

Product Summary

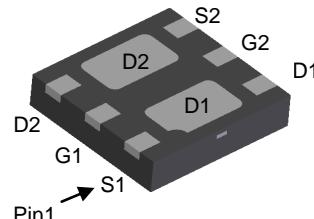
Device	BV_{DSS}	$R_{DS(ON) \text{ MAX}}$	$I_D \text{ MAX}$ $T_A = +25^\circ\text{C}$
Q1 N-Channel	12V	34m Ω @ $V_{GS} = 4.5\text{V}$	5.1A
		40m Ω @ $V_{GS} = 2.5\text{V}$	4.7A
		50m Ω @ $V_{GS} = 1.8\text{V}$	4.2A
		70m Ω @ $V_{GS} = 1.5\text{V}$	3.6A
Q2 P-Channel	-12	59m Ω @ $V_{GS} = -4.5\text{V}$	-3.9A
		81m Ω @ $V_{GS} = -2.5\text{V}$	-3.3A
		115m Ω @ $V_{GS} = -1.8\text{V}$	-2.8A
		215m Ω @ $V_{GS} = -1.5\text{V}$	-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

U-DFN2020-6 (Type B)



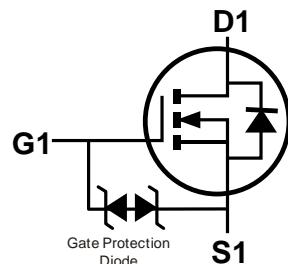
Bottom View

Features

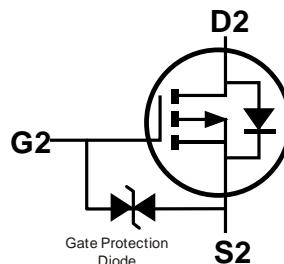
- Low On-Resistance
- Low Input Capacitance
- Low Profile, 0.6mm Max Height
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 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 e4
- Terminals Connections: See Diagram Below
- Weight: 0.0065 grams (Approximate)



N-CHANNEL MOSFET



P-CHANNEL MOSFET
Internal Schematic

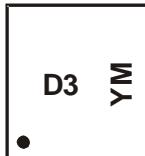
Ordering Information (Note 5)

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 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.
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 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic			Symbol	Q1 N-CHANNEL	Q2 P-CHANNEL	Unit
Drain-Source Voltage			V_{DSS}	12	-12	V
Gate-Source Voltage			V_{GSS}	± 8	± 8	V
Continuous Drain Current (Note 6) N-CHANNEL: $V_{GS} = 4.5\text{V}$ P-CHANNEL: $V_{GS} = -4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	5.1 4.1	-3.9 -3.1	A
	$t < 5\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	6.6 5.3	-5.0 -4.0	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	2	-1.7	A
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	35	-25	A
Avalanche Current (L = 0.1mH)			I_{AS}	5	-5	A
Avalanche Energy (L = 0.1mH)			E_{AS}	4	4	mJ

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 6)	P_D	1.36	W
$t < 5\text{s}$		1.89	
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	92	°C/W
$t < 5\text{s}$		66	
Thermal Resistance, Junction to Case (Note 6)	$R_{\theta JC}$	18	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

 Electrical Characteristics Q1 N-CHANNEL (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	12	—	—	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}	—	—	1.0	μA	$V_{DS} = 12\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 10	μA	$V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.4	—	1	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	17	34	mΩ	$V_{GS} = 4.5\text{V}, I_D = 4.6\text{A}$
		—	20	40		$V_{GS} = 2.5\text{V}, I_D = 4.2\text{A}$
		—	24	50		$V_{GS} = 1.8\text{V}, I_D = 3.8\text{A}$
		—	28	70		$V_{GS} = 1.5\text{V}, I_D = 1.5\text{A}$
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	$V_{GS} = 0\text{V}, I_S = 4.8\text{A}$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	1003	—	pF	$V_{DS} = 6\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	132	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	115	—	pF	
Gate Resistance	R_g	—	11.3	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_g	—	12.2	—	nC	$V_{DS} = 10\text{V}, I_D = 6.8\text{A}$
		—	23.1	—	nC	
Gate-Source Charge	Q_{gs}	—	1.3	—	nC	
Gate-Drain Charge	Q_{gd}	—	1.5	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	4.4	—	ns	$V_{DD} = 6\text{V}, V_{GS} = 4.5\text{V}, R_L = 1.1\Omega, R_G = 1\Omega$
Turn-On Rise Time	t_R	—	7.4	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	18.8	—	ns	
Turn-Off Fall Time	t_F	—	4.9	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	7.6	—	ns	$I_S = 5.4\text{A}, dI/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{RR}	—	0.9	—	nC	$I_S = 5.4\text{A}, dI/dt = 100\text{A}/\mu\text{s}$

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.

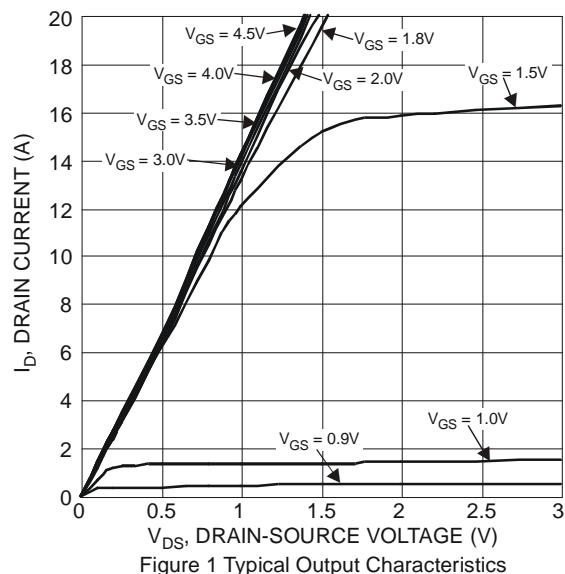


Figure 1 Typical Output Characteristics

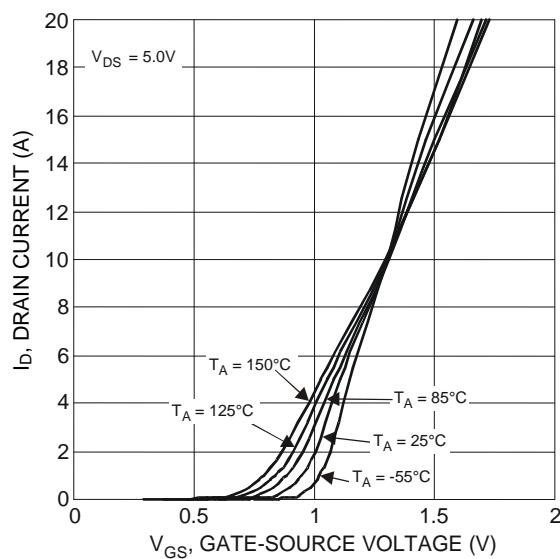


Figure 2 Typical Transfer Characteristics

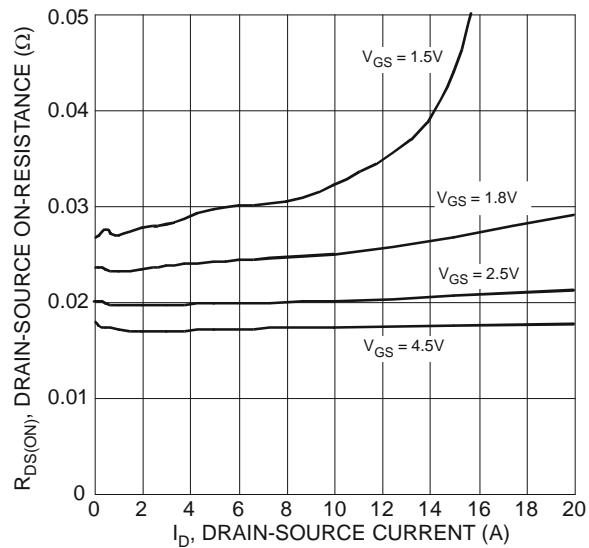


Figure 3 Typical On-Resistance vs.
Drain Current and Gate Voltage

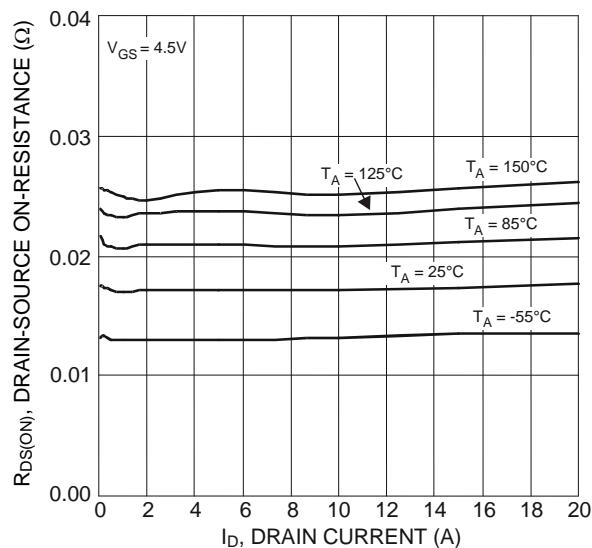


Figure 4 Typical On-Resistance vs.
Drain Current and Temperature

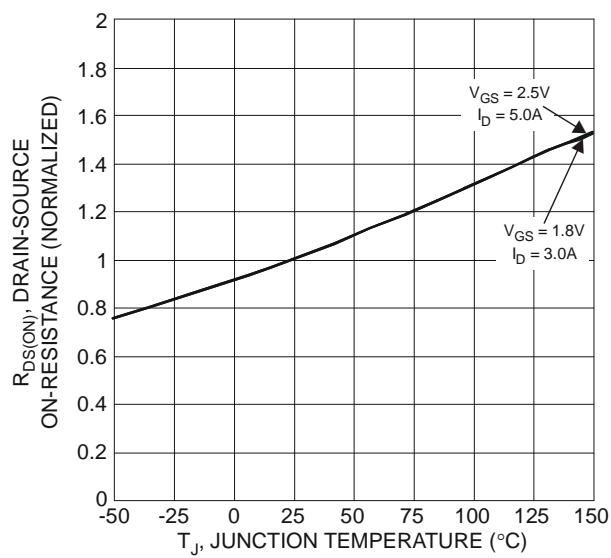


Figure 5 On-Resistance Variation with Temperature

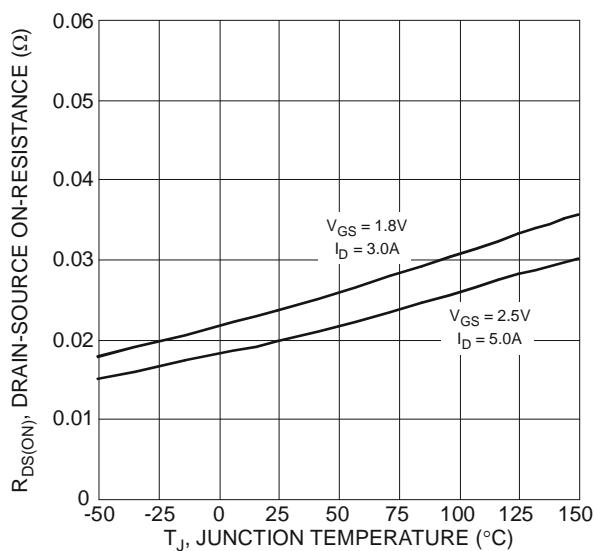


Figure 6 On-Resistance Variation with Temperature

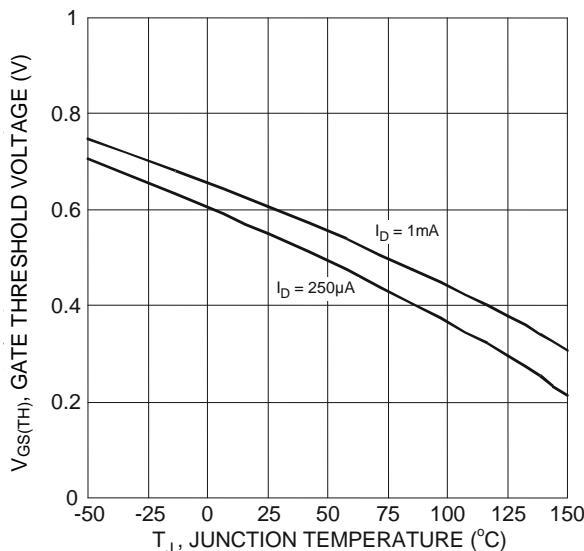


Figure 7 Gate Threshold Variation vs. Junction Temperature

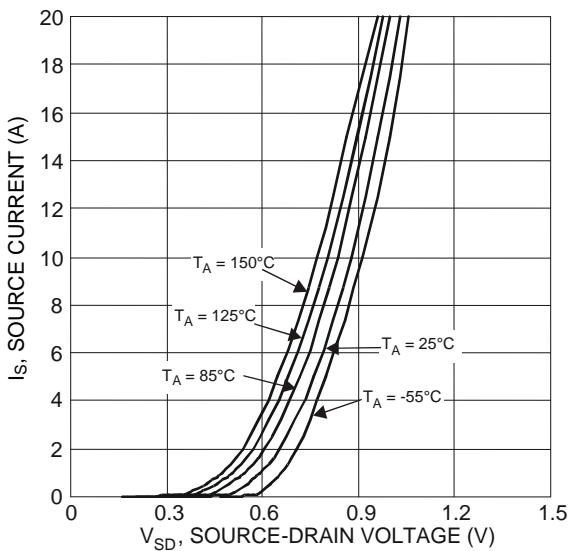


Figure 8 Diode Forward Voltage vs. Current

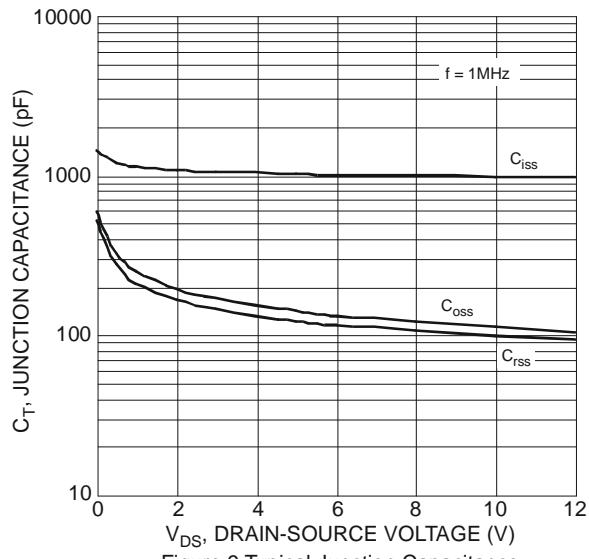


Figure 9 Typical Junction Capacitance

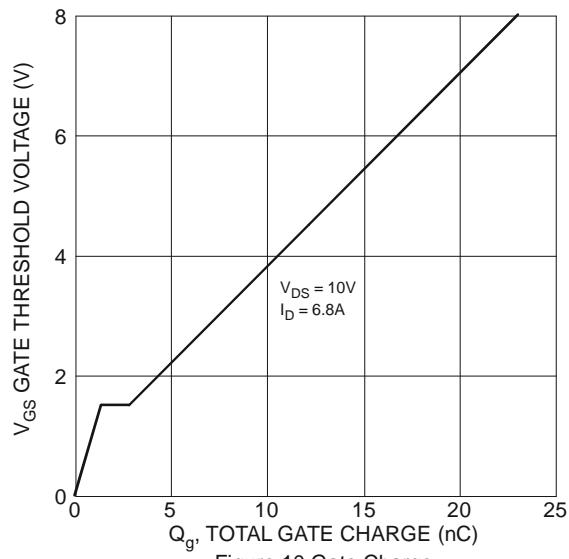


Figure 10 Gate Charge

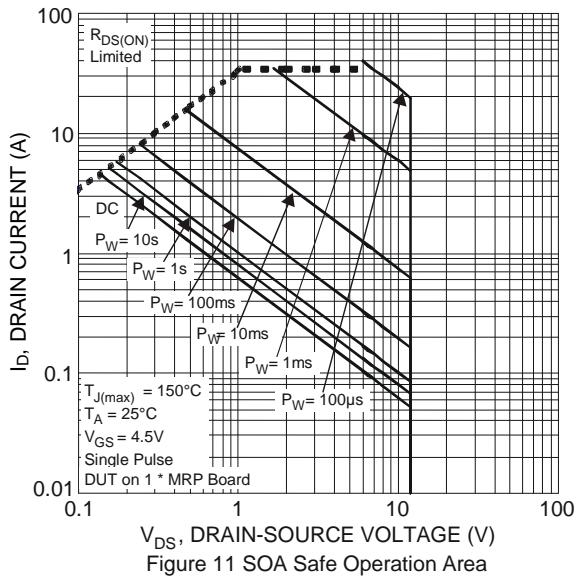


Figure 11 SOA Safe Operation Area

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

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

Notes: 7. Short duration pulse test used to minimize self-heating effect.

8. Guaranteed by design. Not subject to product testing.

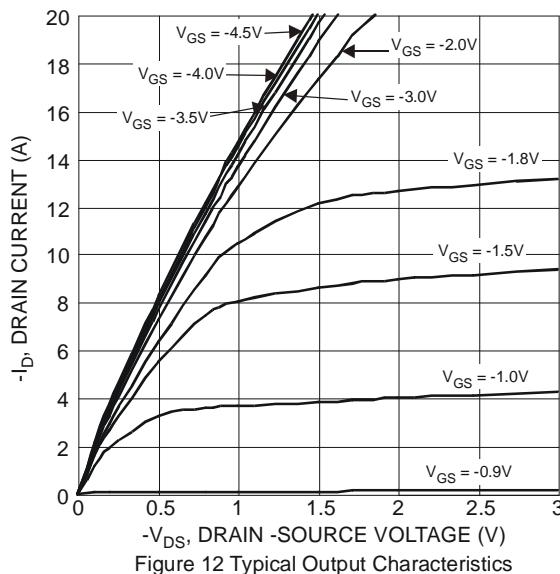


Figure 12 Typical Output Characteristics

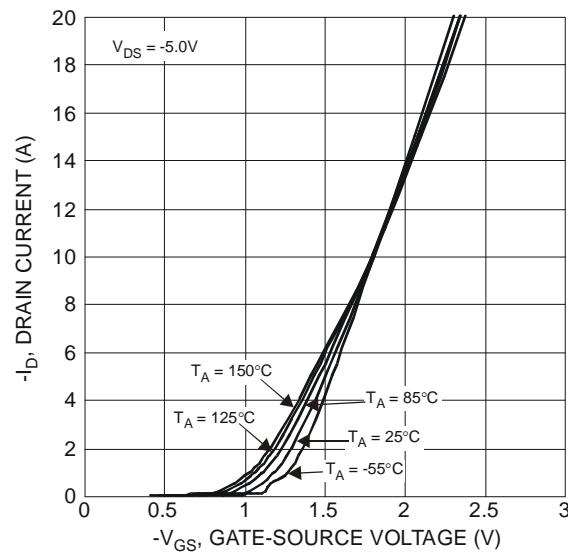


Figure 13 Typical Transfer Characteristics

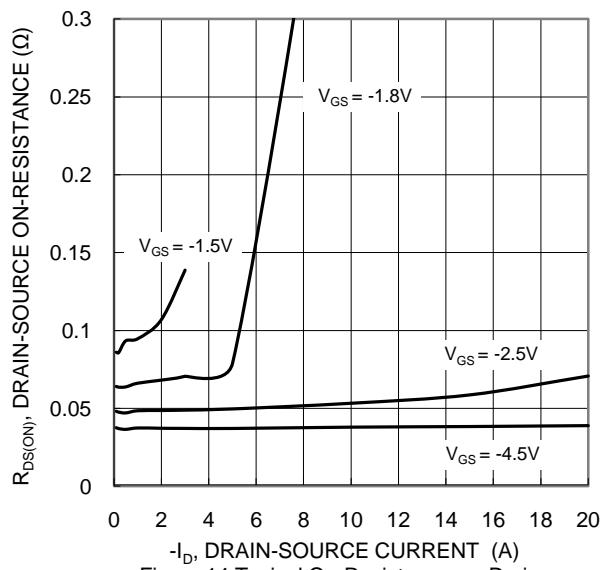


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

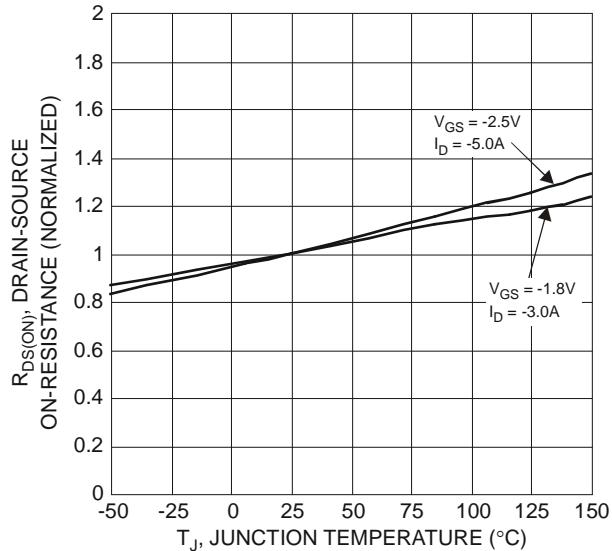


Figure 16 On-Resistance Variation with Temperature

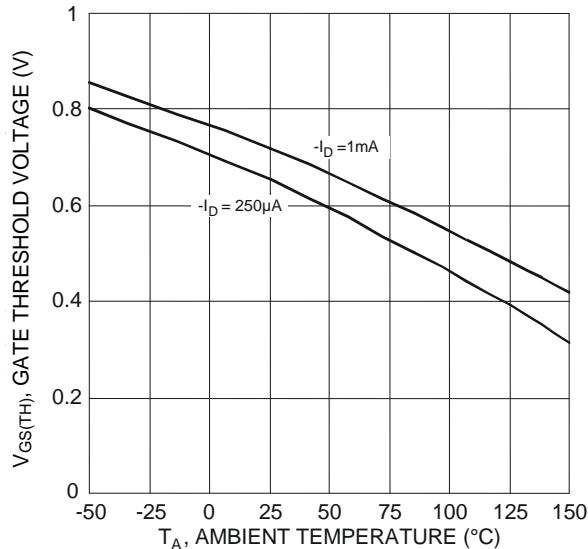


Figure 18 Gate Threshold Variation vs. Ambient Temperature

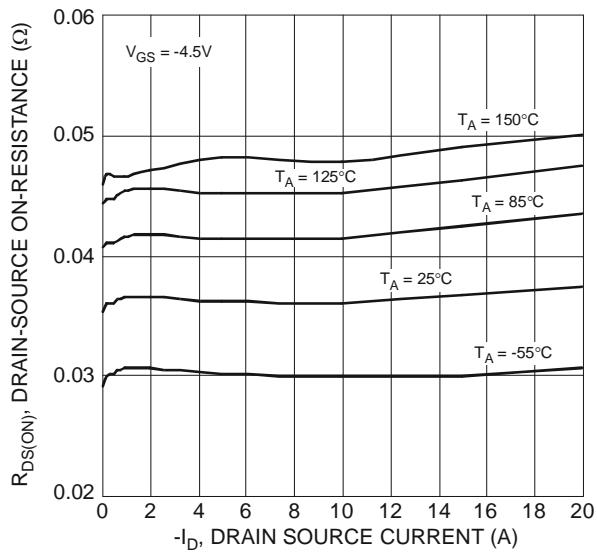


Figure 15 Typical On-Resistance vs. Drain Current and Temperature

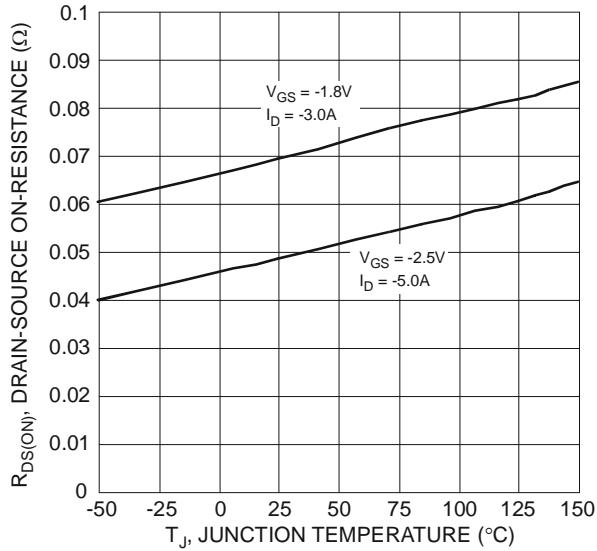


Figure 17 On-Resistance Variation with Temperature

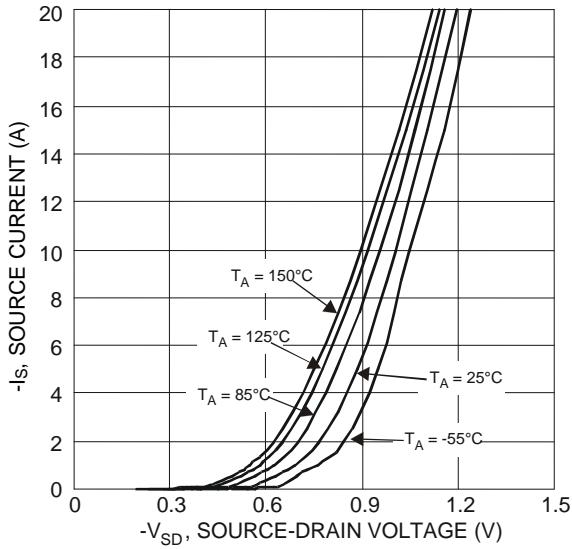
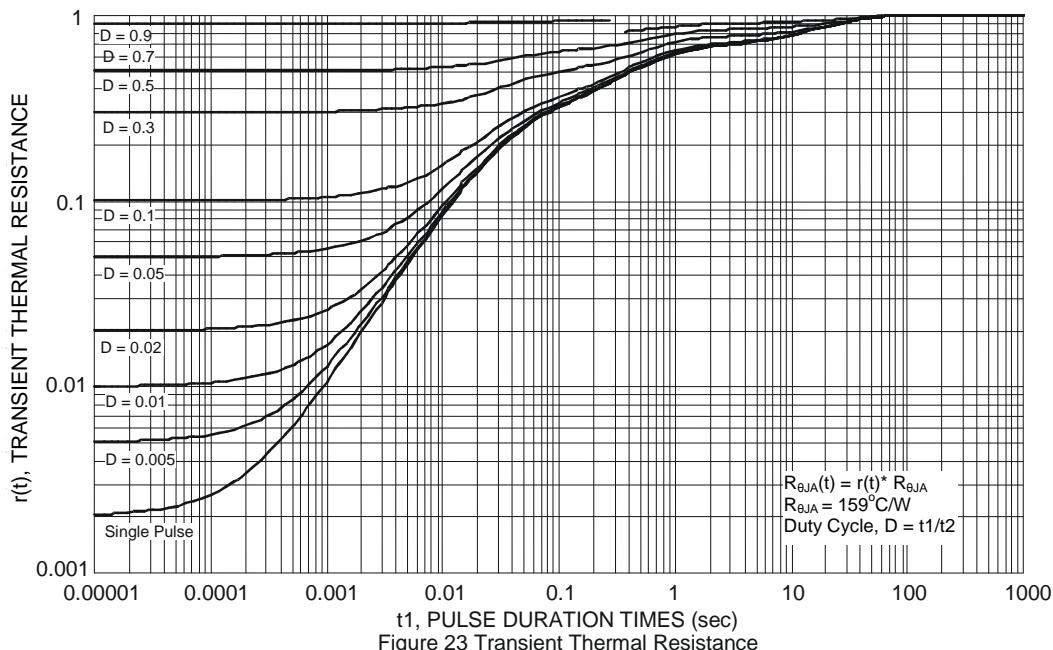
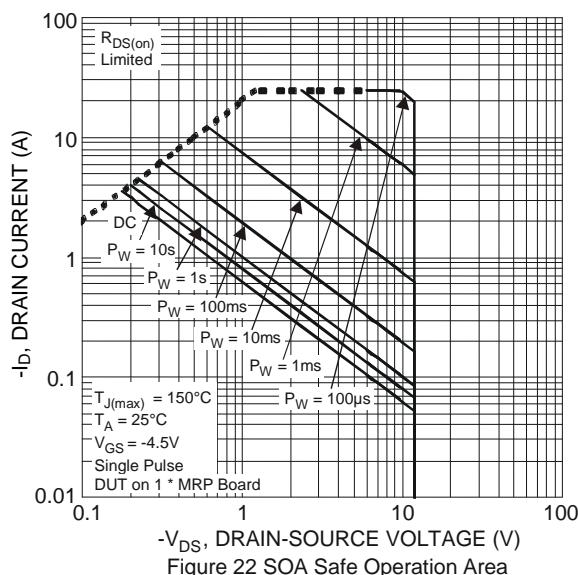
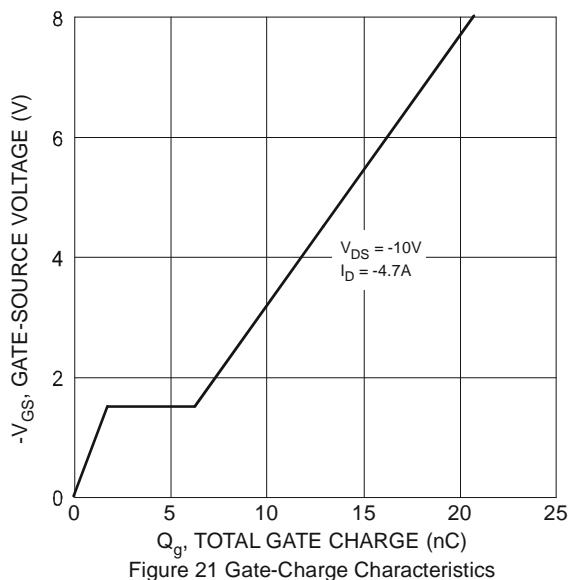
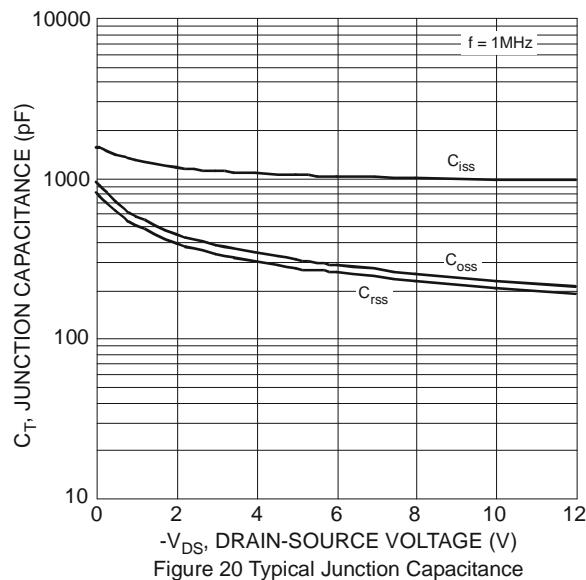


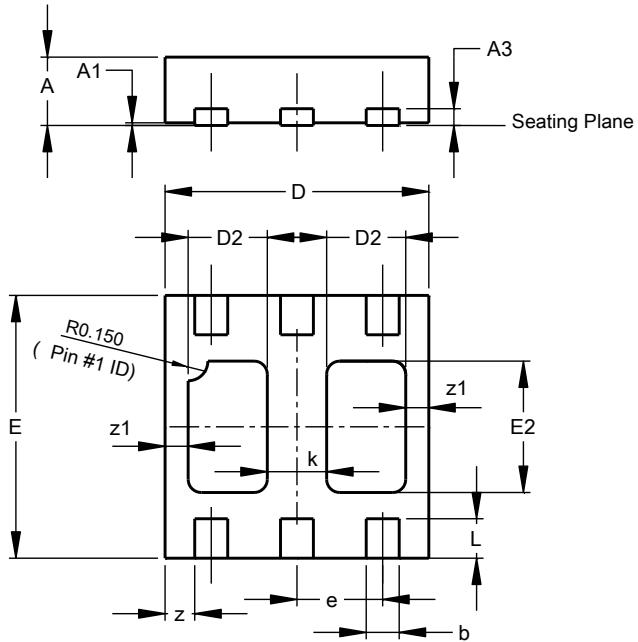
Figure 19 Diode Forward Voltage vs. Current



Package Outline Dimensions

Please see AP02001 at http://www.diodes.com/_files/datasheets/ap02001.pdf for the latest version.

U-DFN2020-6 (Type B)



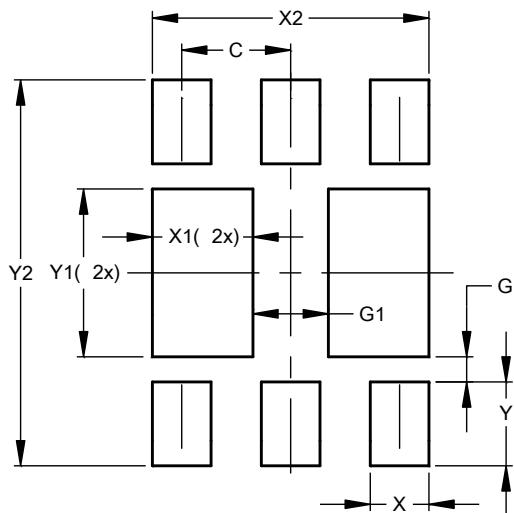
U-DFN2020-6 Type B			
Dim	Min	Max	Typ
A	0.545	0.605	0.575
A1	0.00	0.05	0.02
A3	-	-	0.13
b	0.20	0.30	0.25
D	1.95	2.075	2.00
D2	0.50	0.70	0.60
e	-	-	0.65
E	1.95	2.075	2.00
E2	0.90	1.10	1.00
k	-	-	0.45
L	0.25	0.35	0.30
z	-	-	0.225
z1	-	-	0.175

All Dimensions in mm

Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/_files/datasheets/ap02001.pdf 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.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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