

## Product Summary

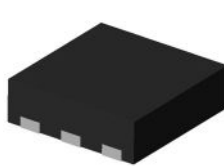
$V_{(BR)DSS}$	$R_{DS(ON)}$ max	$I_D$ max $T_A = +25^\circ C$
-20V	27m $\Omega$ @ $V_{GS} = -4.5V$	-7.6A
	32m $\Omega$ @ $V_{GS} = -2.5V$	-6.7A
	50m $\Omega$ @ $V_{GS} = -1.8V$	-5.2A
	90m $\Omega$ @ $V_{GS} = -1.5V$	-3.9A

## Description

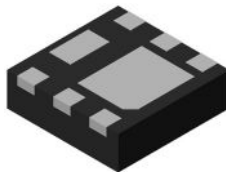
This MOSFET is designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) and yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

- Battery Management Application
- Power Management Functions
- DC-DC Converters

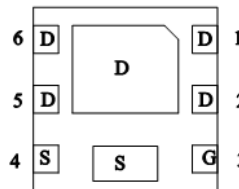
U-DFN2020-6



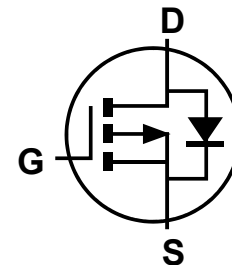
Top View



Bottom View



Pin Out  
Bottom View



Internal Schematic

## Features

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm<sup>2</sup>
- 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 <sup>(e4)</sup>
- Weight: 0.007 Grams (Approximate)

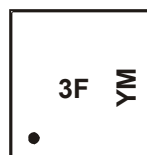
## Ordering Information (Note 4)

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			$V_{GSS}$	$\pm 8$	V
Continuous Drain Current (Note 6) $V_{GS} = -4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	-7.6 -6.1	A
	$t < 5\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	-9.5 -7.6	A
Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%)			$I_{DM}$	-40	A
Continuous Source-Drain Diode Current		$T_A = +25^\circ\text{C}$	$I_S$	-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)	$T_A = +25^\circ\text{C}$	$P_D$	0.73	W
	$T_A = +70^\circ\text{C}$		0.47	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	171	$^\circ\text{C/W}$
	$t < 5\text{s}$		112	
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	$P_D$	2.03	W
	$T_A = +70^\circ\text{C}$		1.30	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	62	$^\circ\text{C/W}$
	$t < 5\text{s}$		40	
Thermal Resistance, Junction to Case (Note 6)		Steady State	$R_{\theta JC}$	9.3
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 8)</b>						
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	$\mu\text{A}$	$V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 5\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 8)</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	$R_{DS(on)}$	—	—	27	m $\Omega$	$V_{GS} = -4.5\text{V}, I_D = -7.0\text{A}$
			—	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	$V_{GS} = 0\text{V}, I_S = -1.0\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
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	—	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
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.

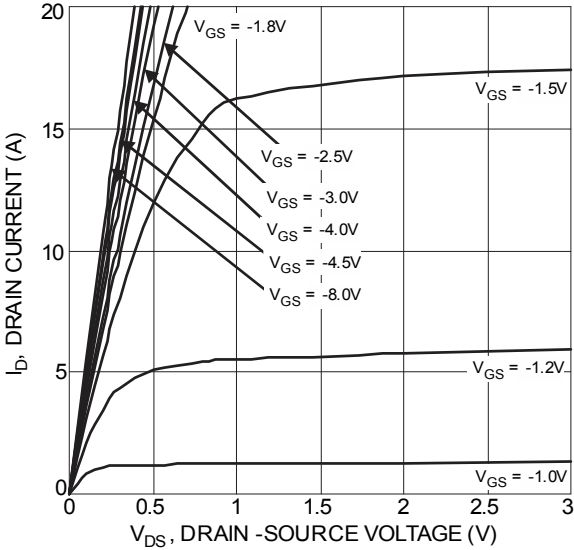


Figure 1 Typical Output Characteristics

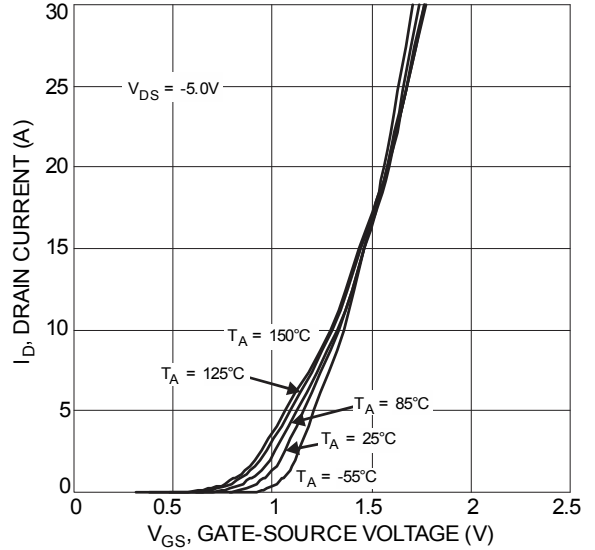


Figure 2 Typical Transfer Characteristics

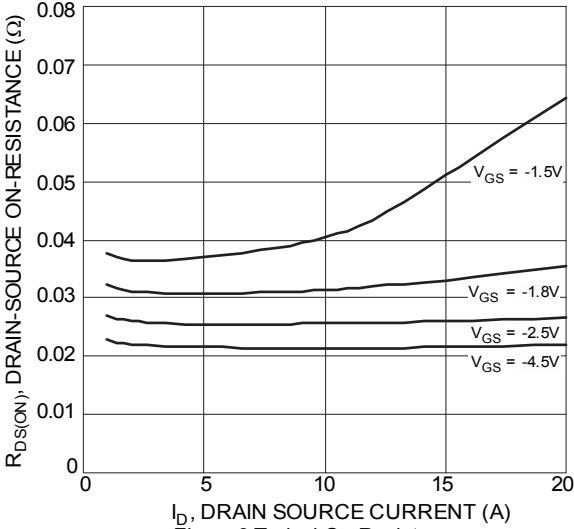


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

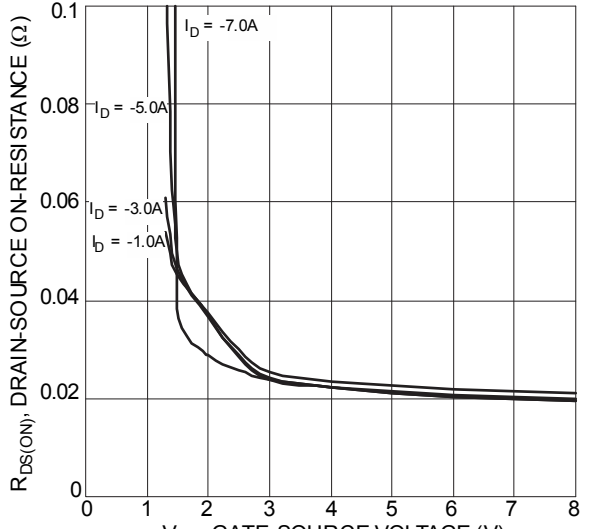


Figure 4 Typical Transfer Characteristics

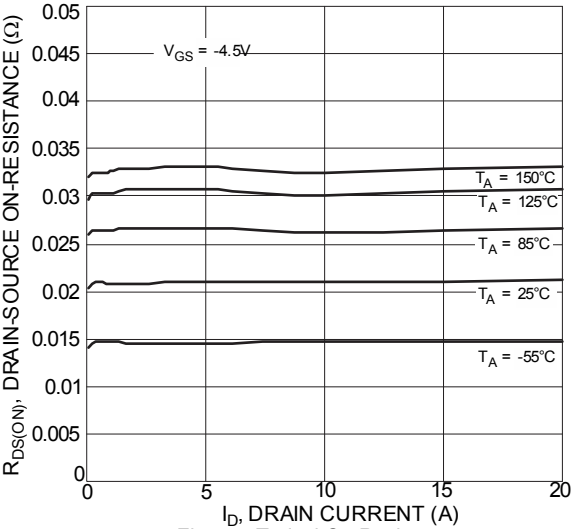


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

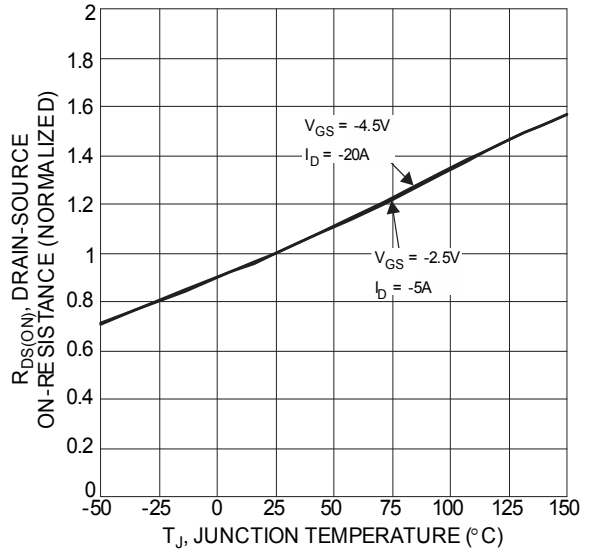


Figure 6 On-Resistance Variation with Temperature

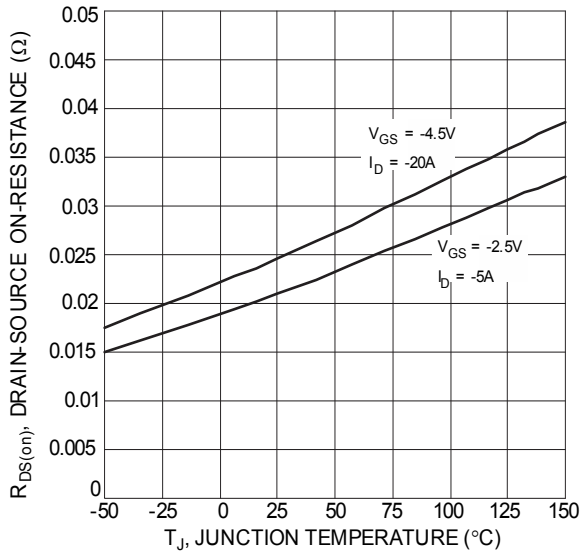


Figure 7 On-Resistance Variation with Temperature

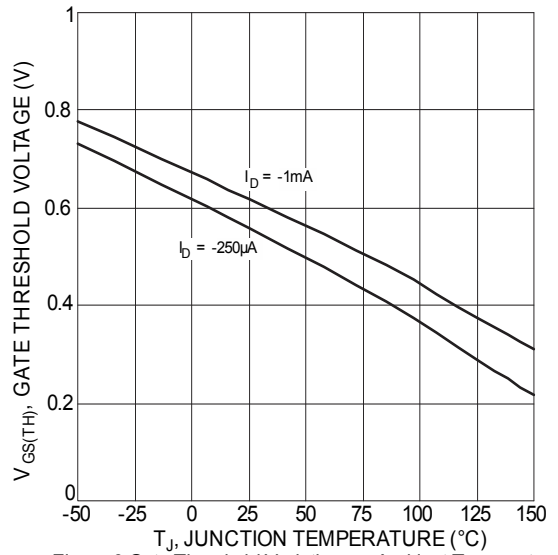


Figure 8 Gate Threshold Variation vs. Ambient Temperature

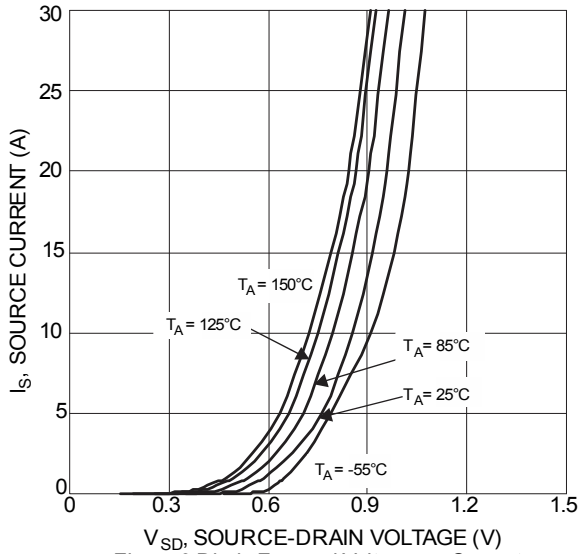


Figure 9 Diode Forward Voltage vs. Current

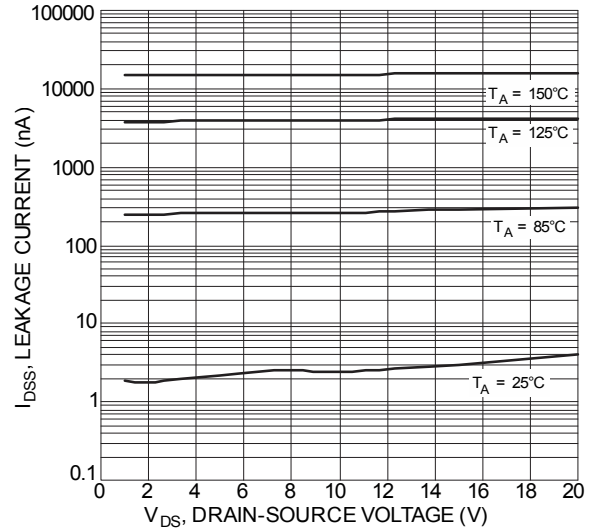


Figure 10 Typical Drain-Source Leakage Current vs. Voltage

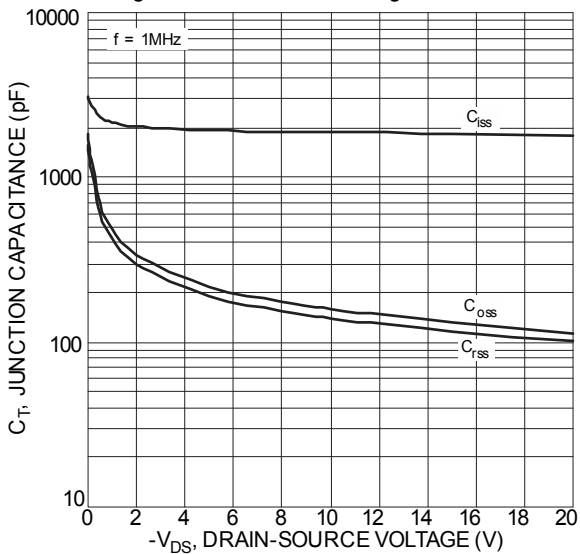


Figure 11 Typical Junction Capacitance

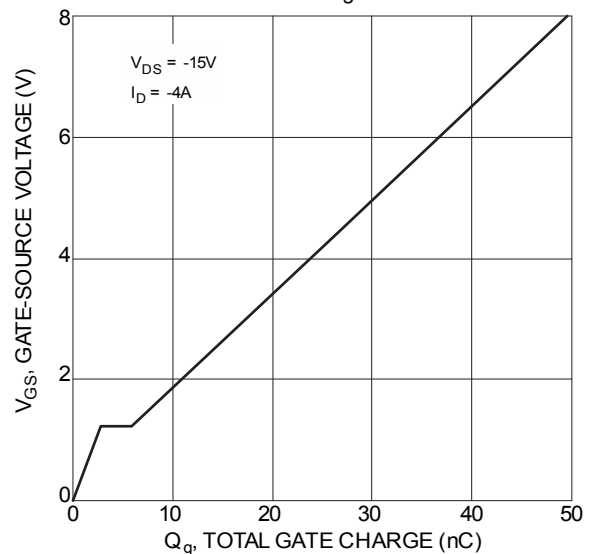
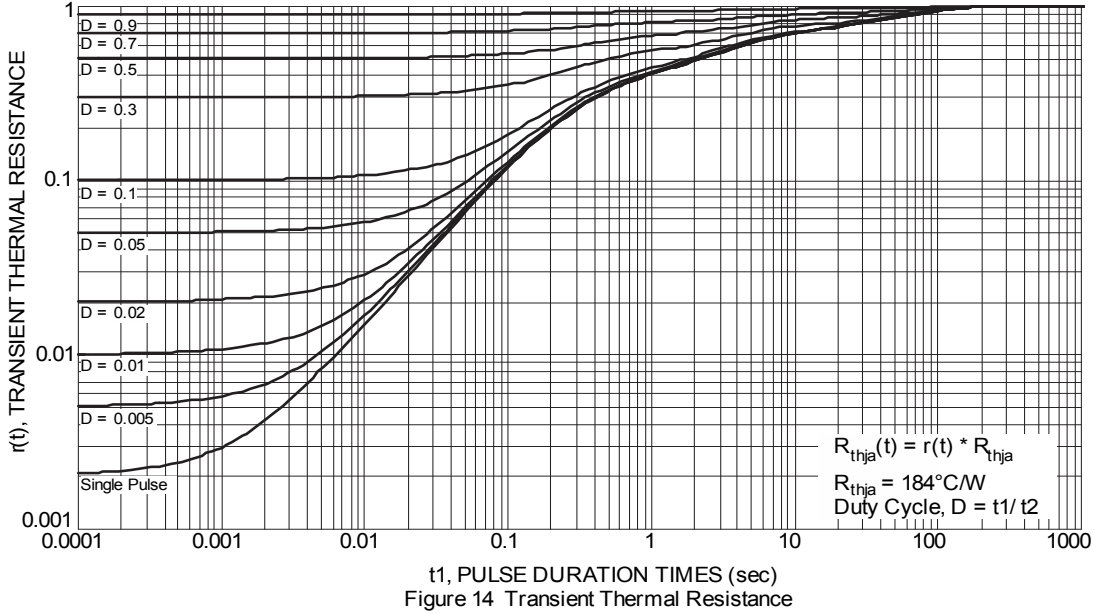
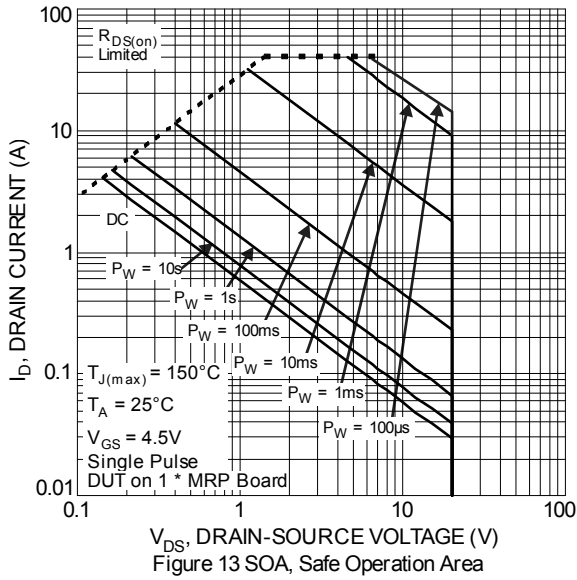
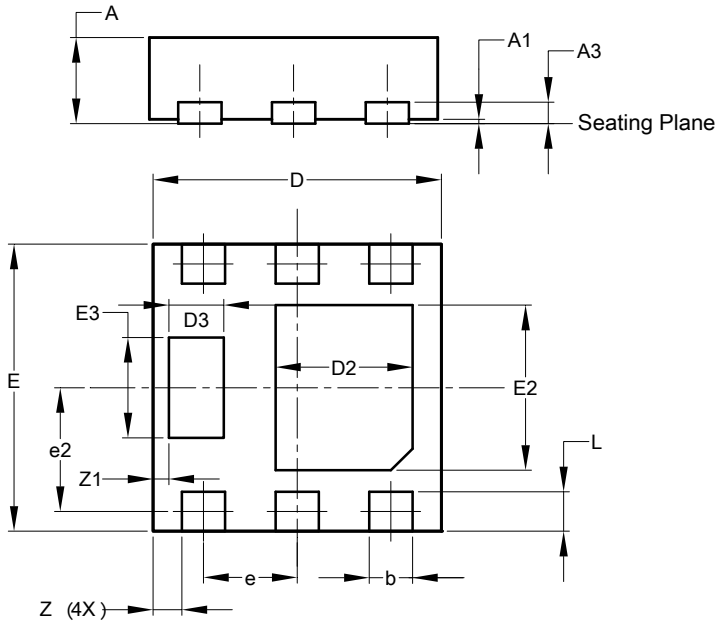


Figure 12 Gate-Charge Characteristics



## Package Outline Dimensions

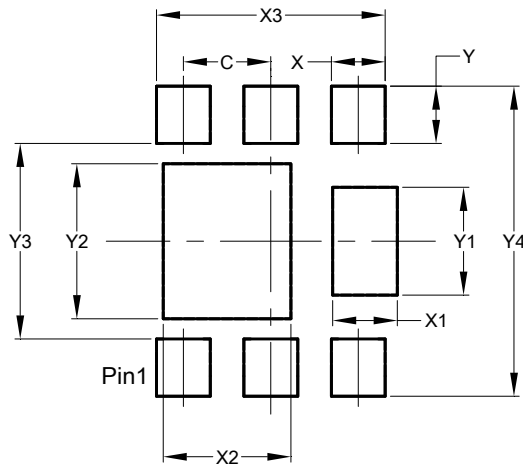
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



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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