 grams (Approximate)



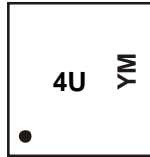
## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN1004UFDF-7	U-DFN2020-6 (Type F)	3,000/Tape & Reel
DMN1004UFDF-13	U-DFN2020-6 (Type F)	10,000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information

Site 1



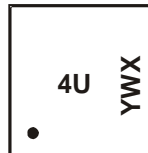
4U = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: 1 = 2021)  
 M = Month (ex: 9 = September)

Date Code Key

Year	2016	...	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Code	D	...	I	J	K	L	M	N	O	P	R	S

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

Site 2



4U = Product Type Marking Code  
 YWX = Date Code Marking  
 Y = Year (ex: 1 = 2021)  
 W = Week (ex: a = Week 27; z Represents Week 52 and 53)  
 X = Internal Code (ex: U = Monday)

Date Code Key

Year	2016	...	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Code	6	...	1	2	3	4	5	6	7	8	9	0

Week	1-26	27-52	53
Code	A-Z	a-z	z

Internal Code	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Code	T	U	V	W	X	Y	Z

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V <sub>DSS</sub>	12	V
Gate-Source Voltage			V <sub>GSS</sub>	±8	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	15	A
		T <sub>A</sub> = +70°C		12	
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)			I <sub>DM</sub>	70	A
Maximum Body Diode Continuous Current (Note 6)			I <sub>S</sub>	3	A
Avalanche Current (Note 7) L = 0.1mH			I <sub>AS</sub>	34	A
Avalanche Energy (Note 7) L = 0.1mH			E <sub>AS</sub>	55	mJ

**Thermal Characteristics**

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	0.9	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R <sub>θJA</sub>	167	°C/W
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	2.1	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R <sub>θJA</sub>	72	°C/W
Thermal Resistance, Junction to Case (Note 6)		R <sub>θJC</sub>	22	
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</b> (Note 8)						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	12	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250µA
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>	—	—	1	µA	V <sub>DS</sub> = 9.6V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10	µA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b> (Note 8)						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	0.3	—	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>	—	4.1	4.8	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 15A
		—	4.5	7.0		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 10A
Diode Forward Voltage	V <sub>SD</sub>	—	0.6	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 3.2A
<b>DYNAMIC CHARACTERISTICS</b> (Note 9)						
Input Capacitance	C <sub>ISS</sub>	—	2,385	—	pF	V <sub>DS</sub> = 6V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>OSS</sub>	—	678	—	pF	
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	520	—	pF	
Gate Resistance	R <sub>G</sub>	—	2.2	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>G</sub>	—	26	—	nC	V <sub>DS</sub> = 6V, I <sub>D</sub> = 10A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>G</sub>	—	47	—	nC	
Gate-Source Charge	Q <sub>GS</sub>	—	2.8	—	nC	
Gate-Drain Charge	Q <sub>GD</sub>	—	5.3	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	5.3	—	ns	V <sub>DS</sub> = 6V, I <sub>D</sub> = 5.0A V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 1.0Ω
Turn-On Rise Time	t <sub>R</sub>	—	10.7	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	31.6	—	ns	
Turn-Off Fall Time	t <sub>F</sub>	—	16.9	—	ns	
Reverse Recovery Time	t <sub>RR</sub>	—	24.3	—	ns	I <sub>F</sub> = 2.0A, di/dt = 100A/µs
Reverse Recovery Charge	Q <sub>RR</sub>	—	7.4	—	nC	

- 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 1-inch square copper plate.
  - I<sub>AS</sub> and E<sub>AS</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

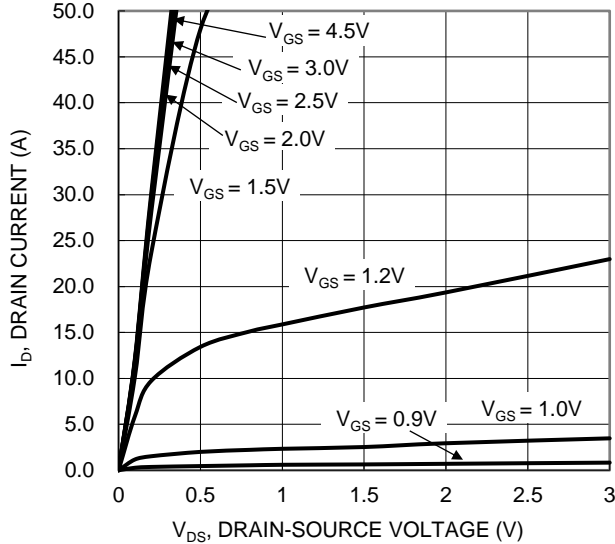


Figure 1. Typical Output Characteristic

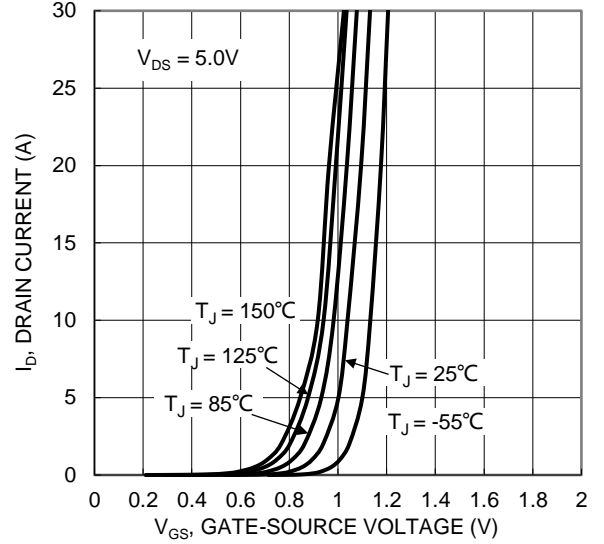


Figure 2. Typical Transfer Characteristic

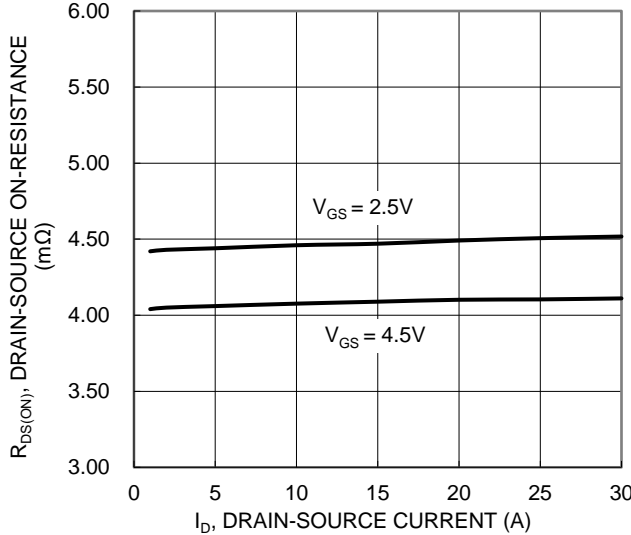


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

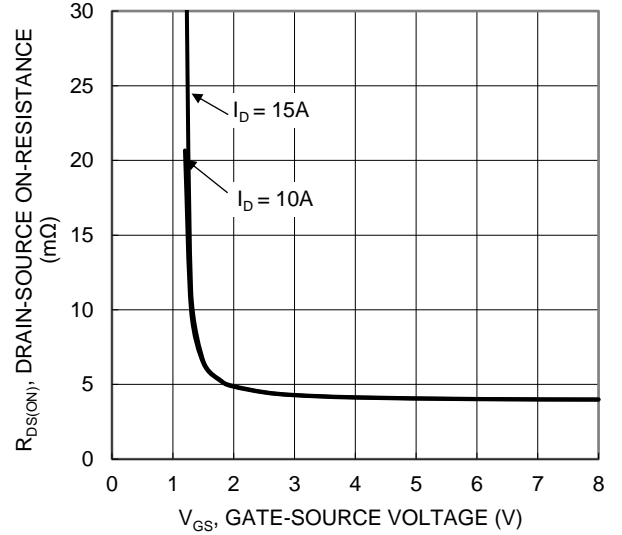


Figure 4. Typical Transfer Characteristic

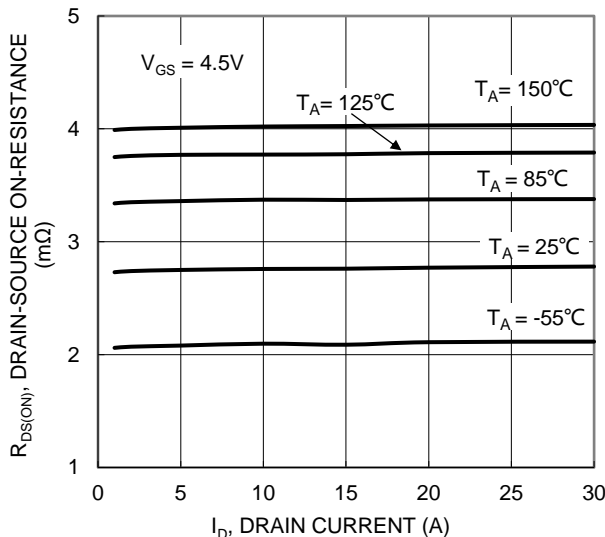


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

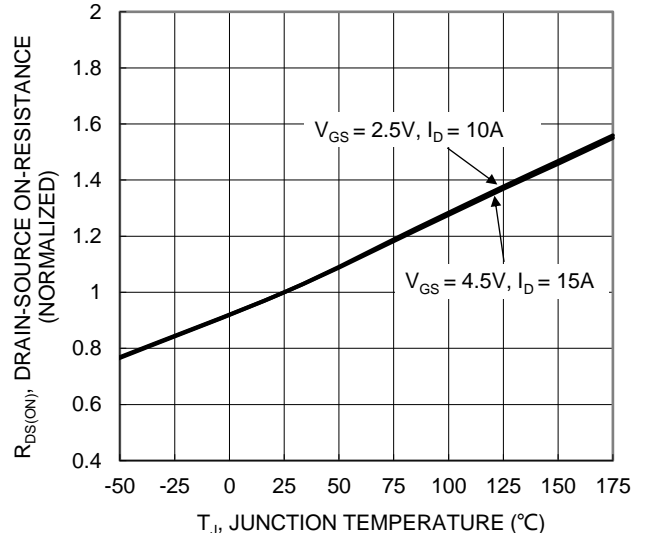


Figure 6. On-Resistance Variation with Temperature

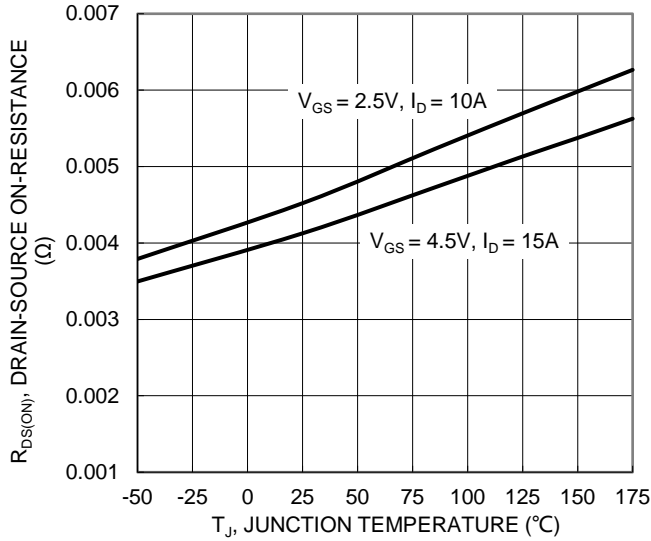


Figure 7. On-Resistance Variation with Temperature

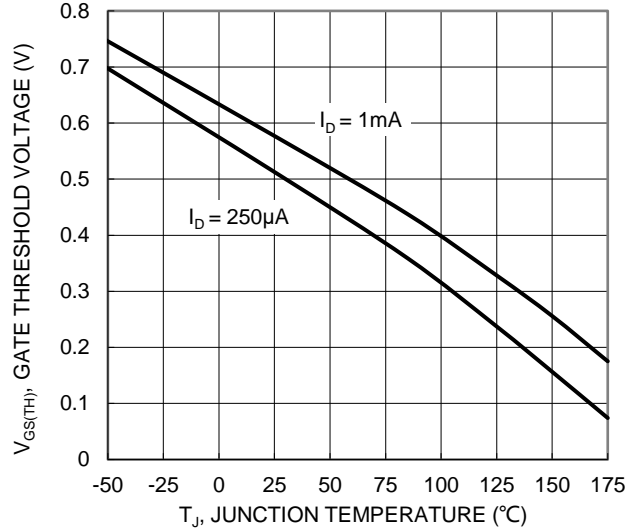


Figure 8. Gate Threshold Variation vs. Junction Temperature

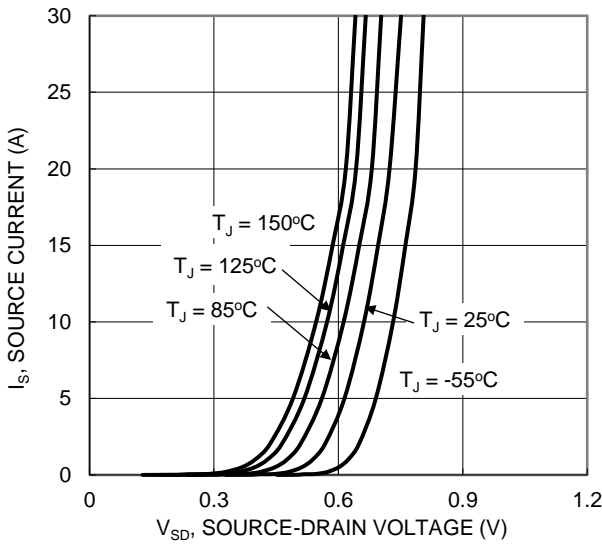


Figure 9. Diode Forward Voltage vs. Current

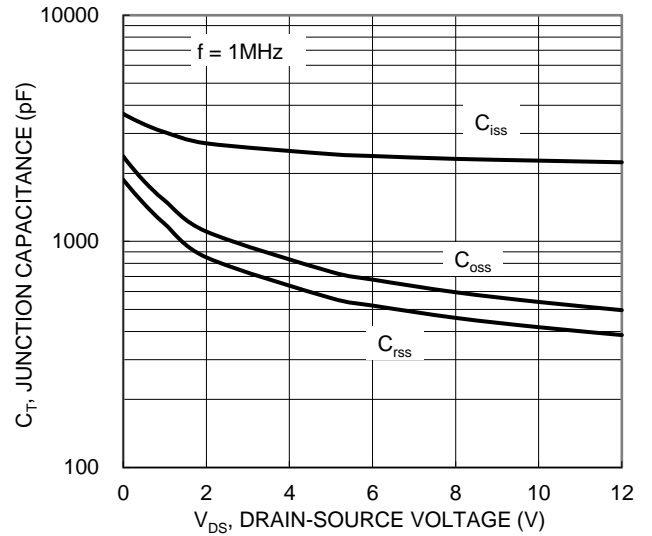


Figure 10. Typical Junction Capacitance

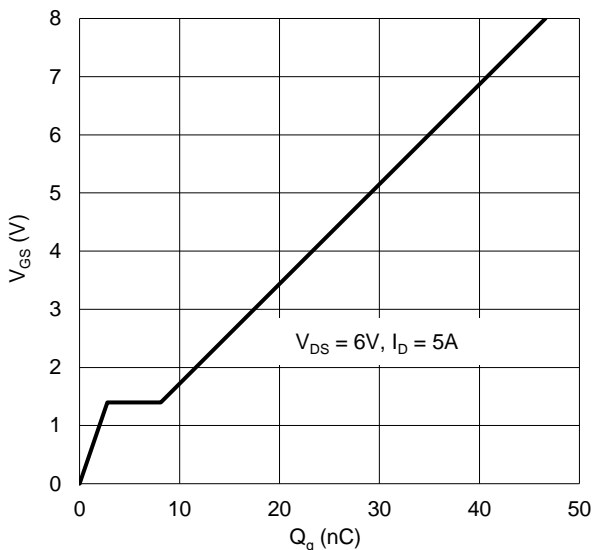


Figure 11. Gate Charge

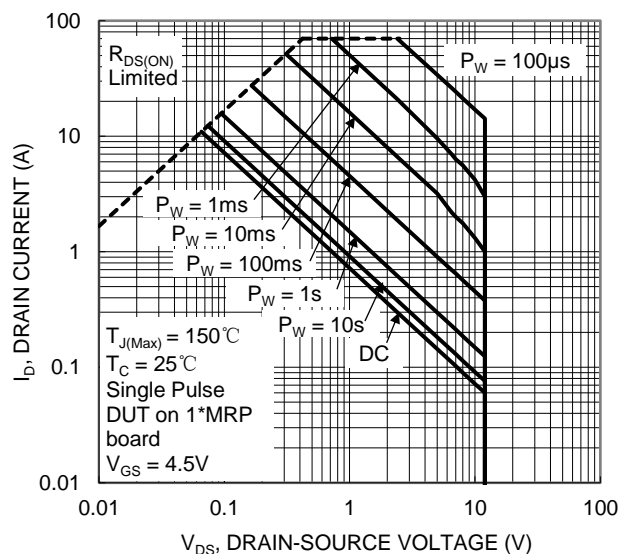


Figure 12. SOA, Safe Operation Area

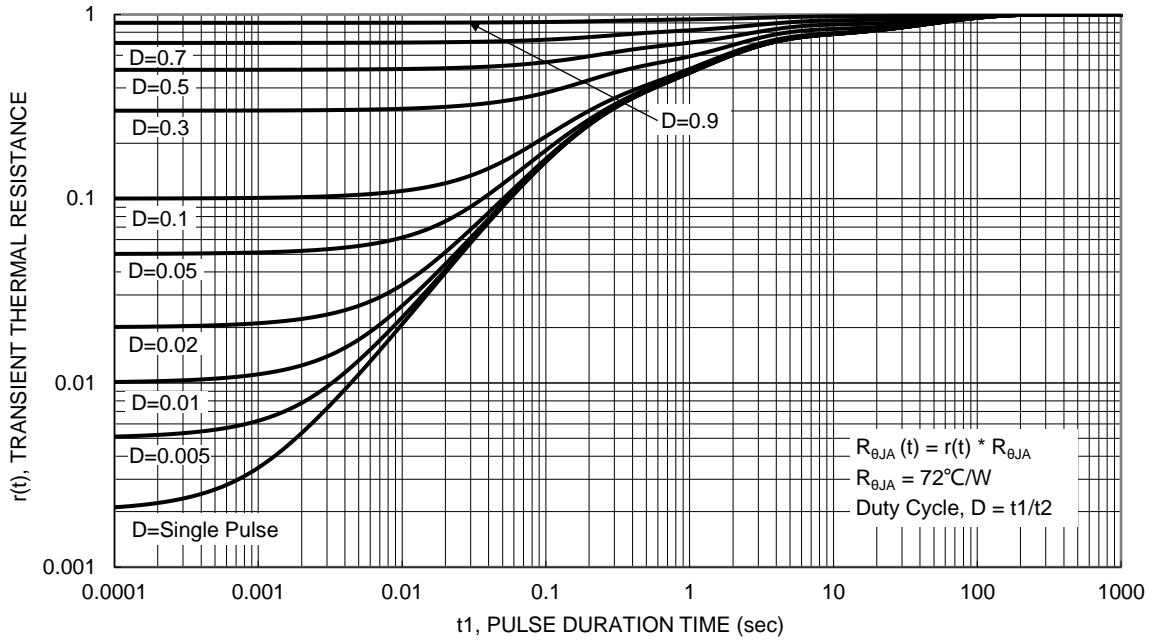
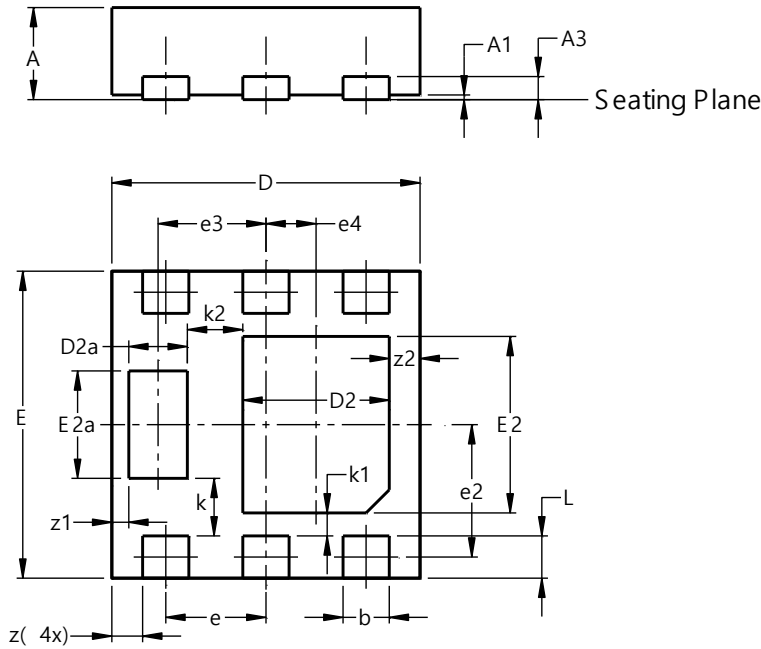


Figure 13. Transient Thermal Resistance

**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**U-DFN2020-6 (Type F)**

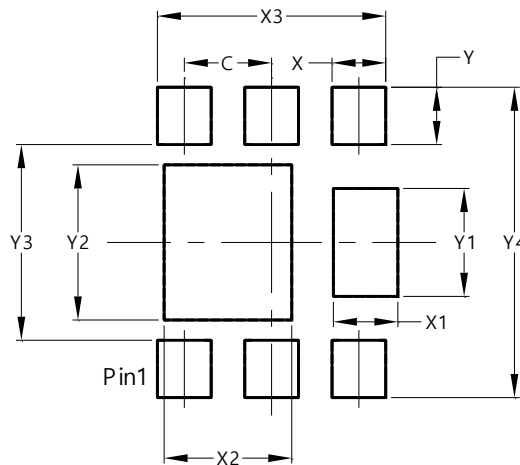


U-DFN2020-6 (Type F)			
Dim	Min	Max	Typ
A	0.57	0.63	0.60
A1	0.00	0.05	0.03
A3	-	-	0.15
b	0.25	0.35	0.30
D	1.95	2.05	2.00
D2	0.85	1.05	0.95
D2a	0.33	0.43	0.38
E	1.95	2.05	2.00
E2	1.05	1.25	1.15
E2a	0.65	0.75	0.70
e	0.65 BSC		
e2	0.863 BSC		
e3	0.70 BSC		
e4	0.325 BSC		
k	0.37 BSC		
k1	0.15 BSC		
k2	0.36 BSC		
L	0.225	0.325	0.275
z	0.20 BSC		
z1	0.110 BSC		
z2	0.20 BSC		
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**U-DFN2020-6 (Type F)**



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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