

## Product Summary

$BV_{DSS}$	$R_{DS(ON)}$ max	$I_D$ max $T_c = +25^\circ\text{C}$
-20V	32m $\Omega$ @ $V_{GS} = -4.5\text{V}$	-13A
	53m $\Omega$ @ $V_{GS} = -2.5\text{V}$	-10A

## Features and Benefits

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm<sup>2</sup>
- Low Gate Threshold Voltage
- Low On-Resistance
- **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 [contact us](mailto:contact@diodes.com) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

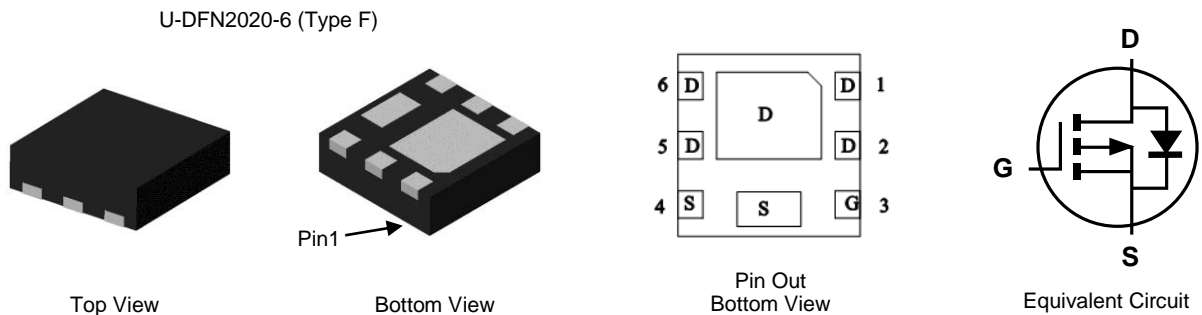
## Description and Applications

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

## 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@4
- Weight: 0.0065 grams (Approximate)



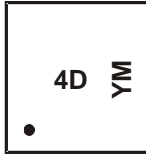
## Ordering Information (Note 4)

Part Number	Case	Packaging
DMP2040UFD-7	U-DFN2020-6 (Type F)	3,000/Tape & Reel
DMP2040UFD-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

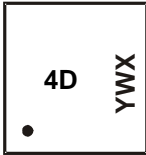


4D = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: H = 2020)  
 M = Month (ex: 9 = September)

Date Code Key

Year	2016	...	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Code	D	...	H	I	J	K	L	M	N	O	P	R
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



4D = Product Type Marking Code  
 YWX = Date Code Marking  
 Y = Year (ex: 0 = 2020)  
 W = Week (ex: a = Week 27; z Represents Week 52 and 53)  
 X = Internal Code (ex: U = Monday)

Date Code Key

Year	2016	...	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Code	6	...	0	1	2	3	4	5	6	7	8	9
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>	-20	V
Gate-Source Voltage			V <sub>GSS</sub>	±12	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = -4.5V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	-6.1	A
		T <sub>A</sub> = +70°C		-4.9	
Continuous Drain Current (Note 7) V <sub>GS</sub> = -4.5V	Steady State	T <sub>C</sub> = +25°C	I <sub>D</sub>	-13	A
		T <sub>C</sub> = +70°C		-10	
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I <sub>DM</sub>	-35	A
Continuous Source-Drain Diode Current (Note 6)			I <sub>S</sub>	-2.0	A
Avalanche Current (Note 8) L = 0.1mH			I <sub>AS</sub>	-17	A
Avalanche Energy (Note 8) L = 0.1mH			E <sub>AS</sub>	14	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	0.8	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R <sub>θJA</sub>	149	°C/W
	t < 10s		95	
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.8	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R <sub>θJA</sub>	70	°C/W
	t < 10s		45	
Thermal Resistance, Junction to Case (Note 7)	Steady State	R <sub>θJC</sub>	16	°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 9)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-20	—	—	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> = -16V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 9)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-0.6	—	-1.5	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	22	32	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -8.9A
		—	31	53		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -6.9A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.7	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -2.9A
<b>DYNAMIC CHARACTERISTICS (Note 10)</b>						
Input Capacitance	C <sub>ISS</sub>	—	834	—	pF	V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>OSS</sub>	—	133	—		
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	105	—		
Gate Resistance	R <sub>G</sub>	—	4.9	—	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>	—	8.6	—	nC	V <sub>DS</sub> = -6V, I <sub>D</sub> = -8.9A
Total Gate Charge (V <sub>GS</sub> = -8V)	Q <sub>g</sub>	—	19	—		
Gate-Source Charge	Q <sub>gs</sub>	—	1.5	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	2.5	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	5.8	—	ns	V <sub>DD</sub> = -6V, R <sub>L</sub> = 6Ω V <sub>GS</sub> = -4.5V, R <sub>G</sub> = 6Ω, I <sub>D</sub> = -1A
Turn-On Rise Time	t <sub>R</sub>	—	7.7	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	28.1	—		
Turn-Off Fall Time	t <sub>F</sub>	—	14.6	—		
Body Diode Reverse Recovery Time	t <sub>RR</sub>	—	9.8	—	ns	I <sub>F</sub> = -8.9A, di/dt = -100A/µs
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	—	2.7	—	nC	I <sub>F</sub> = -8.9A, di/dt = -100A/µs

- 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.
  - Thermal resistance from junction to soldering point (on the exposed drain pad).
  - 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.

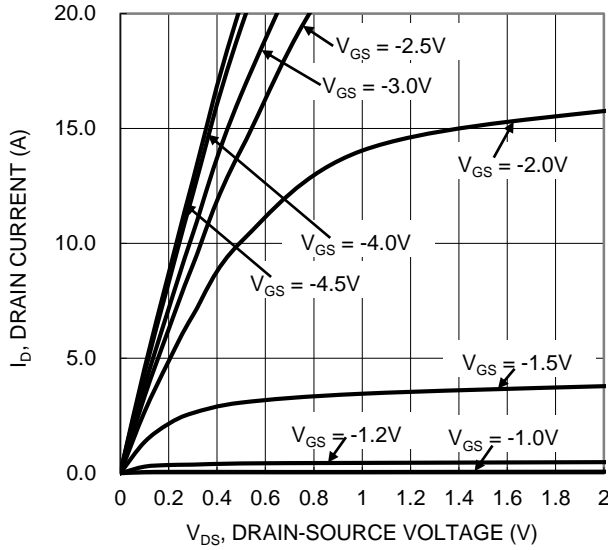


Figure 1. Typical Output Characteristic

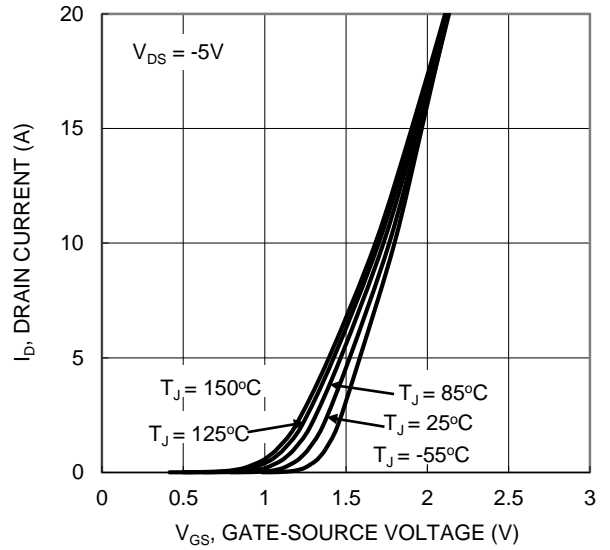


Figure 2. Typical Transfer Characteristic

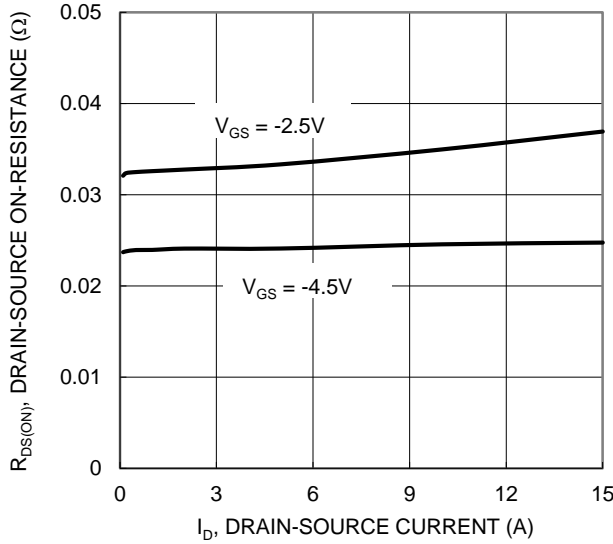


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

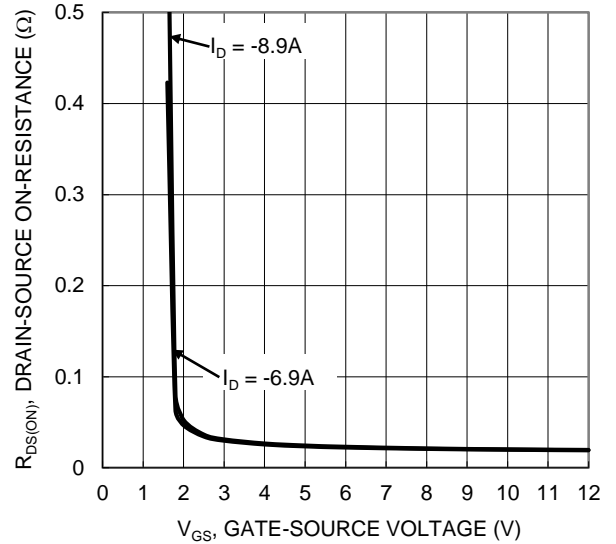


Figure 4. Typical Transfer Characteristic

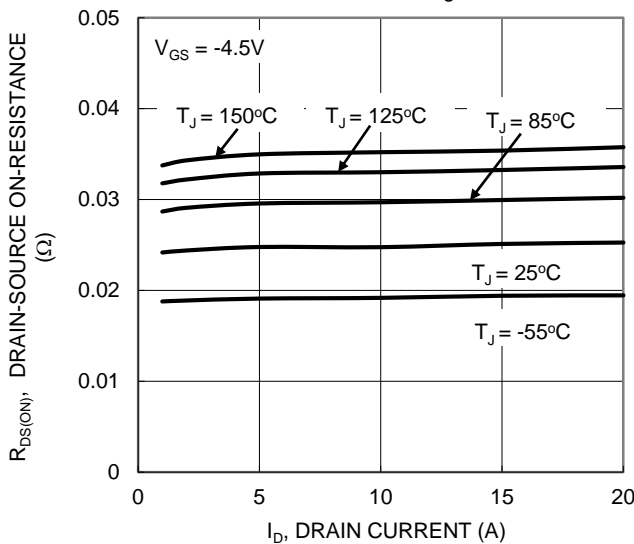


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

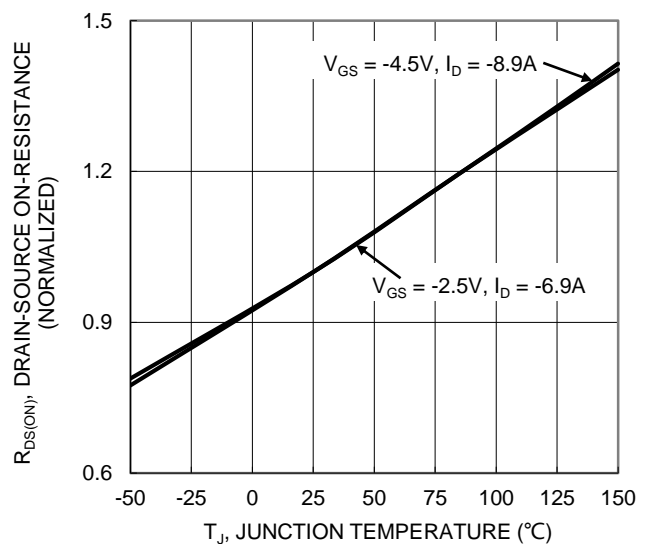


Figure 6. On-Resistance Variation with Temperature

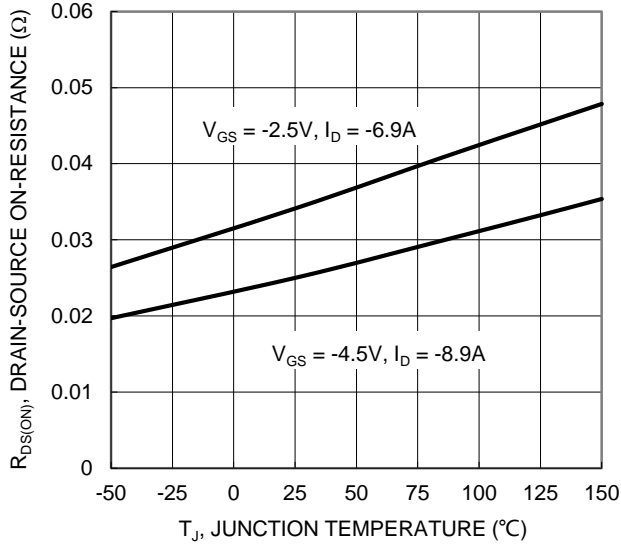


Figure 7. On-Resistance Variation with Temperature

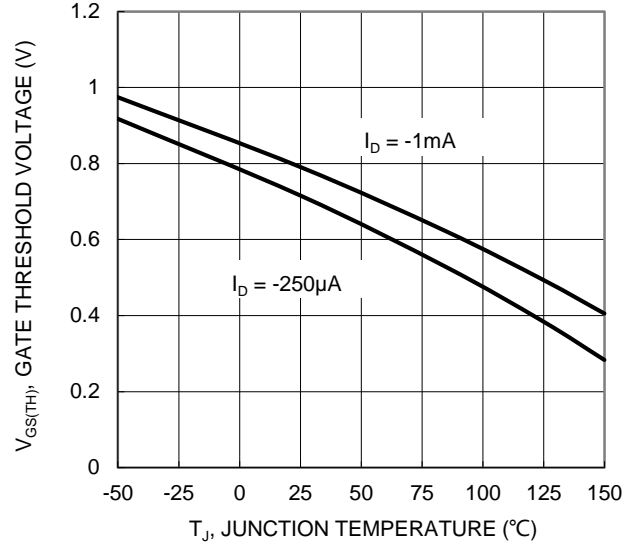


Figure 8. Gate Threshold Variation vs. Junction Temperature

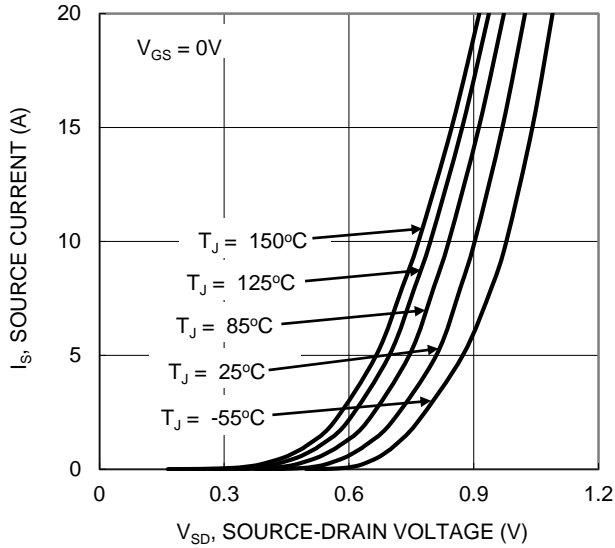


Figure 9. Diode Forward Voltage vs. Current

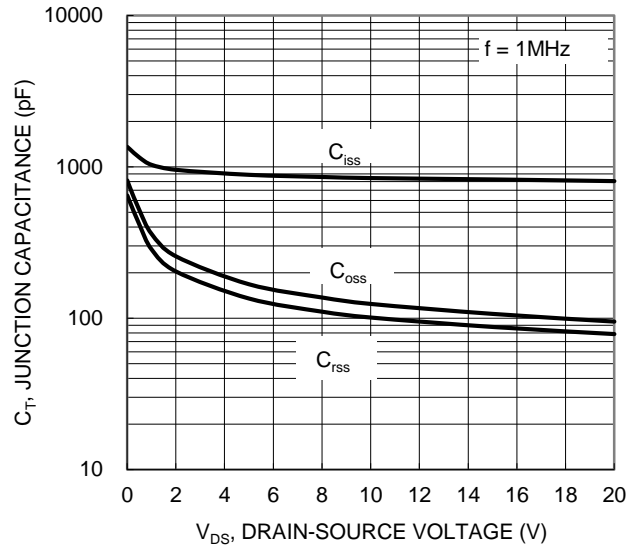


Figure 10. Typical Junction Capacitance

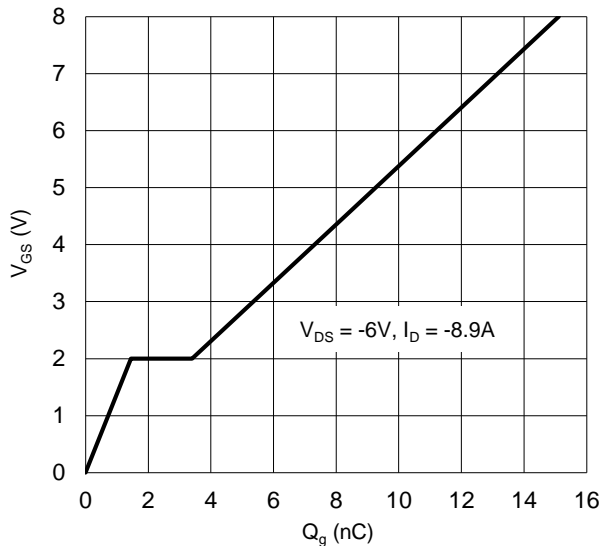


Figure 11. Gate Charge

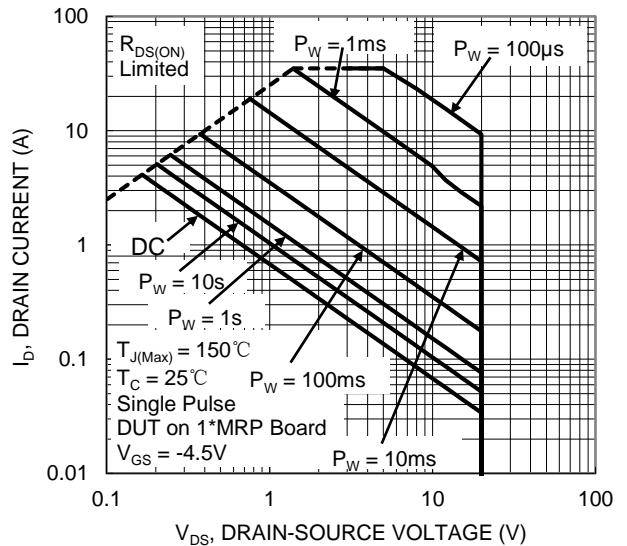


Figure 12. SOA, Safe Operation Area

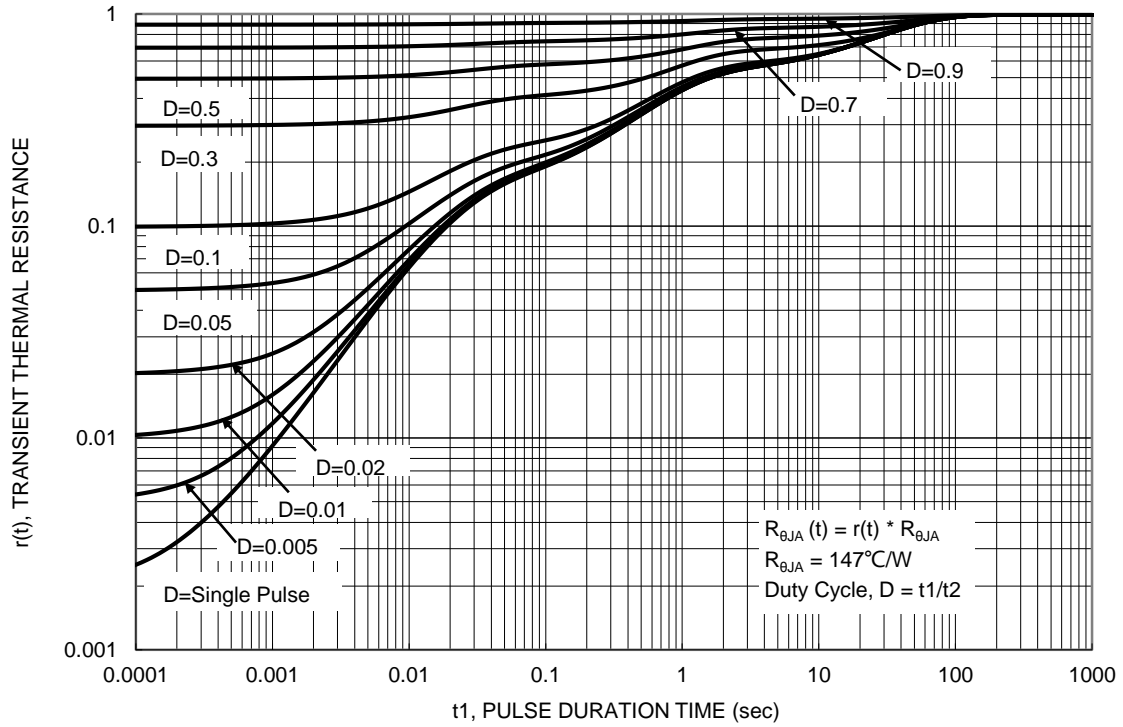
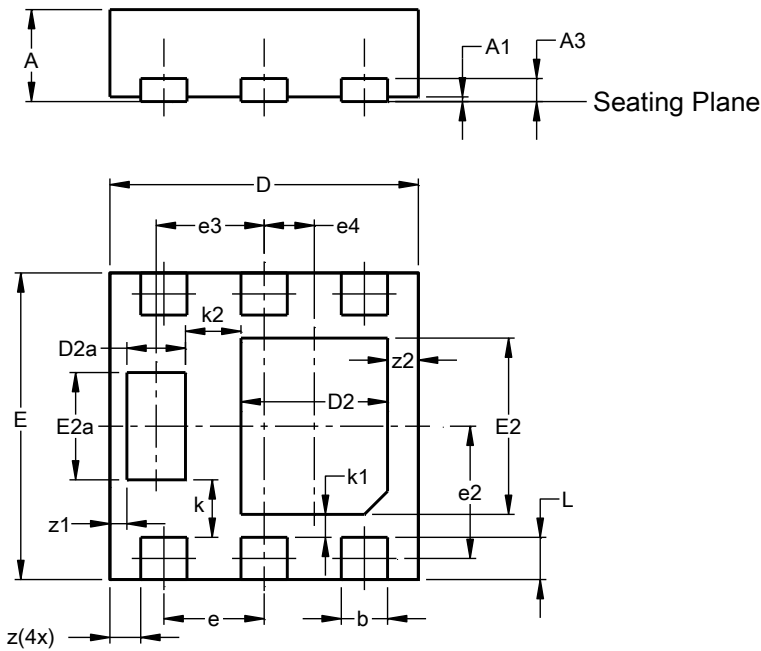


Figure 13. Transient Thermal Resistance

## Package Outline Dimension

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

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

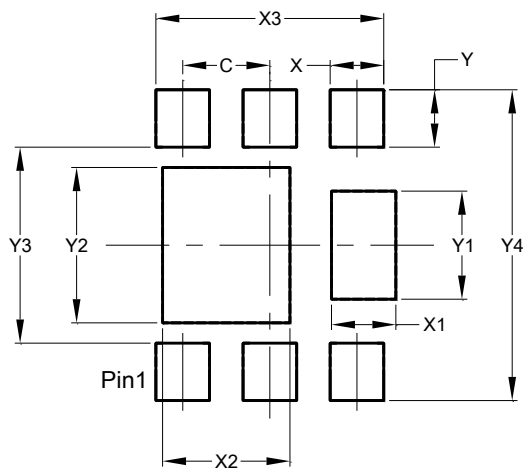


U-DFN2020-6 (Type F)			
Dim	Min	Max	Typ
A	0.57	0.63	0.60
A1	0.00	0.05	0.03
A3	-	-	0.15
b	0.25	0.35	0.30
D	1.95	2.05	2.00
D2	0.85	1.05	0.95
D2a	0.33	0.43	0.38
E	1.95	2.05	2.00
E2	1.05	1.25	1.15
E2a	0.65	0.75	0.70
e	0.65 BSC		
e2	0.863 BSC		
e3	0.70 BSC		
e4	0.325 BSC		
k	0.37 BSC		
k1	0.15 BSC		
k2	0.36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

## 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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