

COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

Device	V _{(BR)DSS}	R _{DS(ON)} Max	I _D Max T _A = +25°C
Q1 N-Channel	12V	29mΩ @ V _{GS} = 4.5V	5.6A
		34mΩ @ V _{GS} = 2.5V	5.1A
		44mΩ @ V _{GS} = 1.8V	4.5A
		65mΩ @ V _{GS} = 1.5V	3.7A
Q2 P-Channel	-12V	61mΩ @ V _{GS} = -4.5V	-3.8A
		81mΩ @ V _{GS} = -2.5V	-3.3A
		115mΩ @ V _{GS} = -1.8V	-2.8A
		170mΩ @ V _{GS} = -1.5V	-2.3A

Description

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

Applications

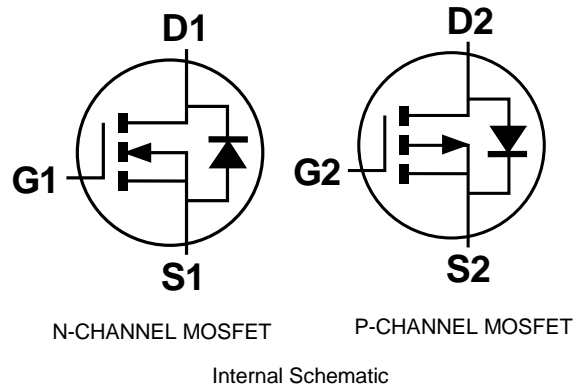
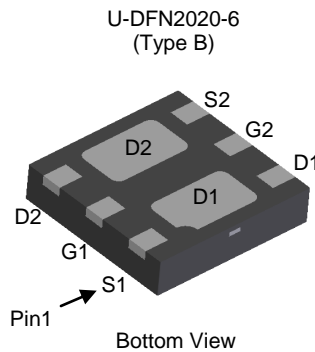
- Load Switch
- Power Management Functions
- Portable Power Adaptors

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)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at <https://www.diodes.com/products/automotive/automotive-products/>.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability.** <https://www.diodes.com/quality/product-definitions/>

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)
- Terminals Connections: See Diagram Below
- Weight: 0.0065 grams (Approximate)

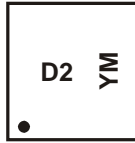


Ordering Information (Note 4)

Part Number	Case	Packaging
DMC1229UFDB -7	U-DFN2020-6 (Type B)	3,000/Tape & Reel
DMC1229UFDB -13	U-DFN2020-6 (Type B)	10,000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

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°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}	±8	±8	V	
Continuous Drain Current (Note 5) V _{GS} = 4.5V	Steady State	T _A = +25°C T _A = +70°C	5.6 4.4	-3.8 -3.0	A
	t < 5s	T _A = +25°C T _A = +70°C	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 (10µs Pulse, Duty Cycle = 1%)	I _{DM}	20	-15	A	

Thermal Characteristics

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P _D	Steady State	1.4
		t < 5s	2.2
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	Steady State	92
		t < 5s	55
Thermal Resistance, Junction to Case (Note 5)	R _{θJC}	30	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	

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

Electrical Characteristics Q1 N-Channel (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV _{DSS}	12	—	—	V	V _{GS} = 0V, I _D = 250μA
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	—	—	1.0	μA	V _{DS} = 12V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±8V, V _{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	V _{GS(th)}	0.4	—	1	V	V _{DS} = V _{GS} , I _D = 250μA
Static Drain-Source On-Resistance	R _{DS(on)}	—	17	29	mΩ	V _{GS} = 4.5V, I _D = 5A
		—	20	34		V _{GS} = 2.5V, I _D = 4.6A
		—	24	44		V _{GS} = 1.8V, I _D = 4.1A
		—	30	65		V _{GS} = 1.5V, I _D = 2A
Forward Transfer Admittance	Y _{fs}	—	6.5	—	S	V _{DS} = 10V, I _D = 5A
Diode Forward Voltage	V _{SD}	—	0.6	1.2	V	V _{GS} = 0V, I _S = 1A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C _{iss}	—	914	—	pF	V _{DS} = 6V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	—	132	—	pF	
Reverse Transfer Capacitance	C _{rss}	—	119	—	pF	
Gate Resistance	R _g	—	1.26	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 4.5V)	Q _g	—	10.5	—	nC	V _{DS} = 6V, I _D = 6.5A
Total Gate Charge (V _{GS} = 8V)		—	19.6	—	nC	
Gate-Source Charge	Q _{gs}	—	1.2	—	nC	
Gate-Drain Charge	Q _{gd}	—	1.6	—	nC	
Turn-On Delay Time	t _{D(on)}	—	5.0	—	nS	
Turn-On Rise Time	t _r	—	10.5	—	nS	V _{DD} = 6V, V _{GS} = 4.5V, R _L = 1.2Ω, R _G = 1Ω
Turn-Off Delay Time	t _{D(off)}	—	16.6	—	nS	
Turn-Off Fall Time	t _f	—	4.1	—	nS	

Electrical Characteristics Q2 P-Channel (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV _{DSS}	-12	—	—	V	V _{GS} = 0V, I _D = -250μA
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	—	—	-1.0	μA	V _{DS} = -12V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±8V, V _{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	V _{GS(th)}	-0.4	—	-1	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(on)}	—	37	61	mΩ	V _{GS} = -4.5V, I _D = -3.6A
		—	47	81		V _{GS} = -2.5V, I _D = -3.2A
		—	63	115		V _{GS} = -1.8V, I _D = -1A
		—	90	170		V _{GS} = -1.5V, I _D = -1A
Forward Transfer Admittance	Y _{fs}	—	5.5	—	S	V _{DS} = -10V, I _D = -3.6A
Diode Forward Voltage	V _{SD}	—	-0.65	-1.2	V	V _{GS} = 0V, I _S = -1A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C _{iss}	—	915	—	pF	V _{DS} = -6V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	—	225	—	pF	
Reverse Transfer Capacitance	C _{rss}	—	183	—	pF	
Gate Resistance	R _g	—	56.9	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = -4.5V)	Q _g	—	10.7	—	nC	V _{DS} = -6V, I _D = -4.3A
Total Gate Charge (V _{GS} = -8V)		—	17.9	—	nC	
Gate-Source Charge	Q _{gs}	—	1.7	—	nC	
Gate-Drain Charge	Q _{gd}	—	3.0	—	nC	
Turn-On Delay Time	t _{D(on)}	—	5.7	—	nS	
Turn-On Rise Time	t _r	—	11.5	—	nS	V _{DD} = -6V, V _{GS} = -4.5V, R _L = 1.6Ω, R _G = 1Ω
Turn-Off Delay Time	t _{D(off)}	—	27.8	—	nS	
Turn-Off Fall Time	t _f	—	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

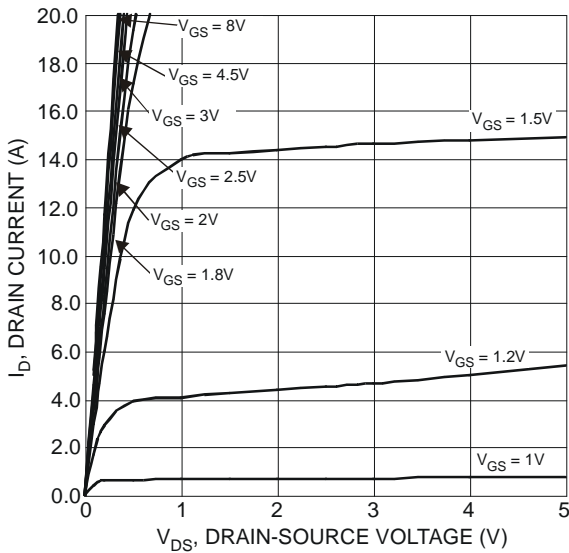


Figure 1 Typical Output Characteristics

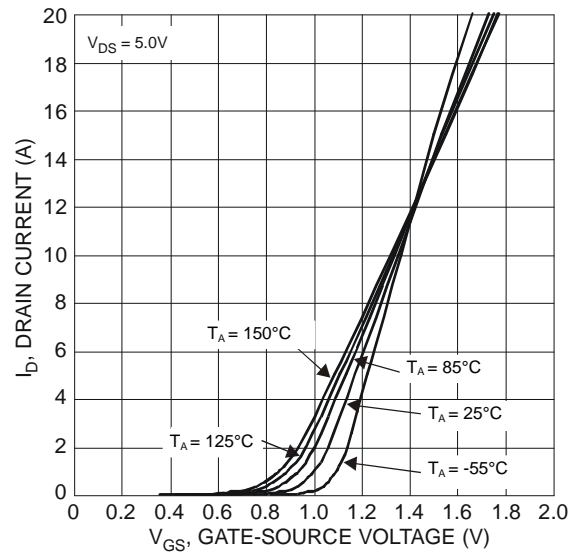


Figure 2 Typical Transfer Characteristics

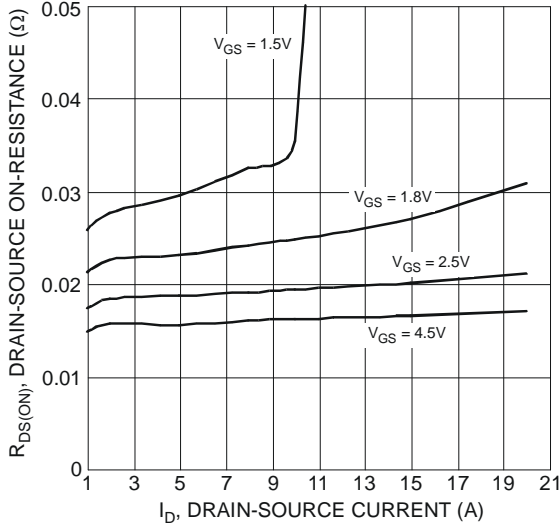


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

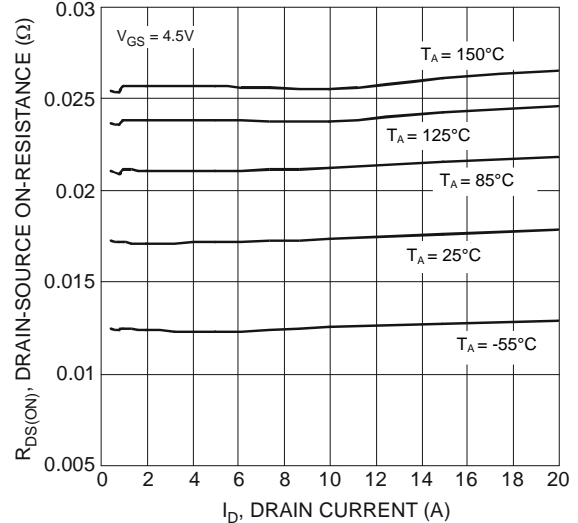


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

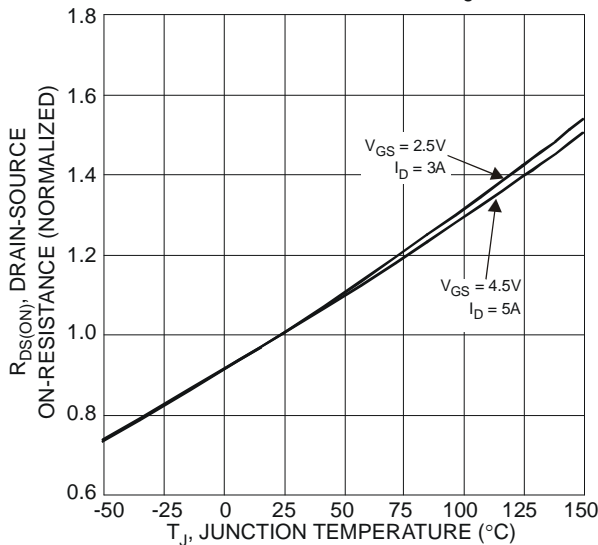


Figure 5 On-Resistance Variation with Temperature

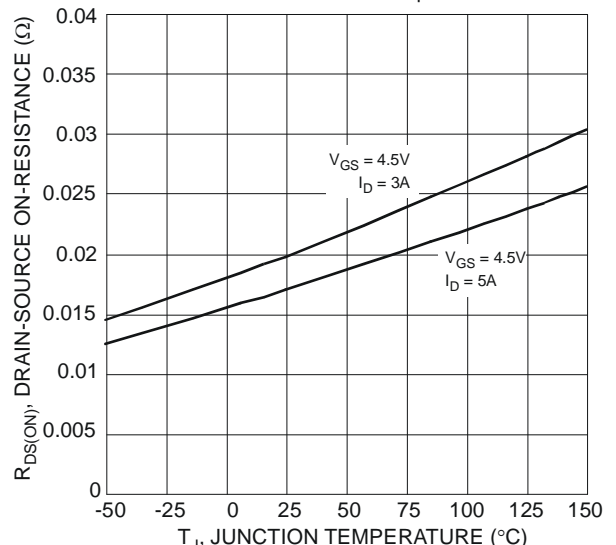


Figure 6 On-Resistance Variation with Temperature

Q1 N-CHANNEL (continued)

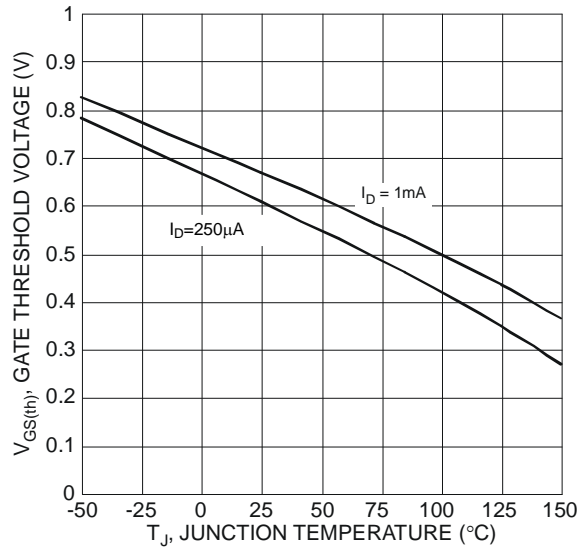


Figure 7 Gate Threshold Variation vs. Ambient Temperature

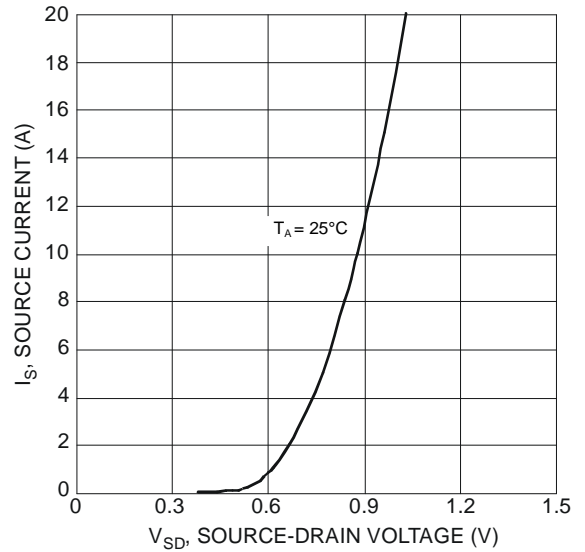


Figure 8 Diode Forward Voltage vs. Current

Q2 P-CHANNEL

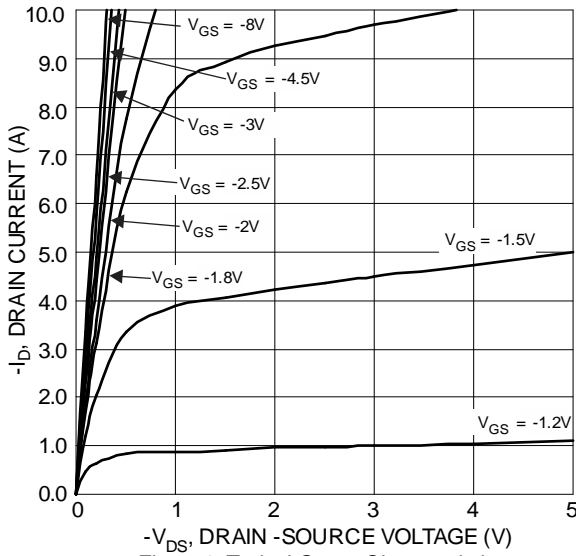


Figure 9 Typical Output Characteristics

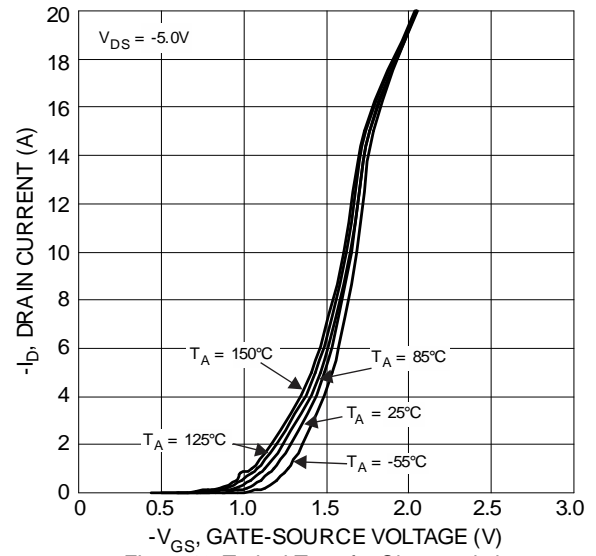


Figure 10 Typical Transfer Characteristics

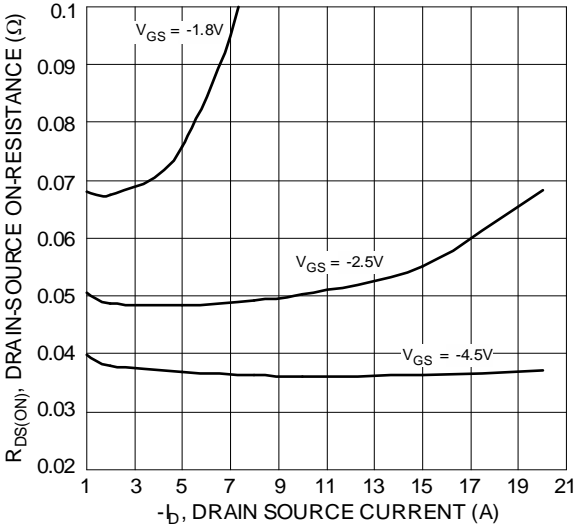


Figure 11 Typical On-Resistance vs. Drain Current and Gate Voltage

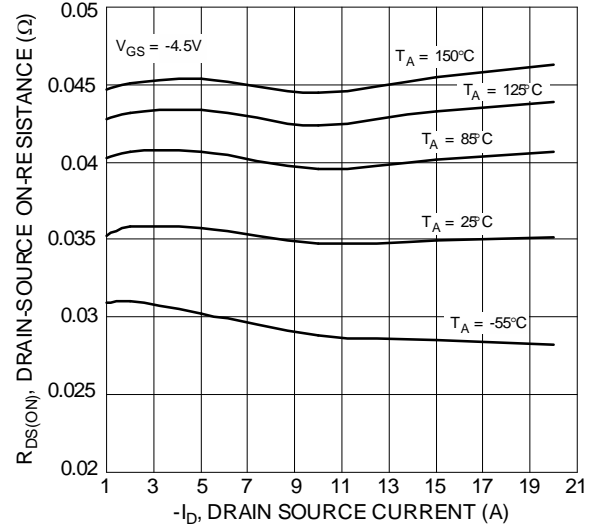


Figure 12 Typical On-Resistance vs. Drain Current and Temperature

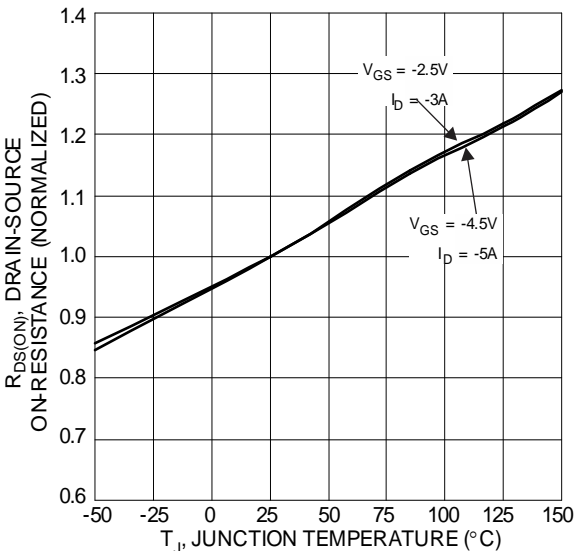


Figure 13 On-Resistance Variation with Temperature

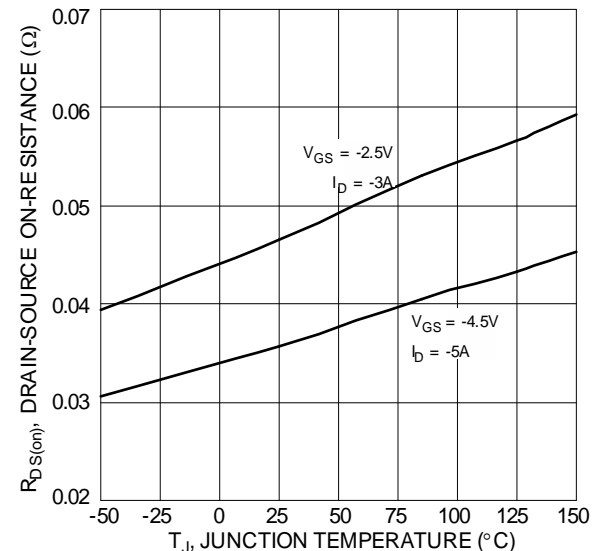


Figure 14 On-Resistance Variation with Temperature

Q2 P-CHANNEL (continued)

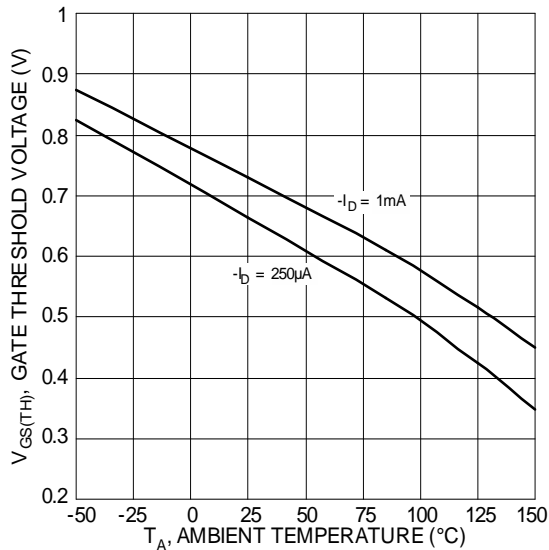


Figure 15 Gate Threshold Variation vs. Ambient Temperature

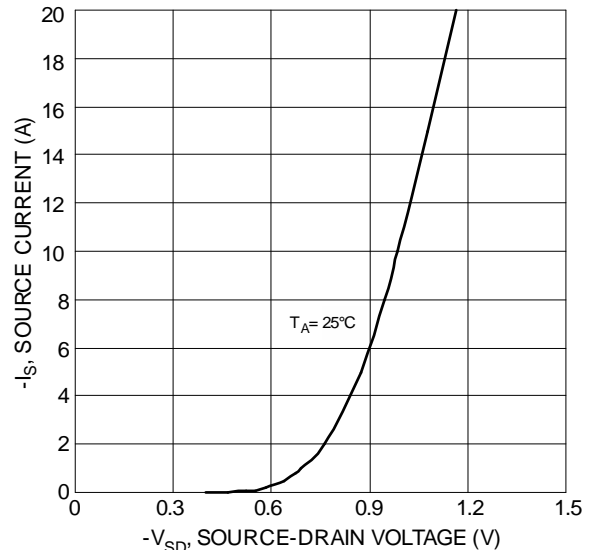


Figure 16 Diode Forward Voltage vs. Current

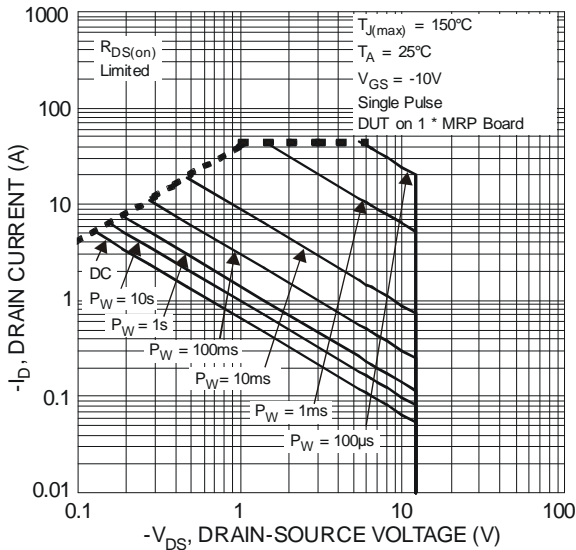


Figure 17 SOA, Safe Operation Area

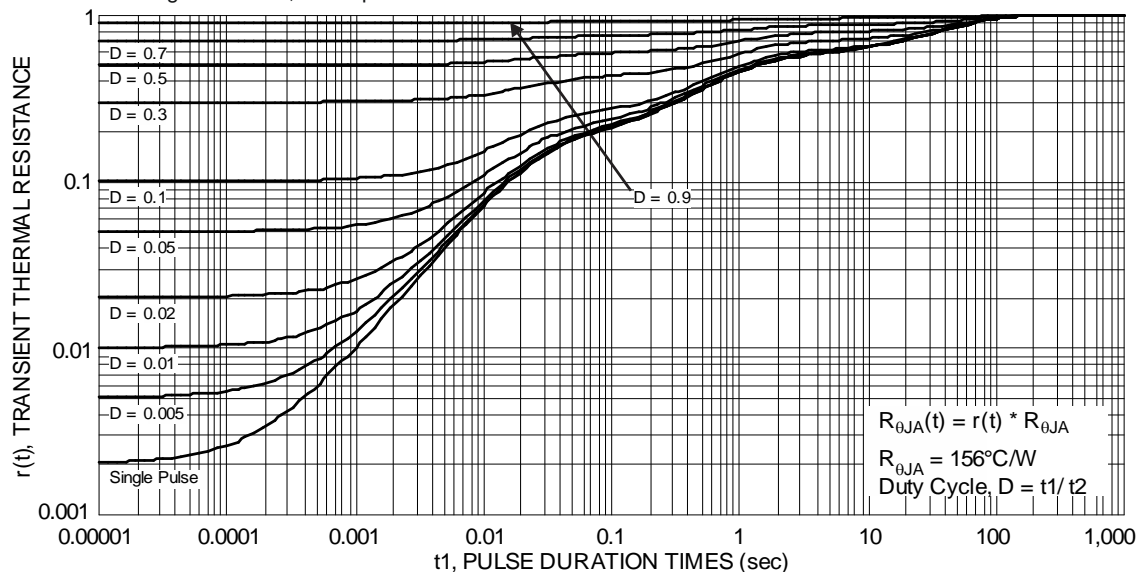


Figure 18 Transient Thermal Resistance

$$R_{\theta JA}(t) = r(t) * R_{\theta JA}$$

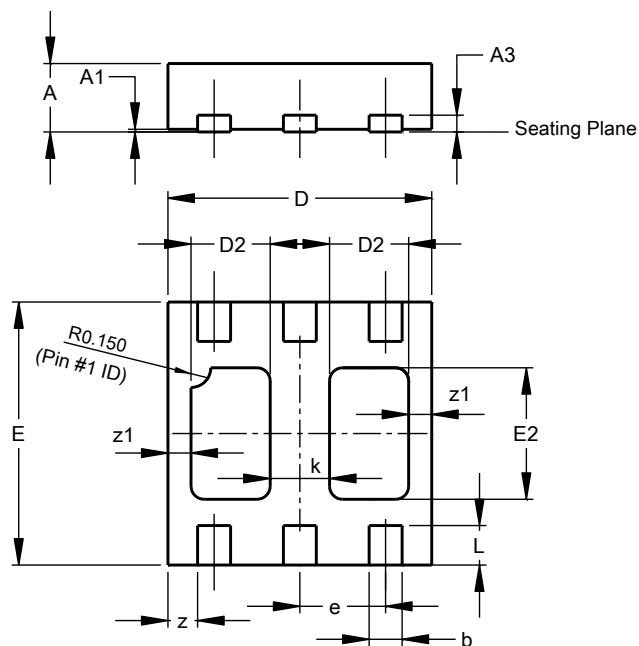
$$R_{\theta JA} = 156^{\circ}\text{C/W}$$

$$\text{Duty Cycle, } D = t1/t2$$

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

U-DFN2020-6 (Type B)

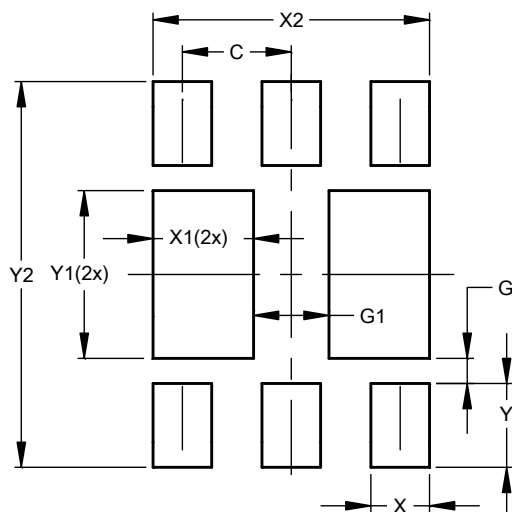


U-DFN2020-6 (Type B)			
Dim	Min	Max	Typ
A	0.545	0.605	0.575
A1	0.00	0.05	0.02
A3	-	-	0.13
b	0.20	0.30	0.25
D	1.95	2.075	2.00
D2	0.50	0.70	0.60
e	-	-	0.65
E	1.95	2.075	2.00
E2	0.90	1.10	1.00
k	-	-	0.45
L	0.25	0.35	0.30
z	-	-	0.225
z1	-	-	0.175
All Dimensions in mm			

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> 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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