

**COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET**

**Product Summary**

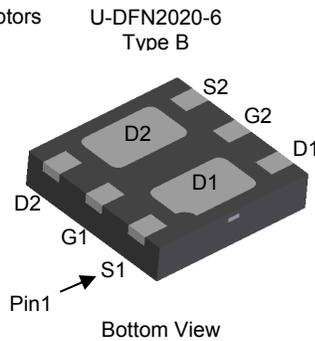
Device	V <sub>(BR)DSS</sub>	R <sub>DS(ON)</sub> max	I <sub>D</sub> MAX T <sub>A</sub> = +25°C
Q1 N-Channel	12V	29mΩ @ V <sub>GS</sub> = 4.5V	5.6A
		34mΩ @ V <sub>GS</sub> = 2.5V	5.1A
		44mΩ @ V <sub>GS</sub> = 1.8V	4.5A
		65mΩ @ V <sub>GS</sub> = 1.5V	3.7A
Q2 P-Channel	-12V	61mΩ @ V <sub>GS</sub> = -4.5V	-3.8A
		81mΩ @ V <sub>GS</sub> = -2.5V	-3.3A
		115mΩ @ V <sub>GS</sub> = -1.8V	-2.8A
		170mΩ @ V <sub>GS</sub> = -1.5V	-2.3A

**Description**

This 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**

- Load Switch
- Power Management Functions
- Portable Power Adaptors

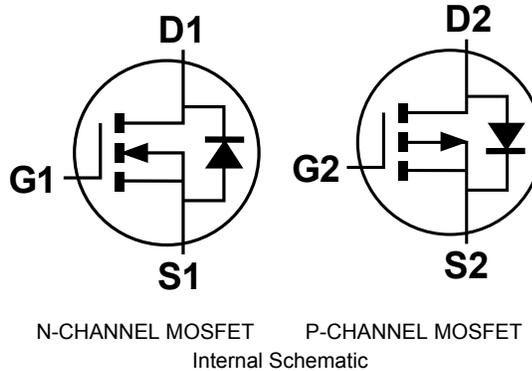


**Features**

- Low On-Resistance
- Low Input Capacitance
- Low Profile, 0.6mm Max Height
- **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**

**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)

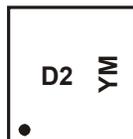


**Ordering Information** (Note 4)

Part Number	Case	Packaging
DMC1229UFDB -7	U-DFN2020-6 Type B	3000/Tape & Reel
DMC1229UFDB -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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>

**Marking Information**



D2 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: A = 2013)  
 M = Month (ex: 9 = September)

Date Code Key

Year	2012	2013	2014	2015	2016	2017	2018
Code	Z	A	B	C	D	E	F

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	Units
Drain-Source Voltage			$V_{DSS}$	12	-12	V
Gate-Source Voltage			$V_{GSS}$	$\pm 8$	$\pm 8$	V
Continuous Drain Current (Note 5) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	5.6 4.4	-3.8 -3.0	A
	$t < 5\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	7.2 5.8	-5.0 -4.0	A
Maximum Continuous Body Diode Forward Current (Note 5)			$I_S$	1	-1	A
Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%)			$I_{DM}$	20	-15	A

**Thermal Characteristics**

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	Steady State	$P_D$	1.4	W
	$t < 5\text{s}$		2.2	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	92	$^\circ\text{C/W}$
	$t < 5\text{s}$		55	
Thermal Resistance, Junction to Case (Note 5)		$R_{\theta JC}$	30	
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$

Note: 5. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.

**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 6)</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>	—	—	±100	nA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 6)</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	29	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 5A
		—	20	34		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 4.6A
		—	24	44		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 4.1A
		—	30	65		V <sub>GS</sub> = 1.5V, I <sub>D</sub> = 2A
Forward Transfer Admittance	Y <sub>fs</sub>	—	6.5	—	S	V <sub>DS</sub> = 10V, I <sub>D</sub> = 5A
Diode Forward Voltage	V <sub>SD</sub>	—	0.6	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A
<b>DYNAMIC CHARACTERISTICS (Note 7)</b>						
Input Capacitance	C <sub>ISS</sub>	—	914	—	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>	—	119	—	pF	
Gate Resistance	R <sub>g</sub>	—	1.26	—	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>	—	10.5	—	nC	V <sub>DS</sub> = 6V, I <sub>D</sub> = 6.5A
Total Gate Charge (V <sub>GS</sub> = 8V)		—	19.6	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	1.2	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	1.6	—	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	—	5.0	—	ns	
Turn-On Rise Time	t <sub>r</sub>	—	10.5	—	ns	V <sub>DD</sub> = 6V, V <sub>GS</sub> = 4.5V, R <sub>L</sub> = 1.2Ω, R <sub>G</sub> = 1Ω
Turn-Off Delay Time	t <sub>D(off)</sub>	—	16.6	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	4.1	—	ns	

**Electrical Characteristics Q2 P-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 6)</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>	—	—	±100	nA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 6)</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>	—	37	61	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3.6A
		—	47	81		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -3.2A
		—	63	115		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -1A
		—	90	170		V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -1A
Forward Transfer Admittance	Y <sub>fs</sub>	—	5.5	—	S	V <sub>DS</sub> = -10V, I <sub>D</sub> = -3.6A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.65	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A
<b>DYNAMIC CHARACTERISTICS (Note 7)</b>						
Input Capacitance	C <sub>ISS</sub>	—	915	—	pF	V <sub>DS</sub> = -6V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>OSS</sub>	—	225	—	pF	
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	183	—	pF	
Gate Resistance	R <sub>g</sub>	—	56.9	—	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>	—	10.7	—	nC	V <sub>DS</sub> = -6V, I <sub>D</sub> = -4.3A
Total Gate Charge (V <sub>GS</sub> = -8V)		—	17.9	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	1.7	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	3.0	—	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	—	5.7	—	ns	
Turn-On Rise Time	t <sub>r</sub>	—	11.5	—	ns	V <sub>DD</sub> = -6V, V <sub>GS</sub> = -4.5V, R <sub>L</sub> = 1.6Ω, R <sub>G</sub> = 1Ω
Turn-Off Delay Time	t <sub>D(off)</sub>	—	27.8	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	26.4	—	ns	

Notes: 6. Short duration pulse test used to minimize self-heating effect.  
7. Guaranteed by design. Not subject to product testing.

**Q1 N-CHANNEL**

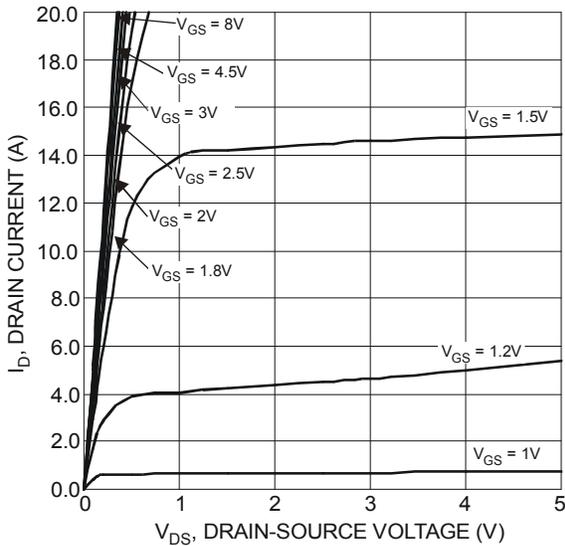


Figure 1 Typical Output Characteristics

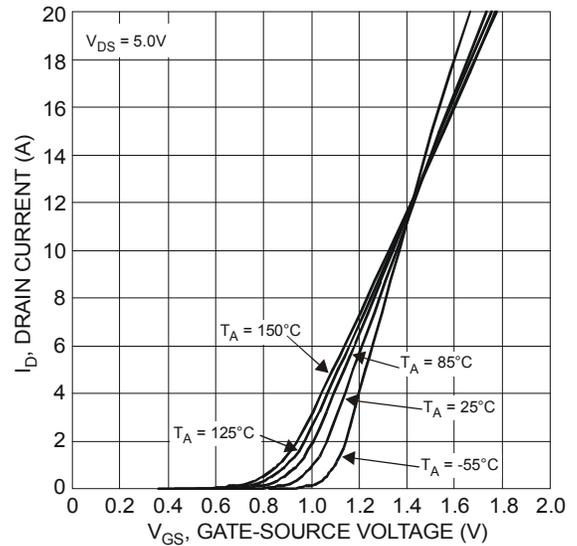


Figure 2 Typical Transfer Characteristics

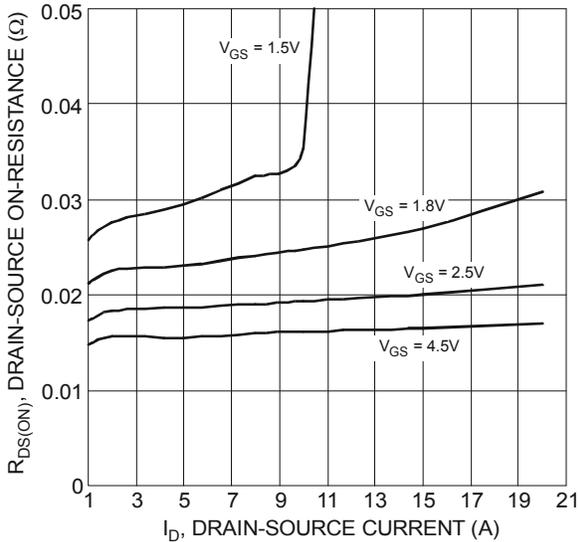


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

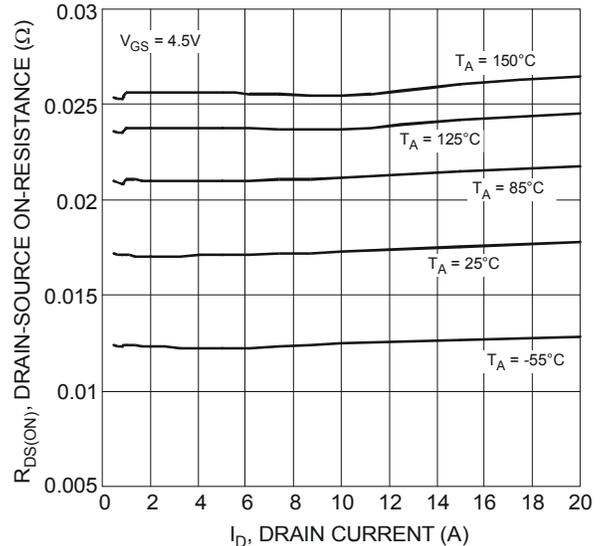


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

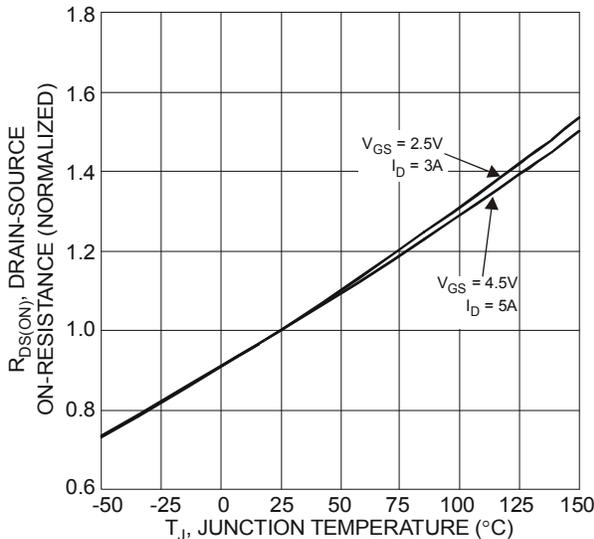


Figure 5 On-Resistance Variation with Temperature

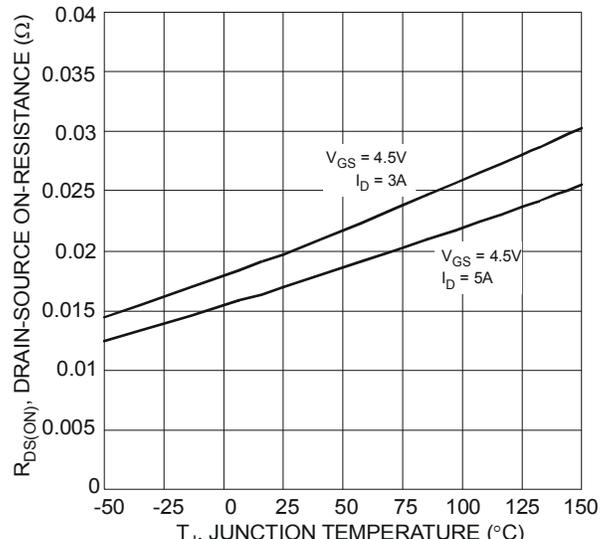


Figure 6 On-Resistance Variation with Temperature

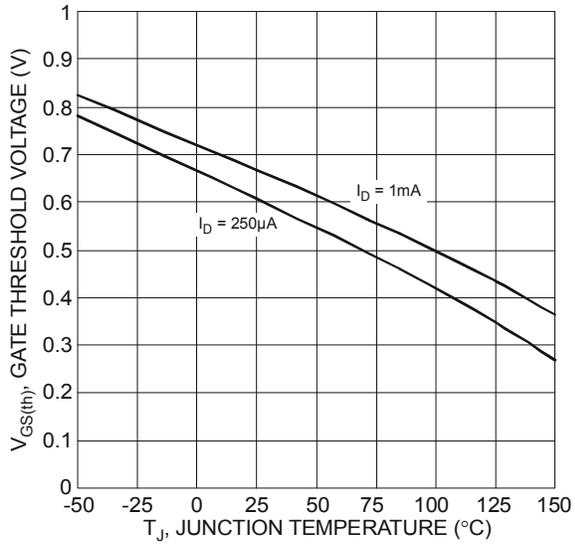


Figure 7 Gate Threshold Variation vs. Ambient Temperature

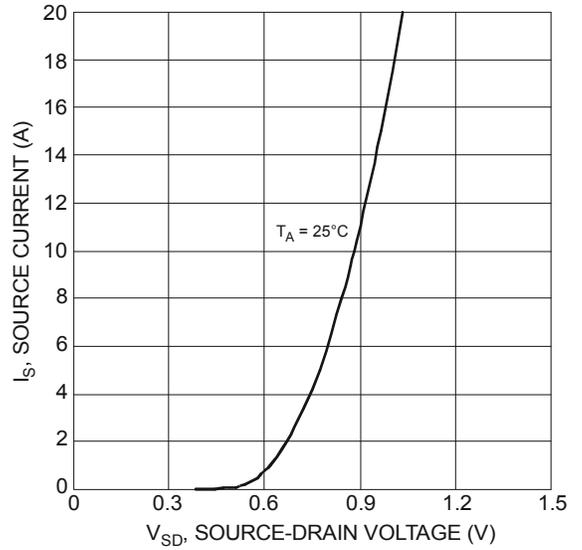


Figure 8 Diode Forward Voltage vs. Current

**Q2 P-CHANNEL**

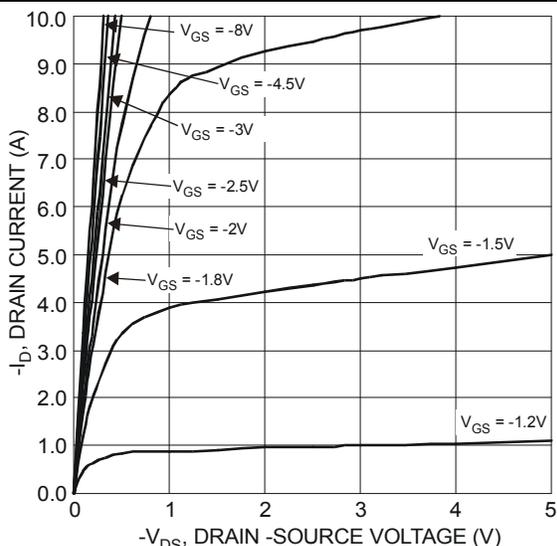


Figure 1 Typical Output Characteristics

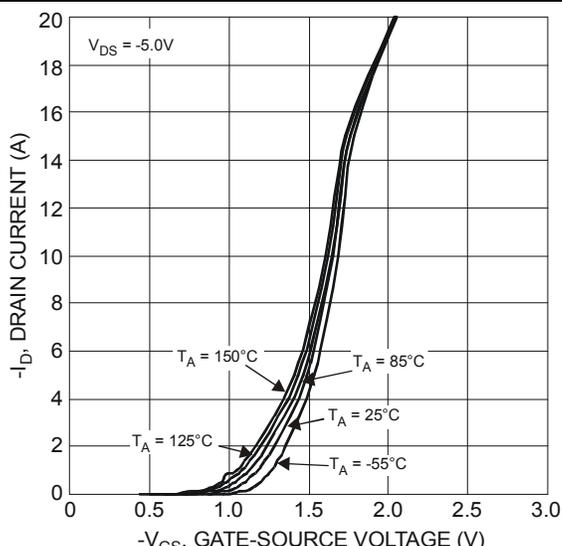


Figure 2 Typical Transfer Characteristics

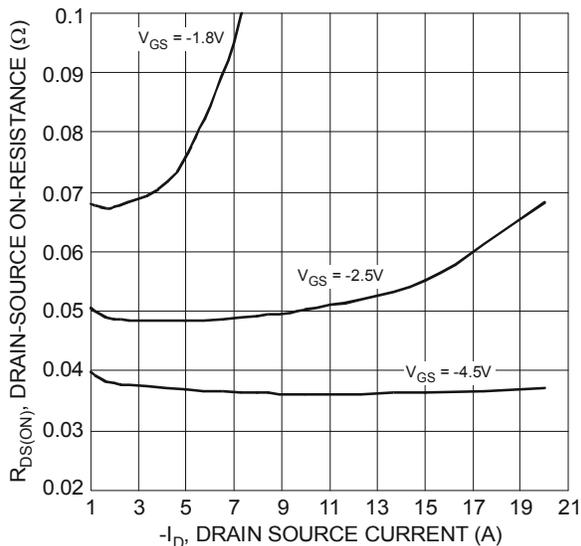


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

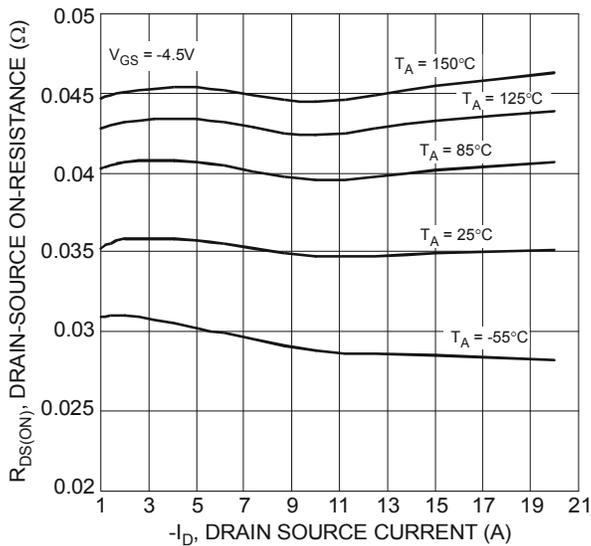


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

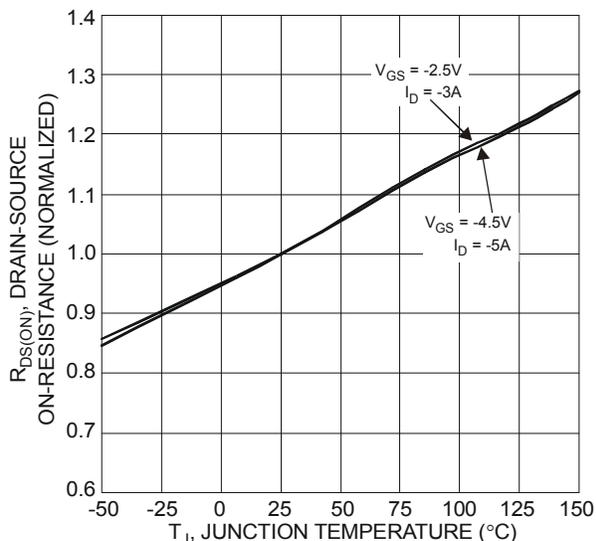


Figure 5 On-Resistance Variation with Temperature

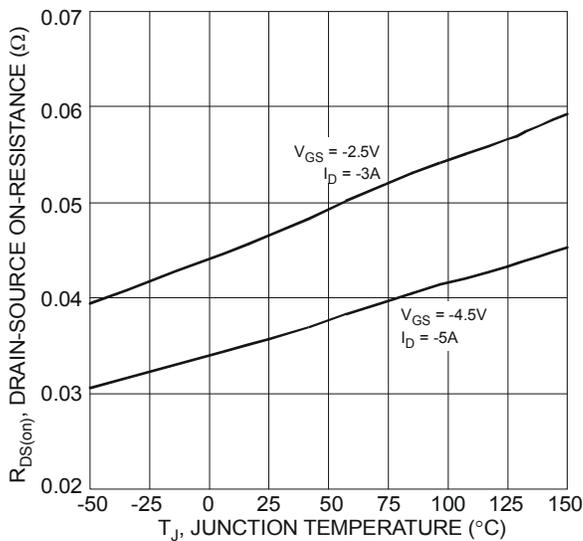


Figure 6 On-Resistance Variation with Temperature

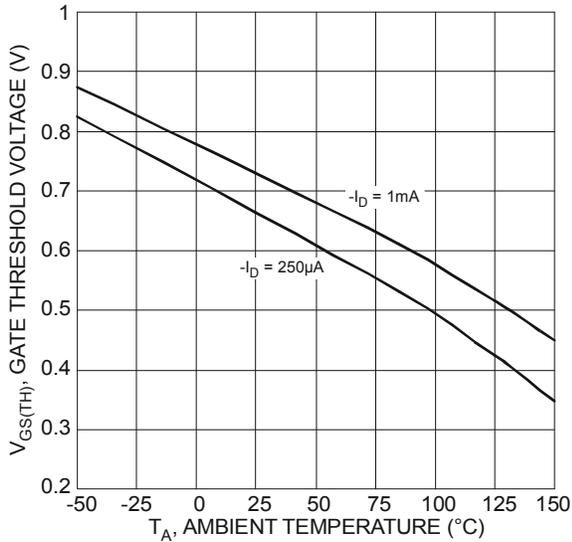


Figure 7 Gate Threshold Variation vs. Ambient Temperature

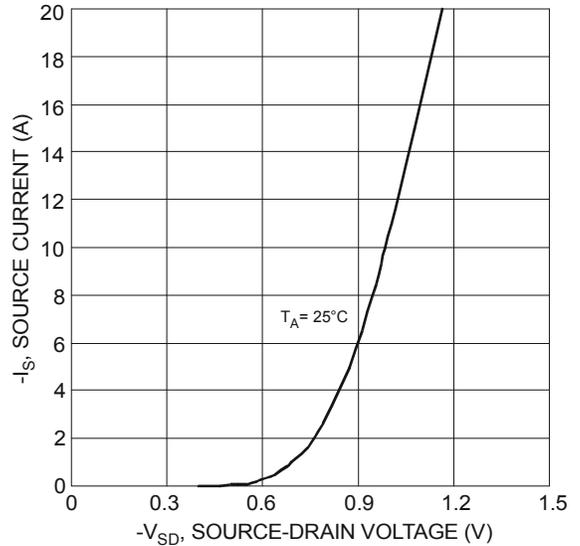


Figure 8 Diode Forward Voltage vs. Current

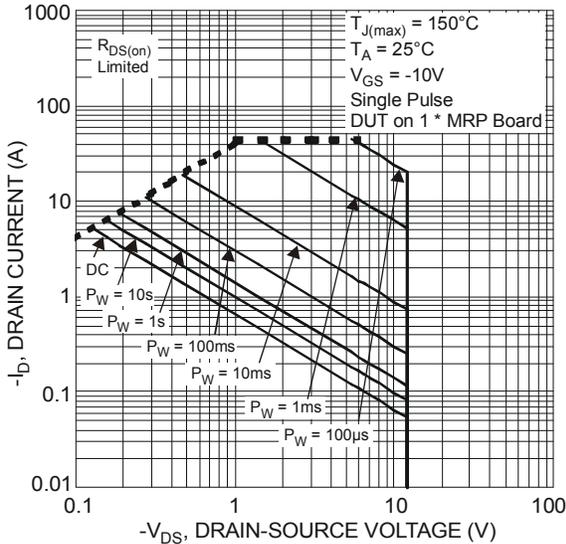


Figure 9 SOA, Safe Operation Area

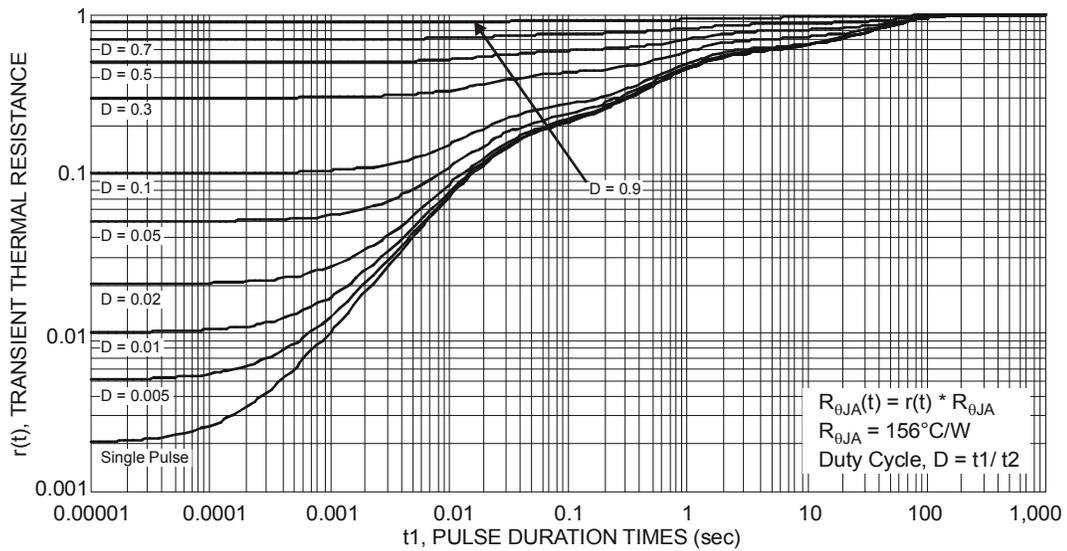
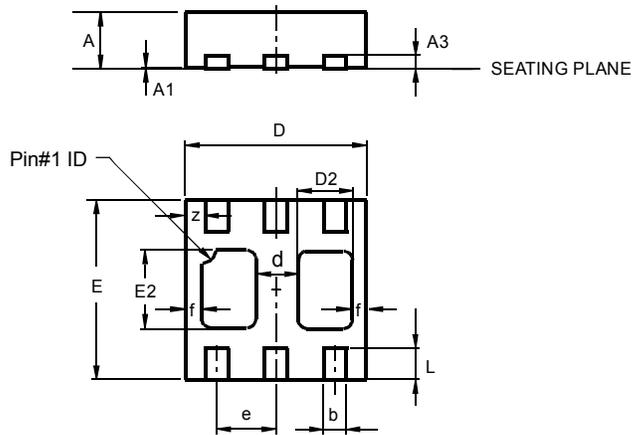


Figure 10 Transient Thermal Resistance

**Package Outline Dimensions**

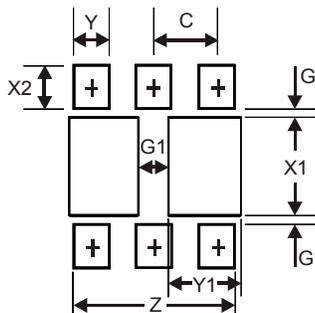
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



U-DFN2020-6 Type B			
Dim	Min	Max	Typ
A	0.545	0.605	0.575
A1	0	0.05	0.02
A3	—	—	0.13
b	0.20	0.30	0.25
D	1.95	2.075	2.00
d	—	—	0.45
D2	0.50	0.70	0.60
e	—	—	0.65
E	1.95	2.075	2.00
E2	0.90	1.10	1.00
f	—	—	0.15
L	0.25	0.35	0.30
z	—	—	0.225
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)
Z	1.67
G	0.20
G1	0.40
X1	1.0
X2	0.45
Y	0.37
Y1	0.70
C	0.65

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