

## Product Summary

V <sub>(BR)DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>A</sub> = +25°C
40V	14mΩ @ V <sub>GS</sub> = 10V	9.8A
	20mΩ @ V <sub>GS</sub> = 4.5V	8.2A

## Description

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

## Applications

- General Purpose Interfacing Switch
- Power Management Functions

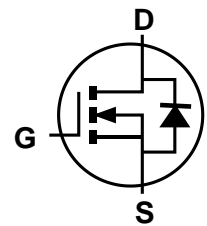
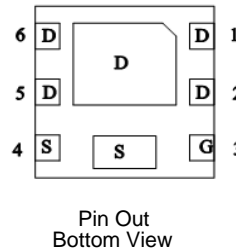
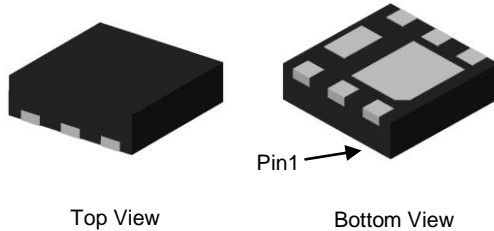
## Features

- 0.6mm Profile –Ideal for Low Profile Applications
- PCB Footprint of 4mm<sup>2</sup>
- Low Gate Threshold Voltage
- Low On-Resistance
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## 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)

U-DFN2020-6

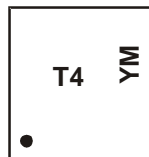


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMT4012LFDF -7	U-DFN2020-6	3,000/Tape & Reel
DMT4012LFDF -13	U-DFN2020-6	10,000/Tape & Reel

- 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/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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



T4 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: C = 2015)  
 M = Month (ex: 9 = September)

### Date Code Key

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

Month Code	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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V <sub>DSS</sub>	40	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = 10.0V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	9.8 7.8	A
	t < 10s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	12.4 10.0	A
Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	8.2 6.6	A
	t < 10s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	10.3 8.3	A
Pulsed Drain Current (10µs pulse, Duty Cycle = 1%)			I <sub>DM</sub>	45	A
Maximum Body Diode Continuous Current (Note 6)			I <sub>S</sub>	2.2	A
Avalanche Current (Note 7) L = 0.1mH			I <sub>AS</sub>	12	A
Avalanche Energy (Note 7) L = 0.1mH			E <sub>AS</sub>	7.2	mJ

**Thermal Characteristics**

Characteristic			Symbol	Value	Unit
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C		P <sub>D</sub>	0.78	W
	T <sub>A</sub> = +70°C			0.50	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state		R <sub>θJA</sub>	160	°C/W
	t < 10s			100	
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C		P <sub>D</sub>	2.0	W
	T <sub>A</sub> = +70°C			1.3	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state		R <sub>θJA</sub>	62.0	°C/W
	t < 10s			39.0	
Thermal Resistance, Junction to Case (Note 6)			R <sub>θJC</sub>	8.3	
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 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40.0	—	—	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>	—	—	1.0	µA	V <sub>DS</sub> = 32V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1.0	—	3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	—	14	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A
		—	—	20		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 8.5A
Diode Forward Voltage	V <sub>SD</sub>	—	—	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 2A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	907	—	pF	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	376	—	pF	
Reverse Transfer Capacitance	C <sub>riss</sub>	—	43	—	pF	
Gate Resistance	R <sub>g</sub>	—	1.5	—	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>	—	7	—	nC	V <sub>DD</sub> = 20V, I <sub>D</sub> = 10A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	15	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	2.5	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	2.3	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	3.1	—	ns	V <sub>DS</sub> = 20V, I <sub>D</sub> = 10A V <sub>GS</sub> = 10V, R <sub>G</sub> = 6Ω
Turn-On Rise Time	t <sub>R</sub>	—	5.1	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	14.1	—	ns	
Turn-Off Fall Time	t <sub>F</sub>	—	6.2	—	ns	
Reverse Recovery Time	t <sub>RR</sub>	—	20.6	—	ns	I <sub>F</sub> = 10A, di/dt = 100A/µs
Reverse Recovery Charge	Q <sub>RR</sub>	—	8.8	—	nC	

- 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<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.

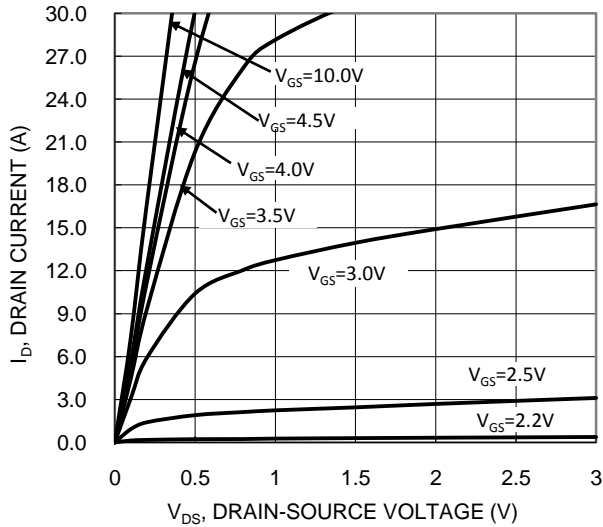


Figure 1. Typical Output Characteristic

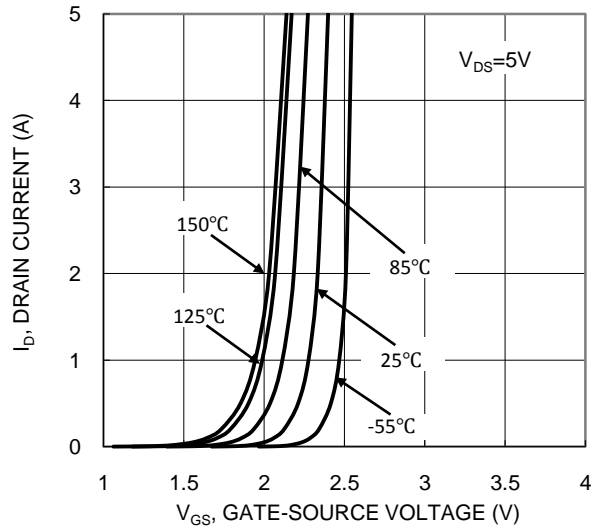


Figure 2. Typical Transfer Characteristic

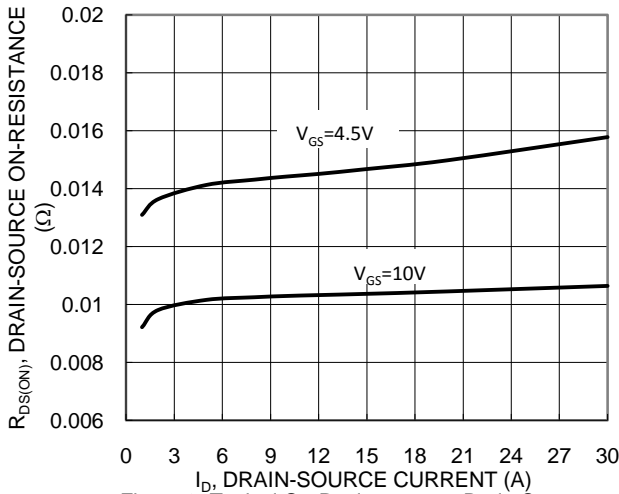


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

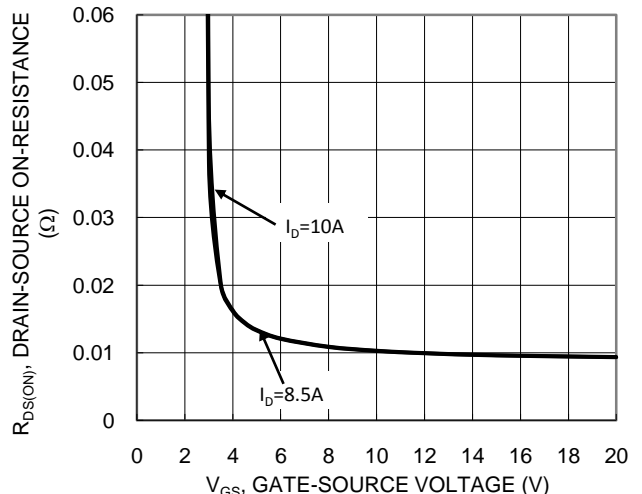


Figure 4. Typical Transfer Characteristic

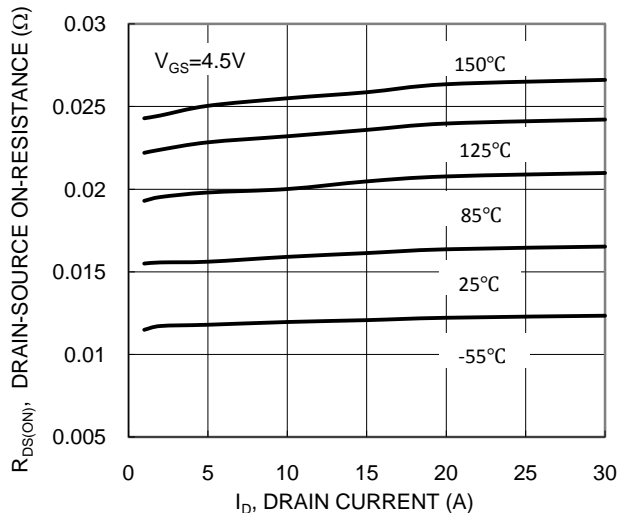


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

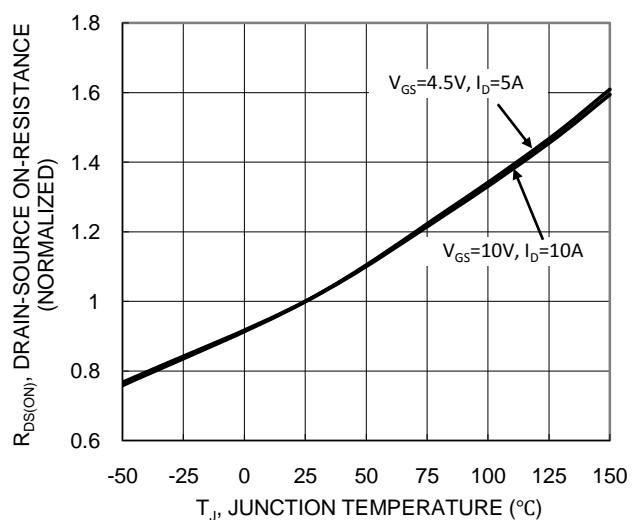


Figure 6. On-Resistance Variation with Temperature

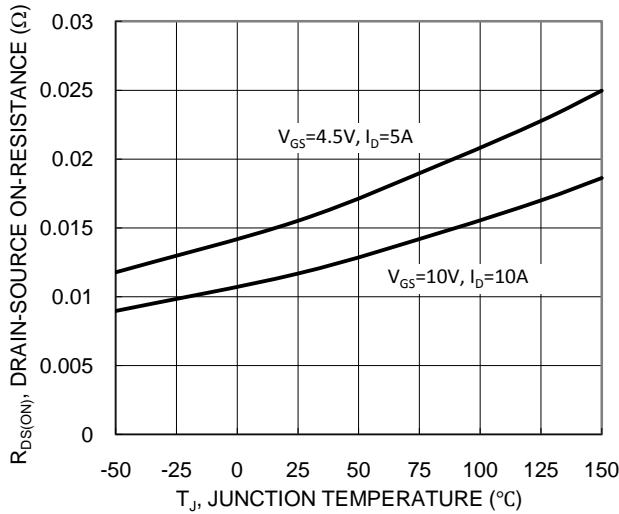


Figure 7. On-Resistance Variation with Temperature

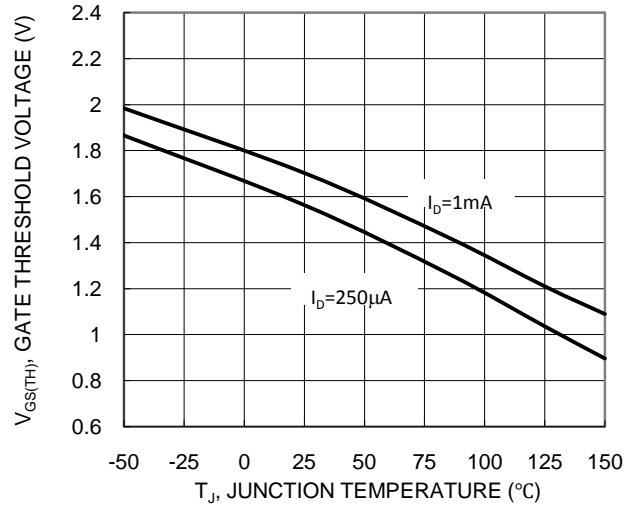


Figure 8. Gate Threshold Variation vs. Junction Temperature

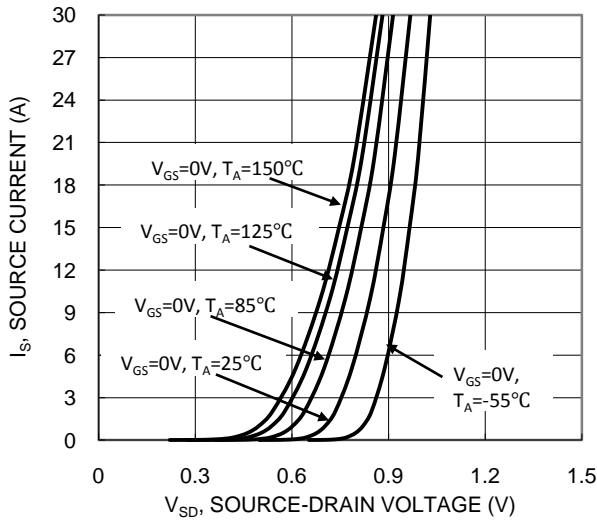


Figure 9. Diode Forward Voltage vs. Current

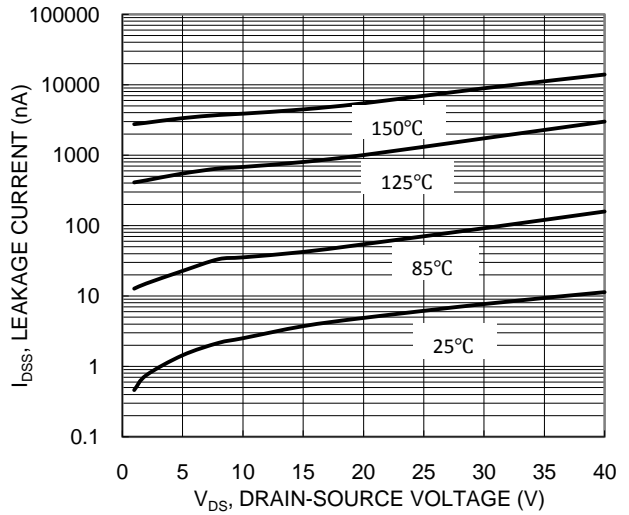


Figure 10. Typical Drain-Source Leakage Current vs. Voltage

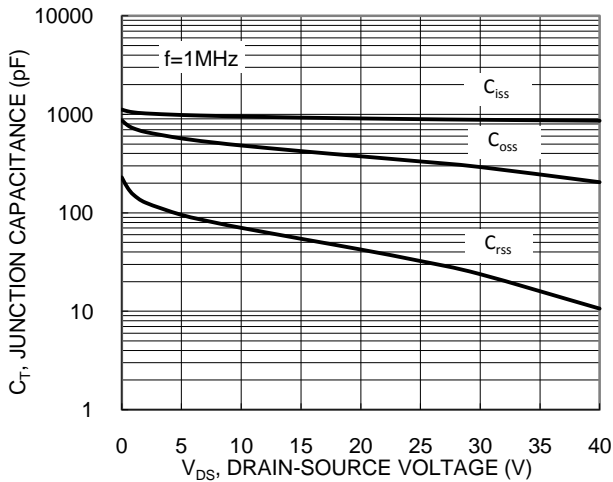


Figure 11. Typical Junction Capacitance

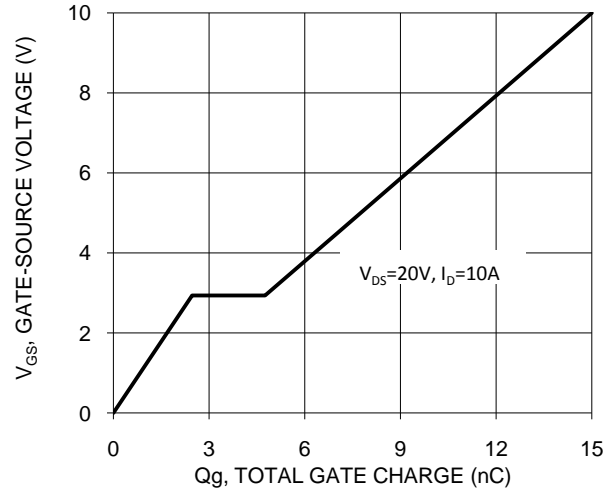
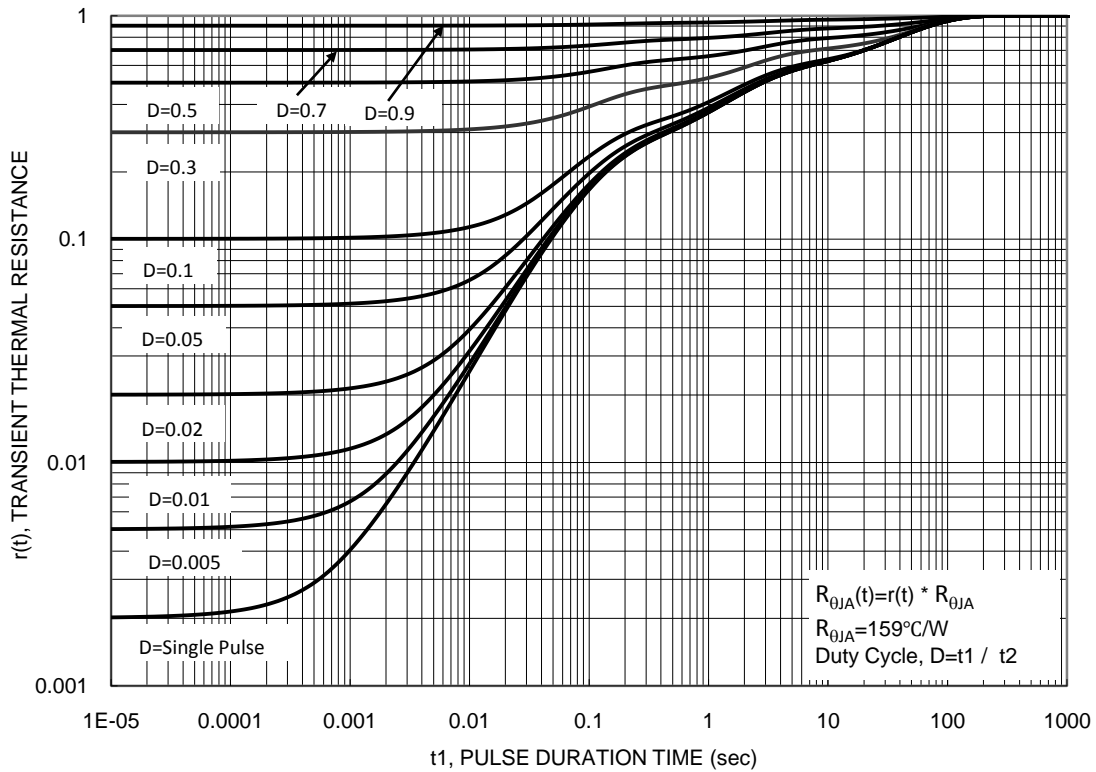
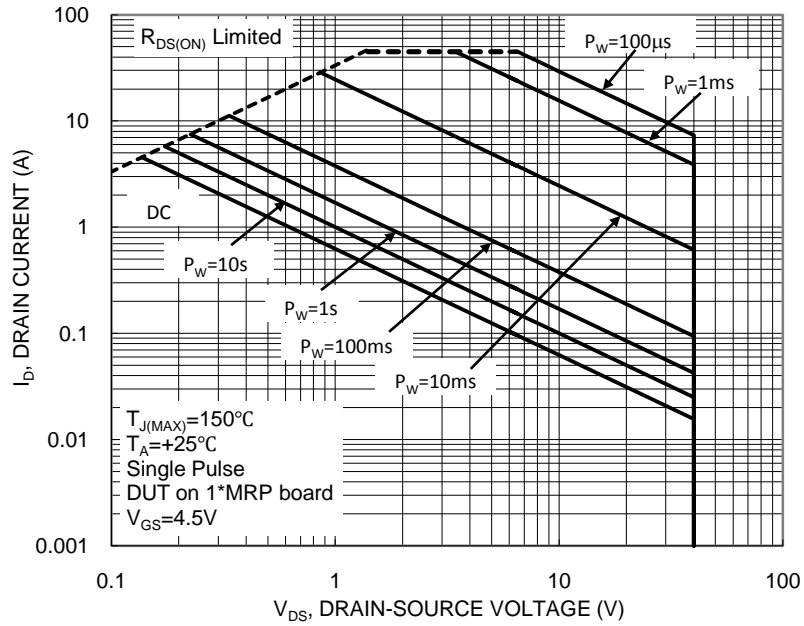


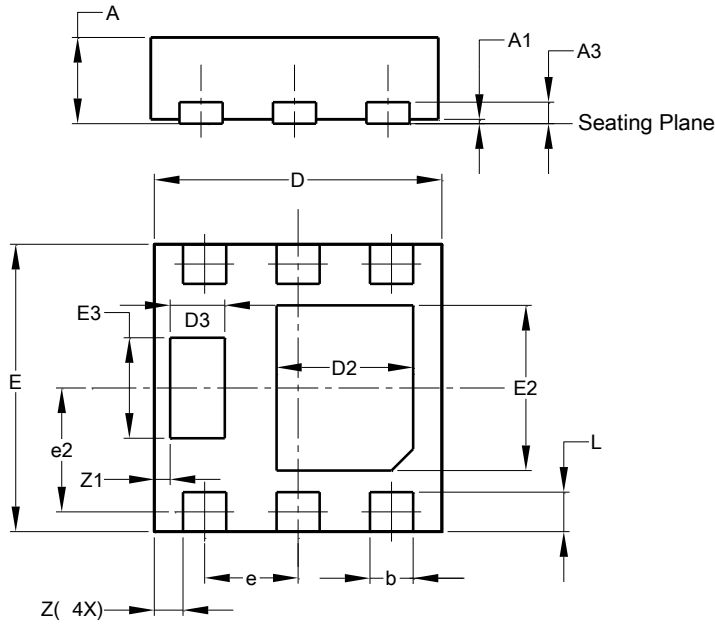
Figure 12. Gate Charge



NEW PRODUCT

**Package Outline Dimensions**

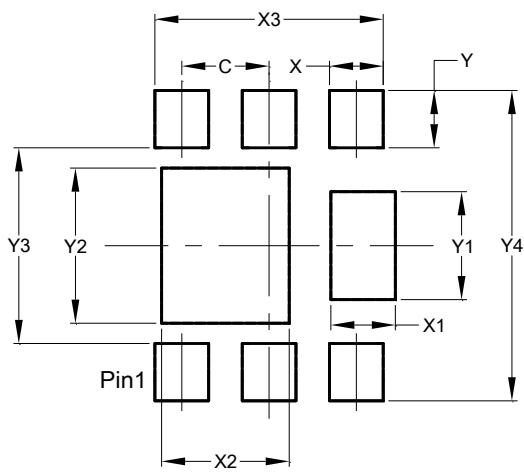
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



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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