

## Product Summary

Device	BV <sub>BSS</sub>	R <sub>DS(ON)</sub> MAX	I <sub>D</sub> MAX T <sub>A</sub> = +25°C
Q1 N-Channel	12V	34mΩ @ V <sub>GS</sub> = 4.5V	5.1A
		40mΩ @ V <sub>GS</sub> = 2.5V	4.7A
		50mΩ @ V <sub>GS</sub> = 1.8V	4.2A
		70mΩ @ V <sub>GS</sub> = 1.5V	3.6A
Q2 P-Channel	-12	59mΩ @ V <sub>GS</sub> = -4.5V	-3.9A
		81mΩ @ V <sub>GS</sub> = -2.5V	-3.3A
		115mΩ @ V <sub>GS</sub> = -1.8V	-2.8A
		215mΩ @ V <sub>GS</sub> = -1.5V	-2.0A

## Description and Applications

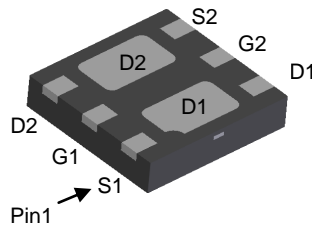
This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Load Switch
- Power Management Functions
- Portable Power Adaptors



ESD PROTECTED

U-DFN2020-6 (Type B)



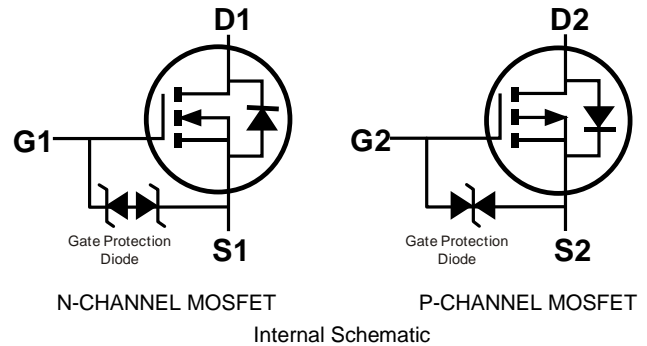
Bottom View

## Features

- Low On-Resistance
- Low Input Capacitance
- Low Profile, 0.6mm Max Height
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

## Mechanical Data

- Case: U-DFN2020-6 (Type B)
- 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>
- Terminals Connections: See Diagram Below
- Weight: 0.0065 grams (Approximate)

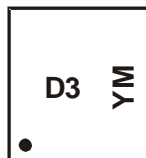


## Ordering Information (Note 5)

Part Number	Case	Packaging
DMC1030UFDBQ-7	U-DFN2020-6 (Type B)	3000/Tape & Reel
DMC1030UFDBQ-13	U-DFN2020-6 (Type B)	10000/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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to [http://www.diodes.com/product\\_compliance\\_definitions.html](http://www.diodes.com/product_compliance_definitions.html).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



D3 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: D = 2016)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2015	2016	2017	2018	2019	2020	2021
Code	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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Q1 N-CHANNEL	Q2 P-CHANNEL	Unit	
Drain-Source Voltage	V <sub>DSS</sub>	12	-12	V	
Gate-Source Voltage	V <sub>GSS</sub>	±8	±8	V	
Continuous Drain Current (Note 6) N-CHANNEL: V <sub>GS</sub> = 4.5V P-CHANNEL: V <sub>GS</sub> = -4.5V	Steady State T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	5.1 4.1	-3.9 -3.1	A
		t < 5s T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	6.6 5.3	-5.0 -4.0
Maximum Continuous Body Diode Forward Current (Note 6)	I <sub>S</sub>	2	-1.7	A	
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	35	-25	A	
Avalanche Current (L = 0.1mH)	I <sub>AS</sub>	5	-5	A	
Avalanche Energy (L = 0.1mH)	E <sub>AS</sub>	4	4	mJ	

**Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 6)	P <sub>D</sub>	1.36	W
		t < 5s 1.89	
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	92	°C/W
		t < 5s 66	
Thermal Resistance, Junction to Case (Note 6)	R <sub>θJC</sub>	18	
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics Q1 N-CHANNEL** (@ T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
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>	—	—	1.0	µA	V <sub>DS</sub> = 12V, 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 (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	0.4	—	1	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	17	34	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 4.6A
		—	20	40		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 4.2A
		—	24	50		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 3.8A
		—	28	70		V <sub>GS</sub> = 1.5V, I <sub>D</sub> = 1.5A
Diode Forward Voltage	V <sub>SD</sub>	—	0.7	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 4.8A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>ISS</sub>	—	1003	—	pF	V <sub>DS</sub> = 6V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>OSS</sub>	—	132	—	pF	
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	115	—	pF	
Gate Resistance	R <sub>g</sub>	—	11.3	—	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>	—	12.2	—	nC	V <sub>DS</sub> = 10V, I <sub>D</sub> = 6.8A
Total Gate Charge (V <sub>GS</sub> = 8V)		—	23.1	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	1.3	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	1.5	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	4.4	—	ns	V <sub>DD</sub> = 6V, V <sub>GS</sub> = 4.5V, R <sub>L</sub> = 1.1Ω, R <sub>G</sub> = 1Ω
Turn-On Rise Time	t <sub>r</sub>	—	7.4	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	18.8	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	4.9	—	ns	
Body Diode Reverse Recovery Time	t <sub>RR</sub>	—	7.6	—	ns	
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	—	0.9	—	nC	I <sub>S</sub> = 5.4A, dI/dt = 100A/µs

- Notes: 6. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.  
7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to product testing.

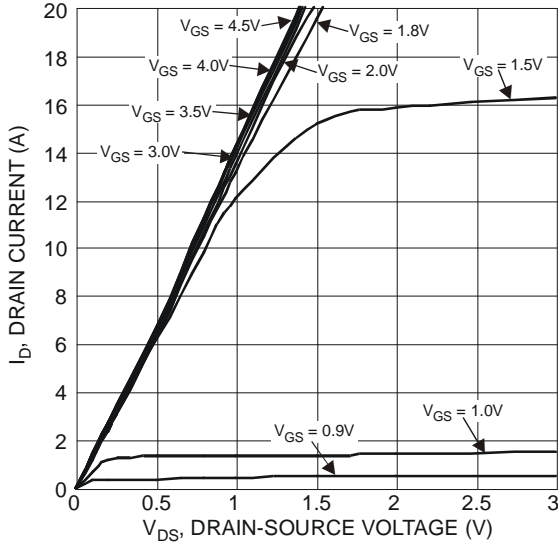


Figure 1 Typical Output Characteristics

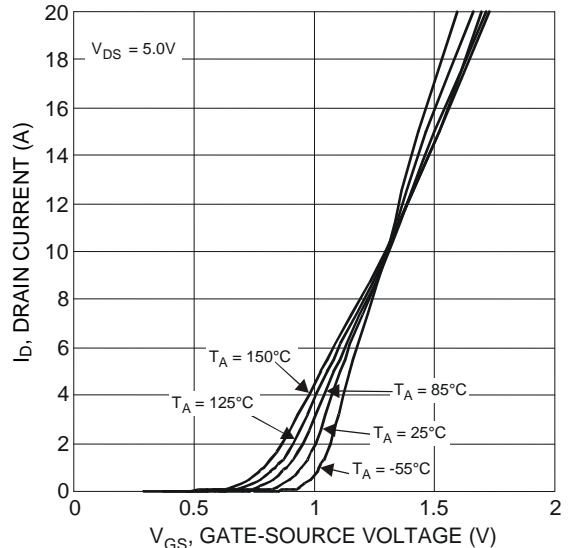


Figure 2 Typical Transfer Characteristics

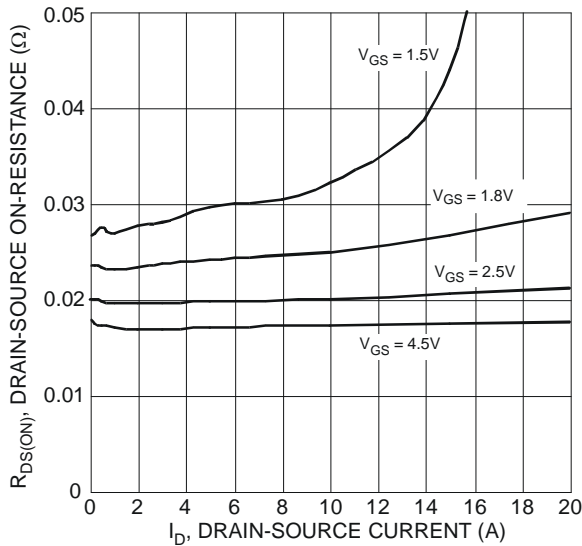


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

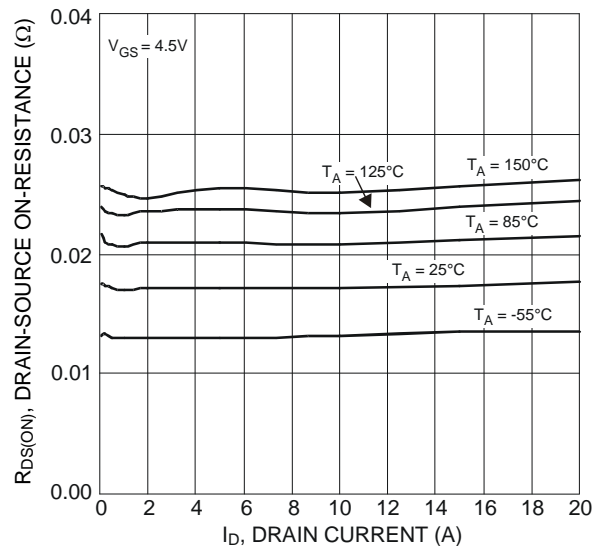


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

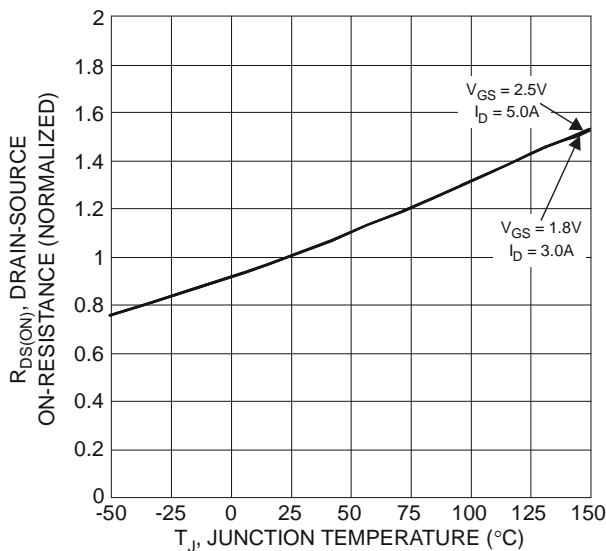


Figure 5 On-Resistance Variation with Temperature

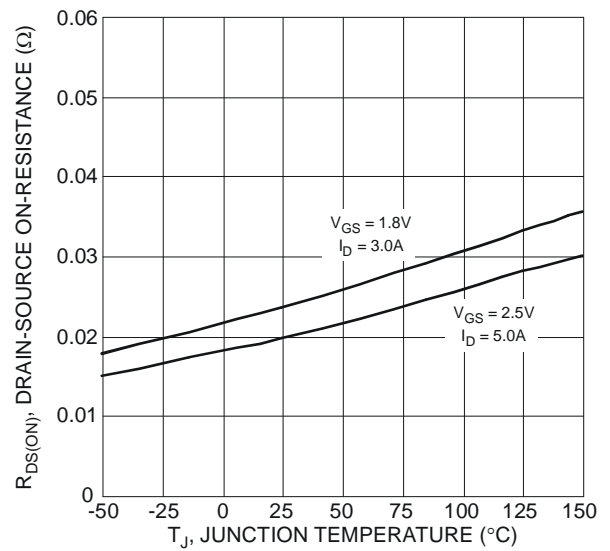


Figure 6 On-Resistance Variation with Temperature

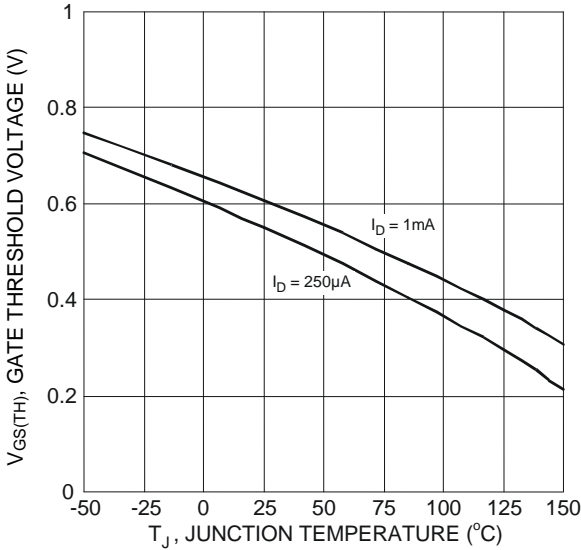


Figure 7 Gate Threshold Variation vs. Junction Temperature

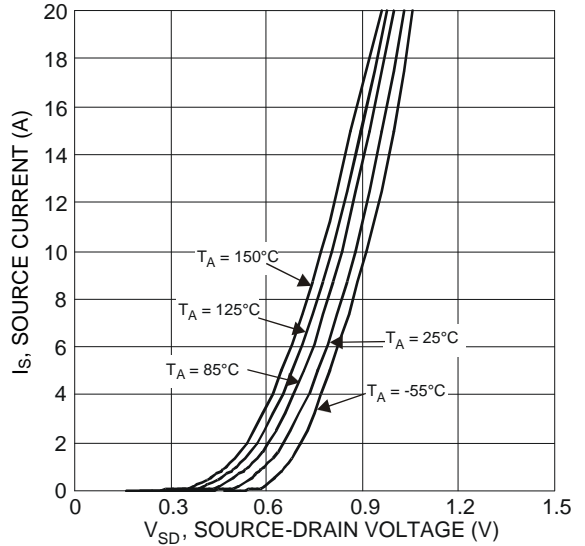


Figure 8 Diode Forward Voltage vs. Current

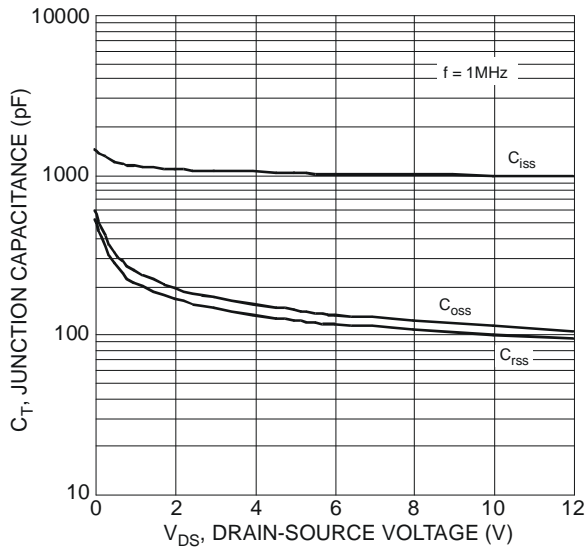


Figure 9 Typical Junction Capacitance

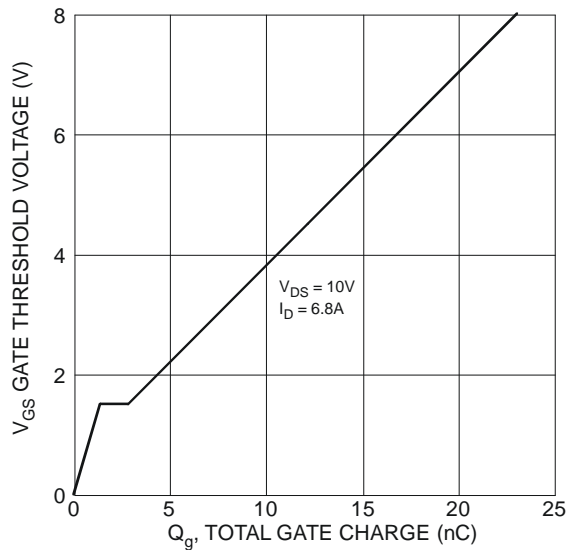


Figure 10 Gate Charge

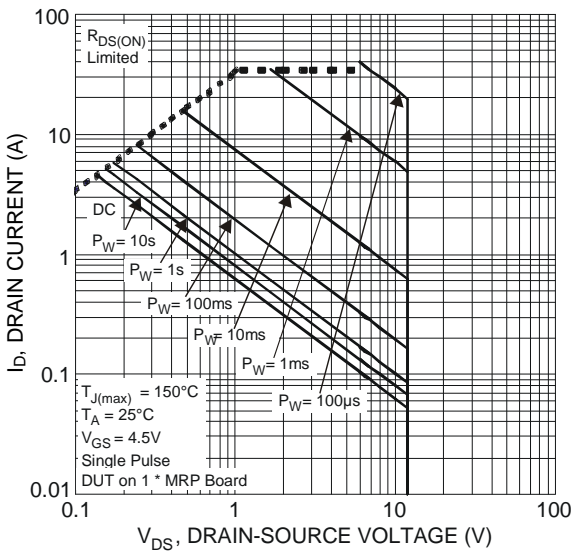


Figure 11 SOA Safe Operation Area

**Electrical Characteristics Q2 P-CHANNEL** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	-12	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	$I_{DSS}$	—	—	-1.0	$\mu A$	$V_{DS} = -12V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 10$	$\mu A$	$V_{GS} = \pm 8V, V_{DS} = 0V$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.4	—	-1	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	37	59	m $\Omega$	$V_{GS} = -4.5V, I_D = -3.6A$
		—	48	81		$V_{GS} = -2.5V, I_D = -3.1A$
		—	69	115		$V_{GS} = -1.8V, I_D = -2.6A$
		—	88	215		$V_{GS} = -1.5V, I_D = -0.5A$
Diode Forward Voltage	$V_{SD}$	—	-0.7	-1.2	V	$V_{GS} = 0V, I_S = -3.7A$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	$C_{iss}$	—	1028	—	pF	$V_{DS} = -6V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	285	—	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	254	—	pF	
Gate Resistance	$R_g$	—	19.6	—	$\Omega$	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$
Total Gate Charge ( $V_{GS} = -4.5V$ )	$Q_g$	—	13	—	nC	$V_{DS} = -10V, I_D = -4.7A$
Total Gate Charge ( $V_{GS} = -8V$ )		—	20.8	—	nC	
Gate-Source Charge	$Q_{gs}$	—	1.8	—	nC	
Gate-Drain Charge	$Q_{gd}$	—	4.5	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	5.6	—	ns	$V_{DD} = -6V, V_{GS} = -4.5V,$ $R_L = 1.6\Omega, R_G = 1\Omega$
Turn-On Rise Time	$t_R$	—	12.8	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	30.7	—	ns	
Turn-Off Fall Time	$t_F$	—	25.4	—	ns	
Body Diode Reverse Recovery Time	$t_{RR}$	—	31.6	—	ns	$I_S = -3.6A, dI/dt = 100A/\mu s$
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	7.8	—	nC	$I_S = -3.6A, dI/dt = 100A/\mu s$

Notes: 7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to product testing.

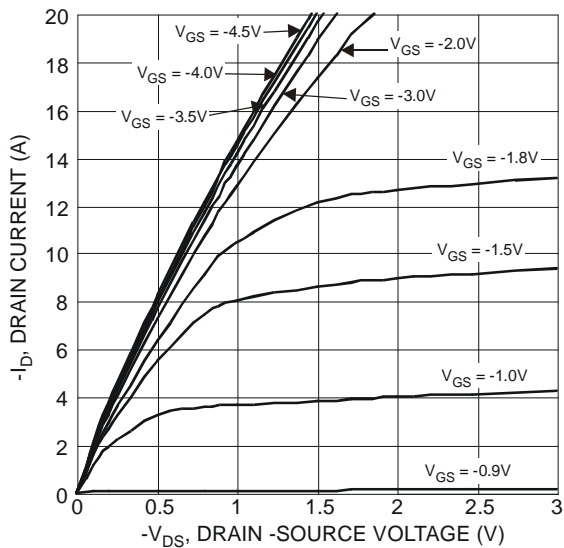


Figure 12 Typical Output Characteristics

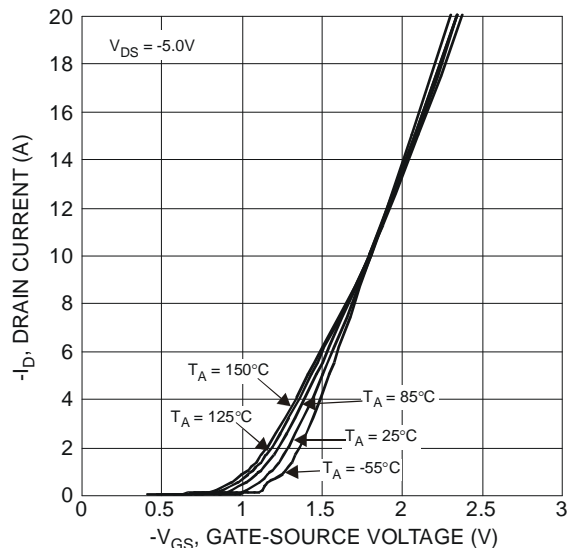


Figure 13 Typical Transfer Characteristics

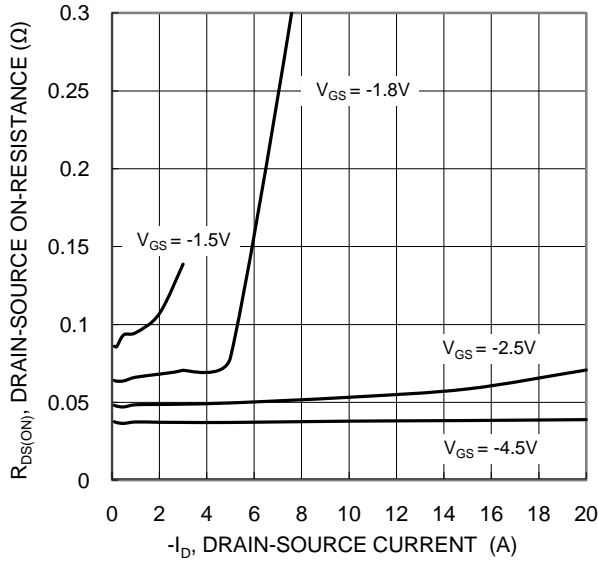


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

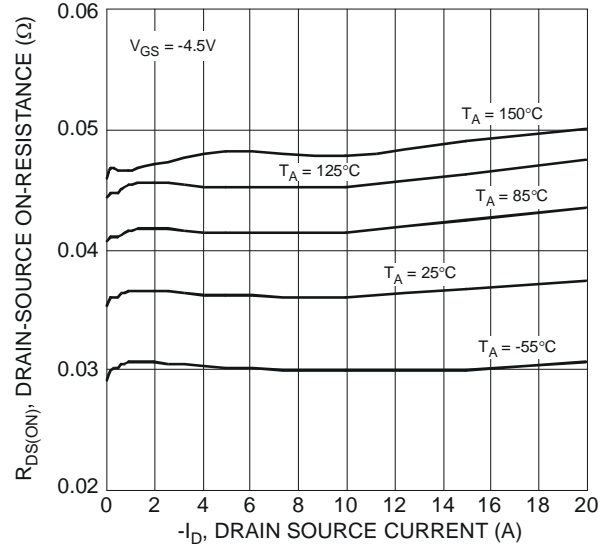


Figure 15 Typical On-Resistance vs. Drain Current and Temperature

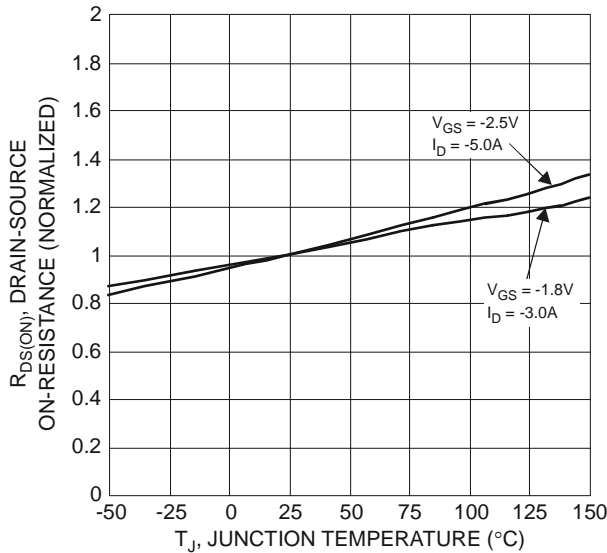


Figure 16 On-Resistance Variation with Temperature

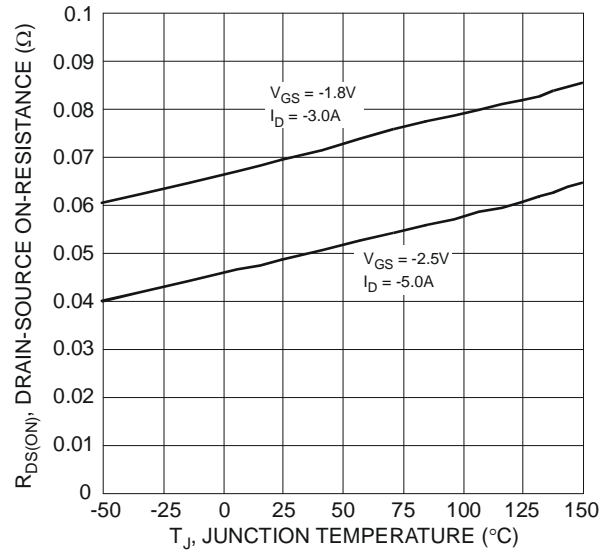


Figure 17 On-Resistance Variation with Temperature

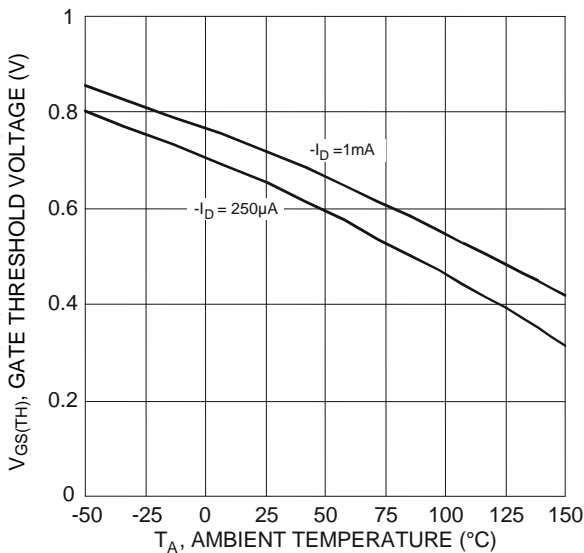


Figure 18 Gate Threshold Variation vs. Ambient Temperature

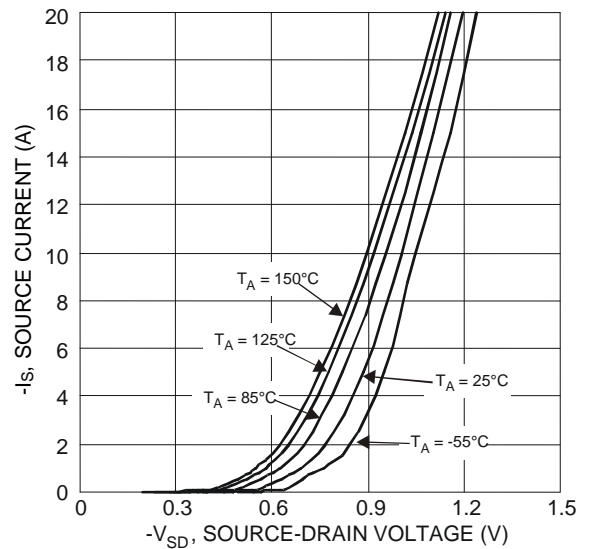


Figure 19 Diode Forward Voltage vs. Current

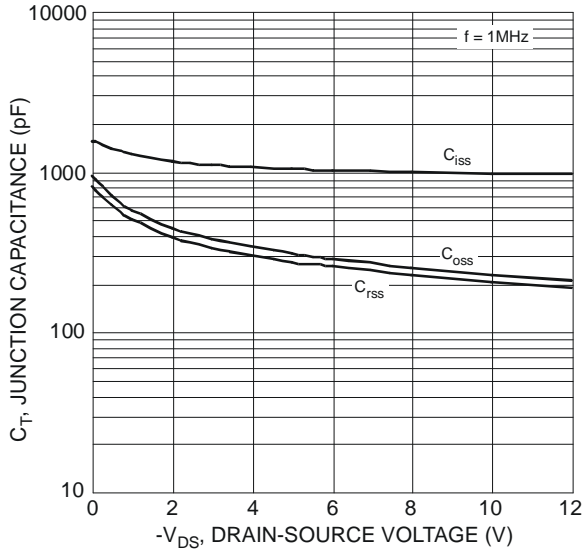


Figure 20 Typical Junction Capacitance

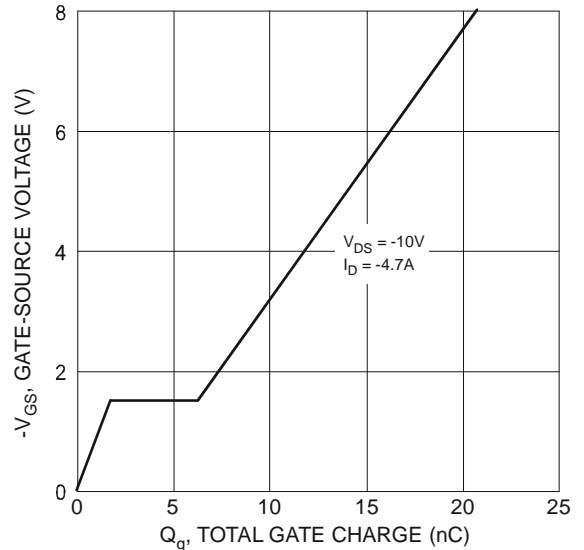


Figure 21 Gate-Charge Characteristics

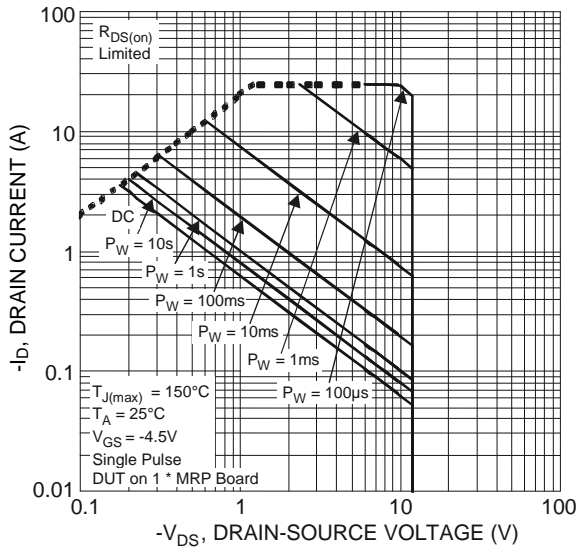


Figure 22 SOA Safe Operation Area

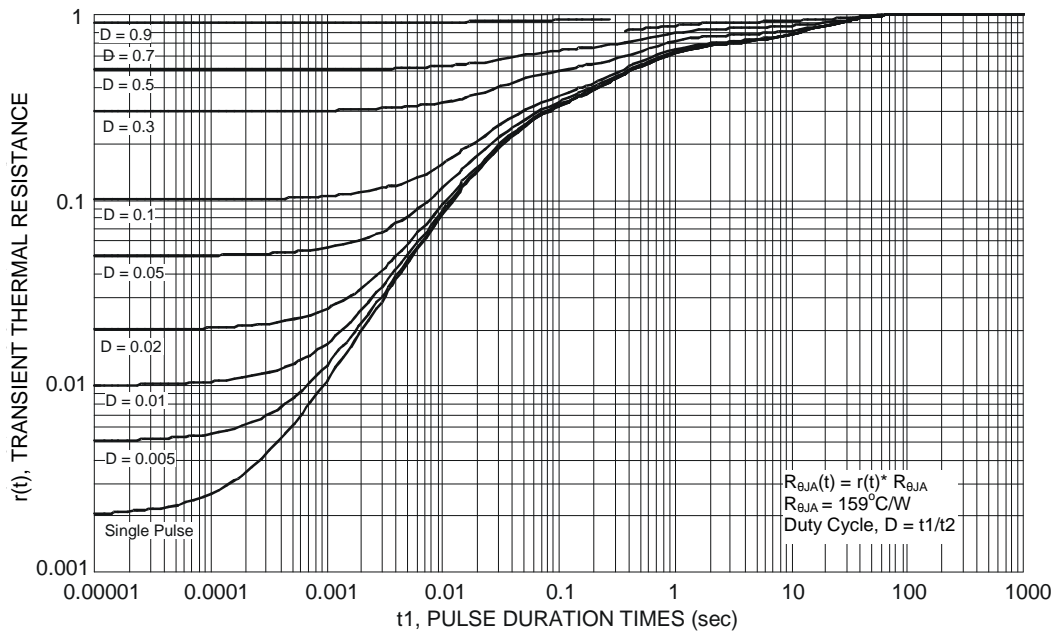
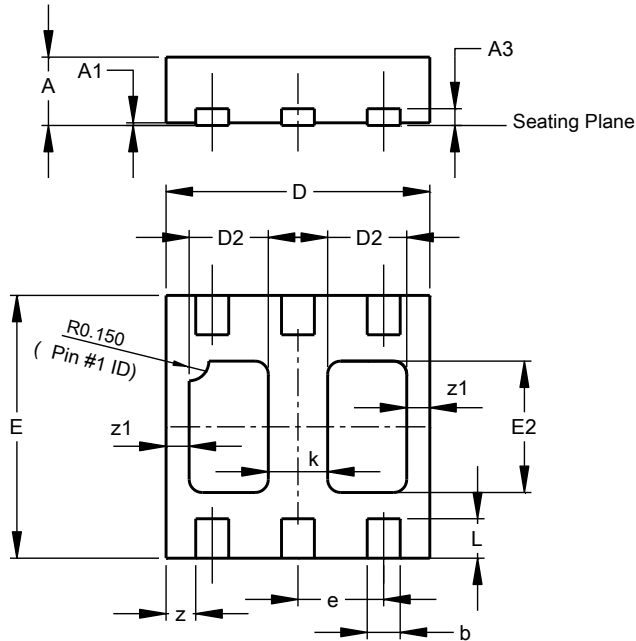


Figure 23 Transient Thermal Resistance

**Package Outline Dimensions**

Please see AP02001 at [http://www.diodes.com/\\_files/datasheets/ap02001.pdf](http://www.diodes.com/_files/datasheets/ap02001.pdf) for the latest version.

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

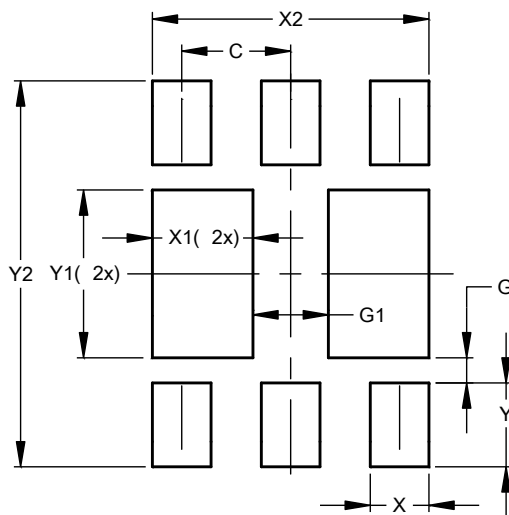


U-DFN2020-6 Type B			
Dim	Min	Max	Typ
A	0.545	0.605	0.575
A1	0.00	0.05	0.02
A3	-	-	0.13
b	0.20	0.30	0.25
D	1.95	2.075	2.00
D2	0.50	0.70	0.60
e	-	-	0.65
E	1.95	2.075	2.00
E2	0.90	1.10	1.00
k	-	-	0.45
L	0.25	0.35	0.30
z	-	-	0.225
z1	-	-	0.175
All Dimensions in mm			

**Suggested Pad Layout**

Please see AP02001 at [http://www.diodes.com/\\_files/datasheets/ap02001.pdf](http://www.diodes.com/_files/datasheets/ap02001.pdf) for the latest version.

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



Dimensions	Value (in mm)
C	0.650
G	0.150
G1	0.450
X	0.350
X1	0.600
X2	1.650
Y	0.500
Y1	1.000
Y2	2.300



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2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

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