

COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET
Product Summary

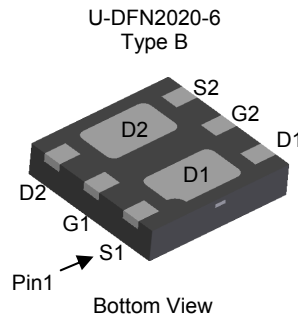
Device	V _{(BR)DSS}	R _{DS(ON)} max	I _D MAX T _A = +25°C
Q1 N-Channel	12V	34mΩ @ V _{GS} = 4.5V	5.1A
		40mΩ @ V _{GS} = 2.5V	4.7A
		50mΩ @ V _{GS} = 1.8V	4.2A
		70mΩ @ V _{GS} = 1.5V	3.6A
Q2 P-Channel	-12V	59mΩ @ V _{GS} = -4.5V	-3.9A
		81mΩ @ V _{GS} = -2.5V	-3.3A
		115mΩ @ V _{GS} = -1.8V	-2.8A
		215mΩ @ V _{GS} = -1.5V	-2.0A

Description

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

Applications

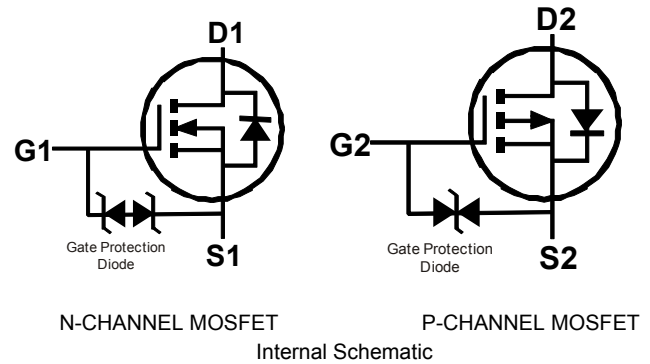
- Load Switch
- Power Management Functions
- Portable Power Adaptors


Features

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

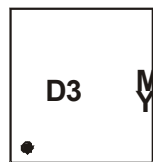
Mechanical Data

- 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)


Ordering Information (Note 4)

Part Number	Case	Packaging
DMC1030UFDB -7	U-DFN2020-6 Type B	3000/Tape & Reel
DMC1030UFDB -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. 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: 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	I _D	5.1 4.1	-3.9 -3.1	A
	t < 5s	T _A = +25°C T _A = +70°C	I _D	6.6 5.3	-5.0 -4.0	A
Maximum Continuous Body Diode Forward Current (Note 5)			I _S	2	-1.7	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I _{DM}	35	-25	A

Thermal Characteristics

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	Steady State	P _D	1.36	W
	t < 5s		1.89	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R _{θJA}	92	°C/W
	t < 5s		66	
Thermal Resistance, Junction to Case (Note 5)		R _{θJC}	18	
Operating and Storage Temperature Range		T _J , T _{STG}	-55 to +150	°C

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}	—	—	±10	µA	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	34	mΩ	V _{GS} = 4.5V, I _D = 4.6A
		—	20	40		V _{GS} = 2.5V, I _D = 4.2A
		—	24	50		V _{GS} = 1.8V, I _D = 3.8A
		—	28	70		V _{GS} = 1.5V, I _D = 1.5A
Diode Forward Voltage	V _{SD}	—	0.7	1.2	V	V _{GS} = 0V, I _S = 4.8A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C _{iss}	—	1003	—	pF	V _{DS} = 6V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	—	132	—	pF	
Reverse Transfer Capacitance	C _{rss}	—	115	—	pF	
Gate Resistance	R _g	—	11.3	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 4.5V)	Q _g	—	12.2	—	nC	V _{DS} = 10V, I _D = 6.8A
Total Gate Charge (V _{GS} = 8V)		—	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} = 6V, V _{GS} = 4.5V, R _L = 1.1Ω, R _G = 1Ω
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 = 5.4A, dI/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q _{rr}	—	0.9	—	nC	I _S = 5.4A, dI/dt = 100A/µs

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

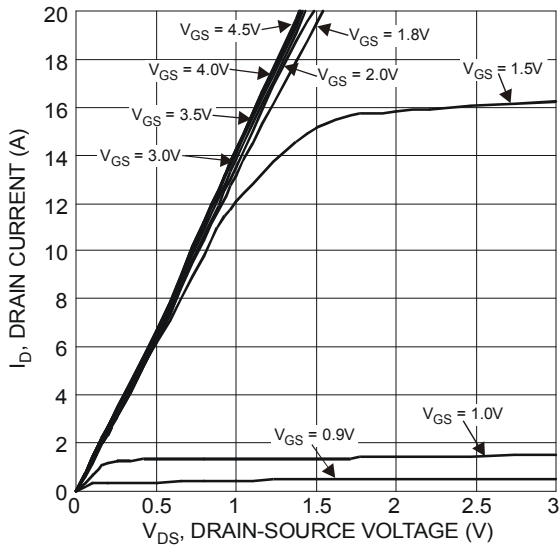


Figure 1 Typical Output Characteristics

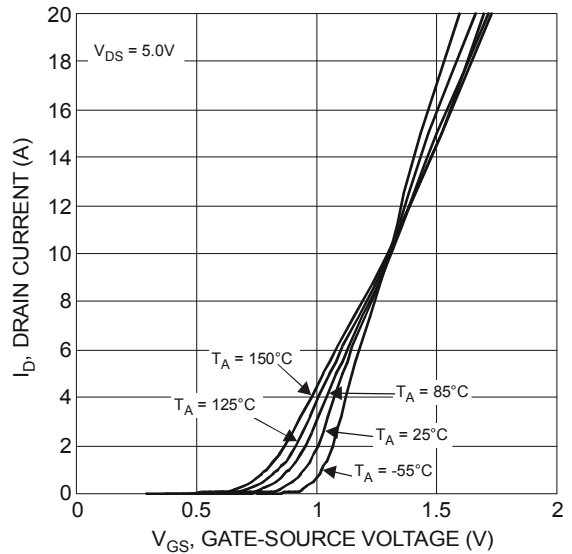


Figure 2 Typical Transfer Characteristics

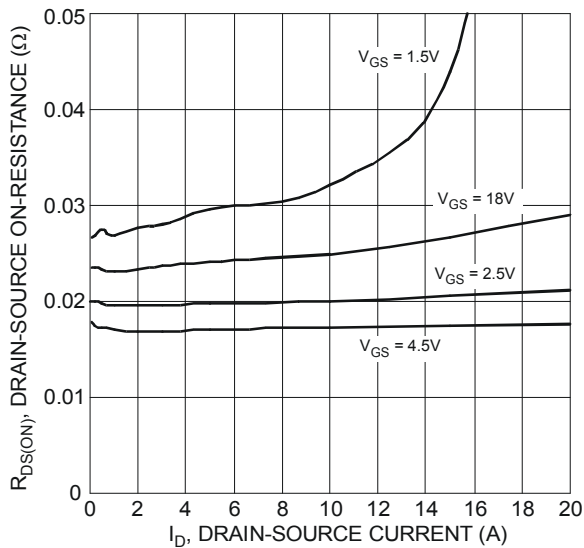


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

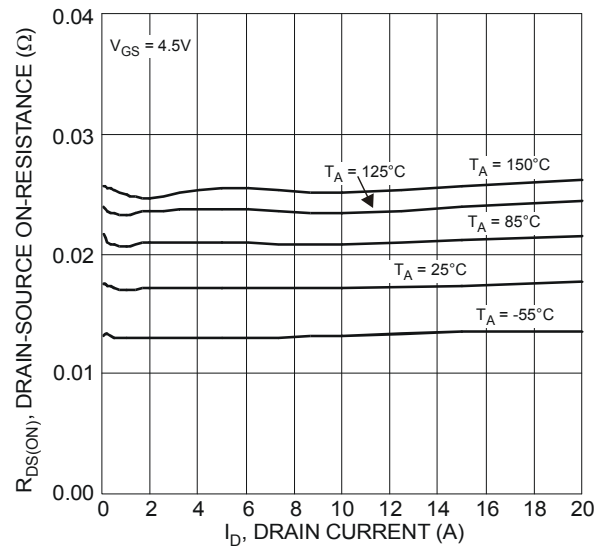


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

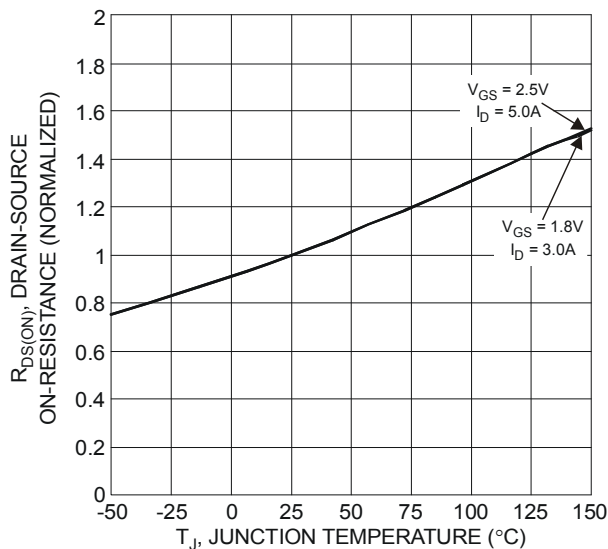


Figure 5 On-Resistance Variation with Temperature

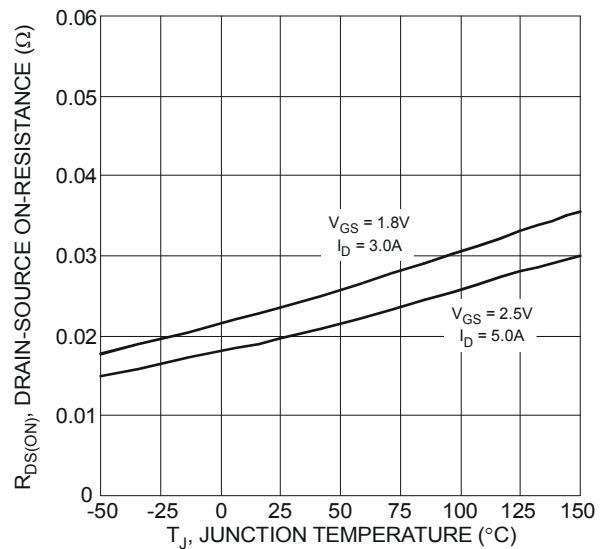


Figure 6 On-Resistance Variation with Temperature

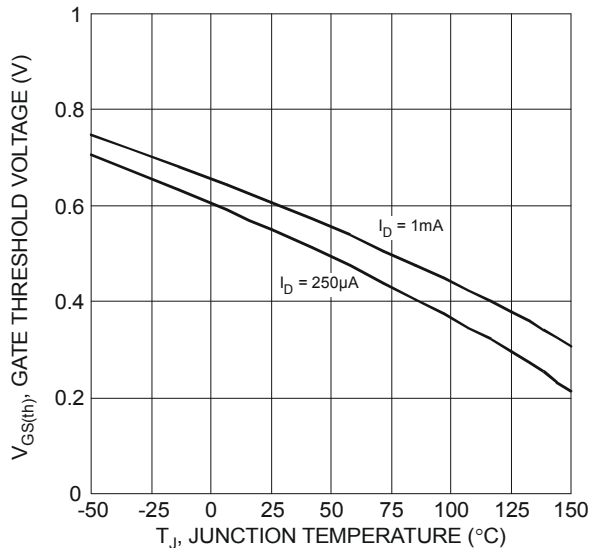


Figure 7 Gate Threshold Variation vs. Ambient Temperature

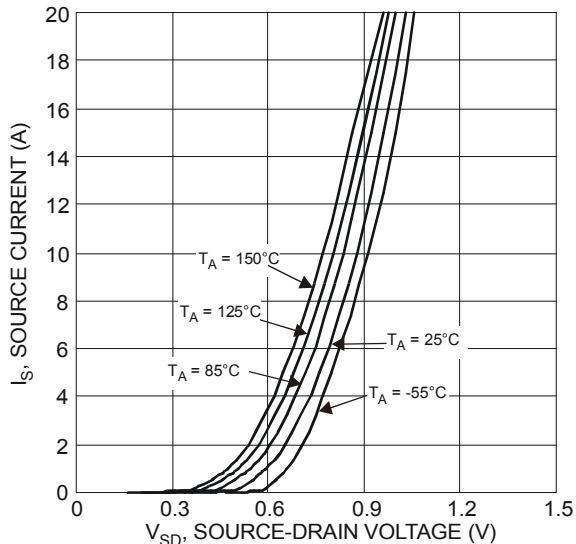


Figure 8 Diode Forward Voltage vs. Current

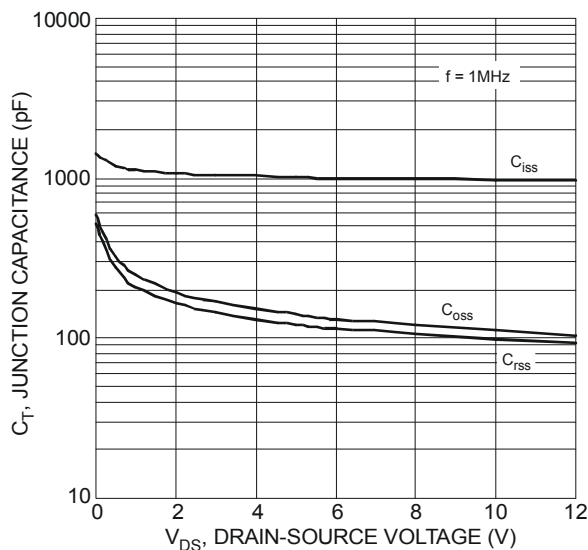


Figure 9 Typical Junction Capacitance

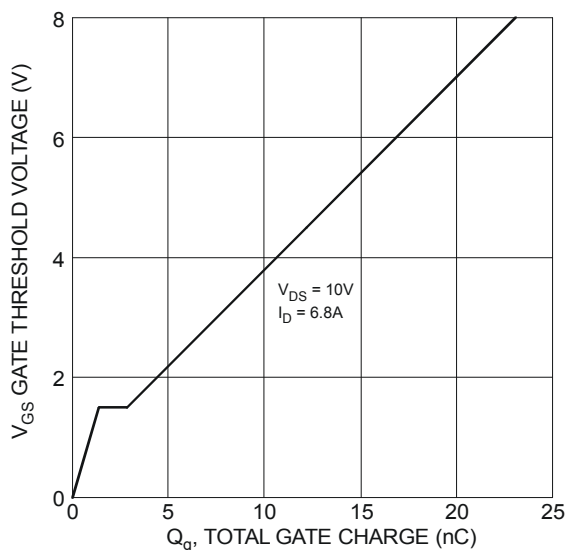


Figure 10 Gate Charge

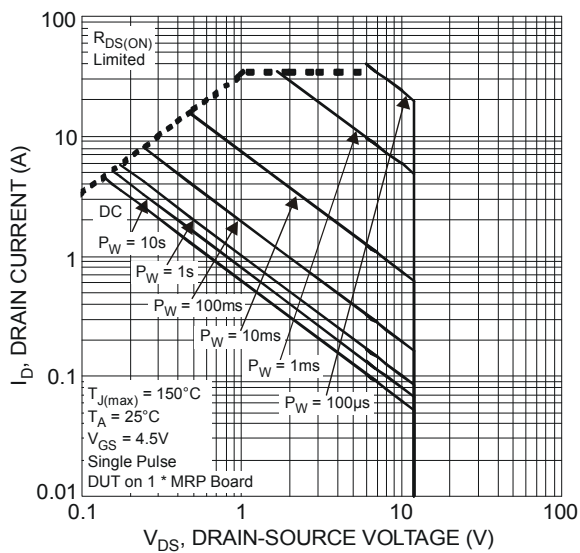


Figure 11 SOA Safe Operation Area

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 6)						
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	μA	$V_{DS} = -12V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	± 10	μA	$V_{GS} = \pm 8V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 6)						
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 Ω	$V_{GS} = -4.5V, I_D = -3.6A$
		—	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	$V_{GS} = 0V, I_S = -3.7A$
DYNAMIC CHARACTERISTICS (Note 7)						
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	—	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$
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	
Turn-On Rise Time	t_r	—	12.8	—	ns	$V_{DD} = -6V, V_{GS} = -4.5V, R_L = 1.6\Omega, R_G = 1\Omega$
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: 6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to product testing.

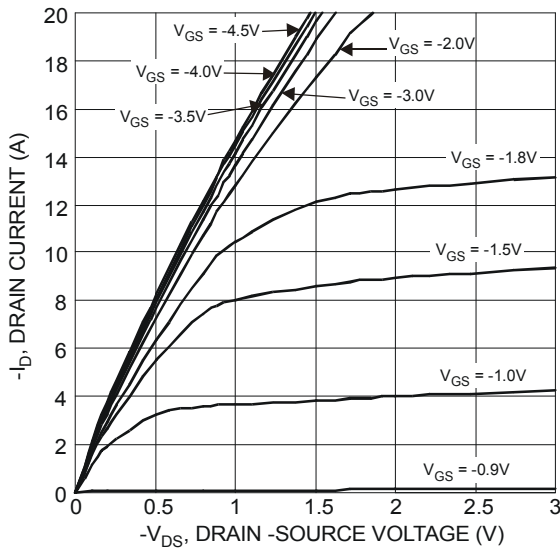


Figure 12 Typical Output Characteristics

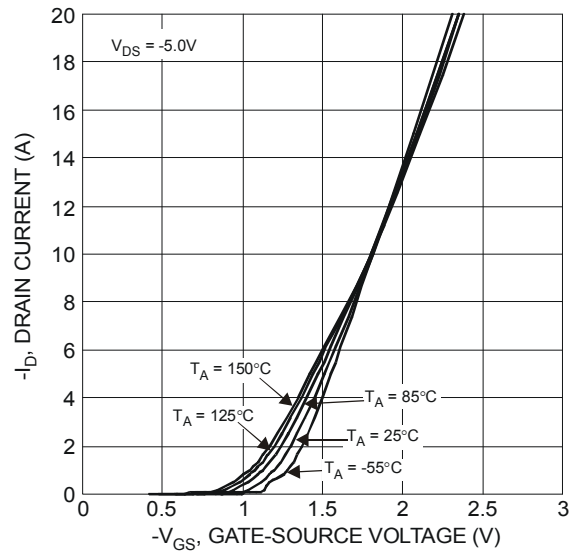


Figure 13 Typical Transfer Characteristics

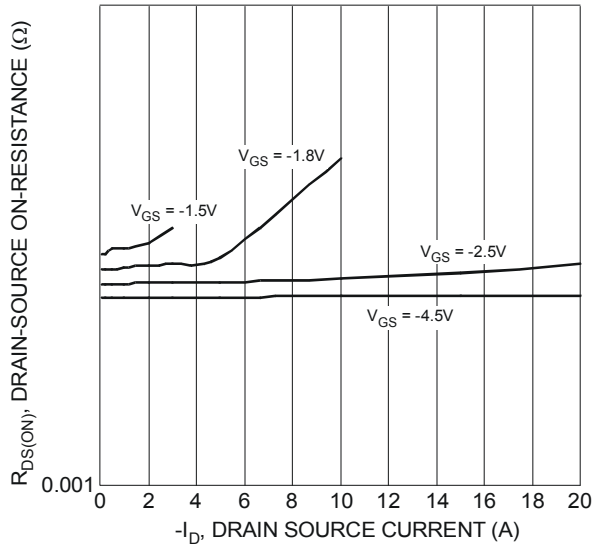


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

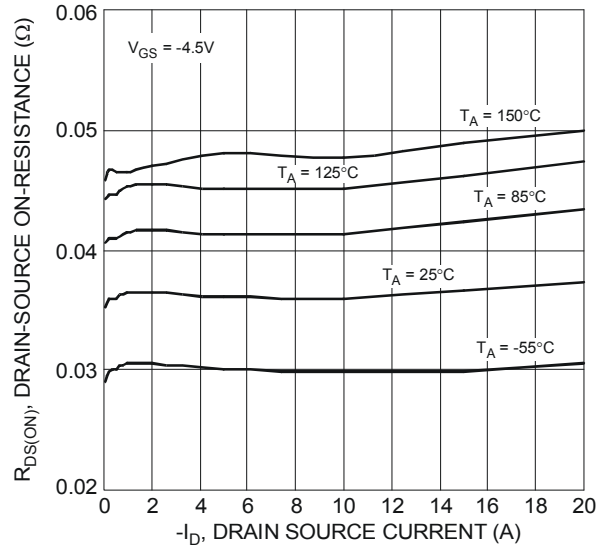


Figure 15 Typical On-Resistance vs. Drain Current and Temperature

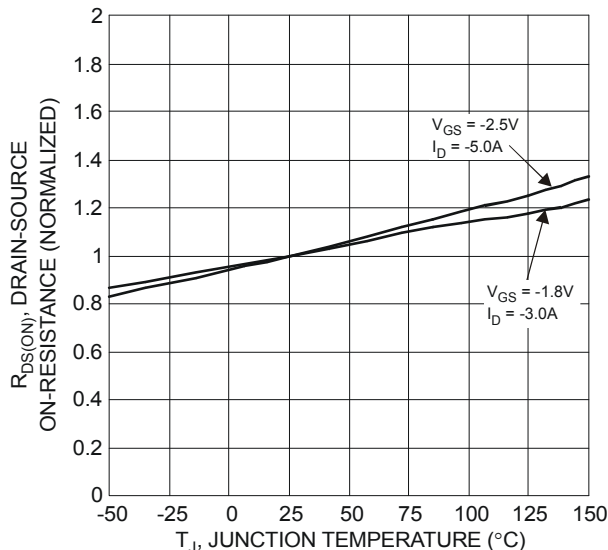


Figure 16 On-Resistance Variation with Temperature

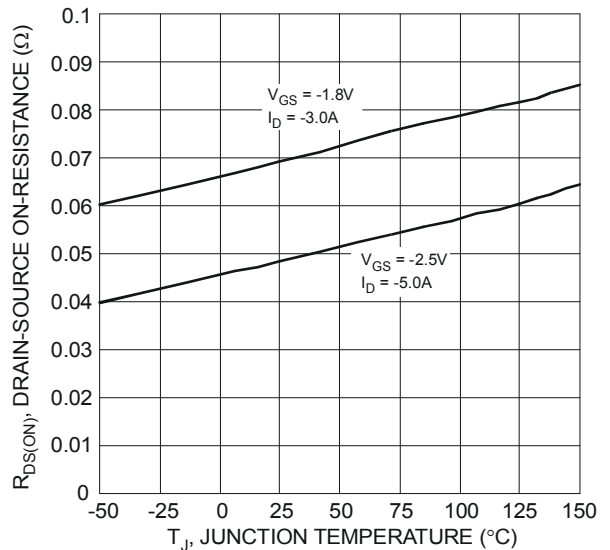


Figure 17 On-Resistance Variation with Temperature

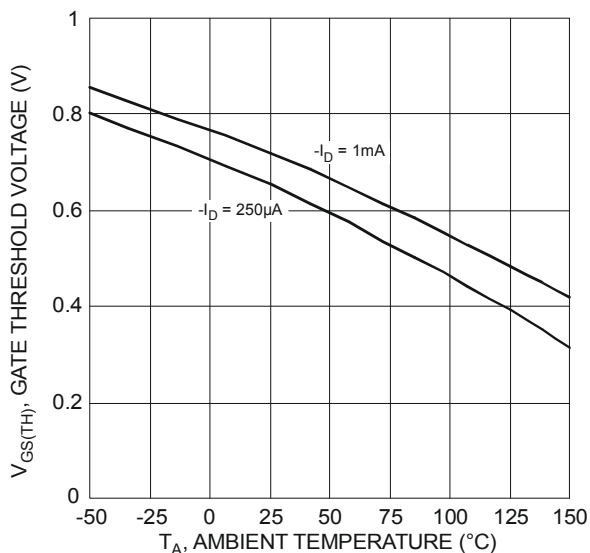


Figure 18 Gate Threshold Variation vs. Ambient Temperature

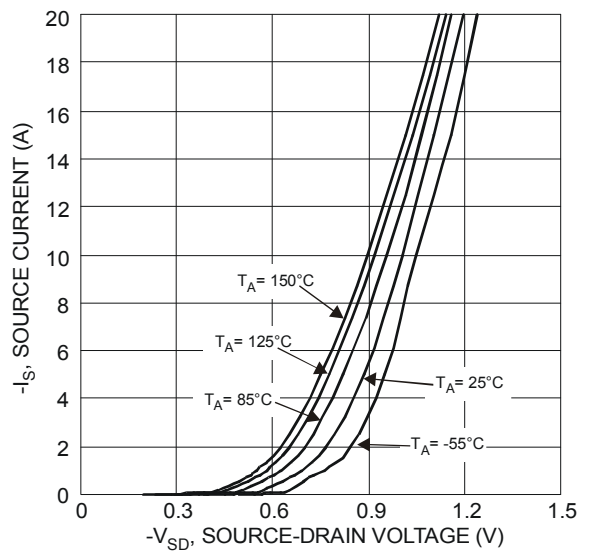


Figure 19 Diode Forward Voltage vs. Current

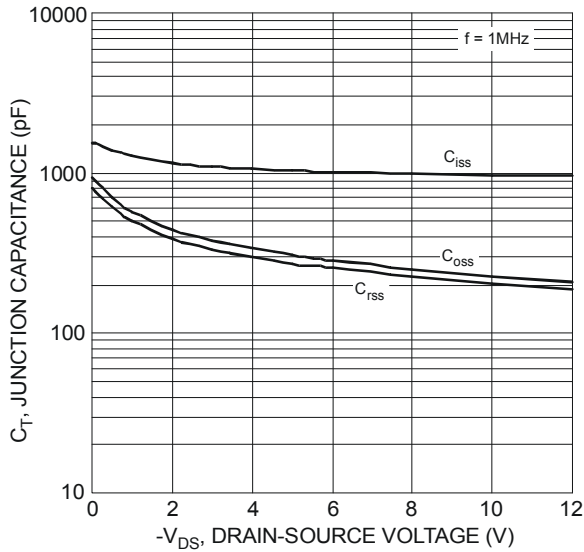


Figure 20 Typical Junction Capacitance

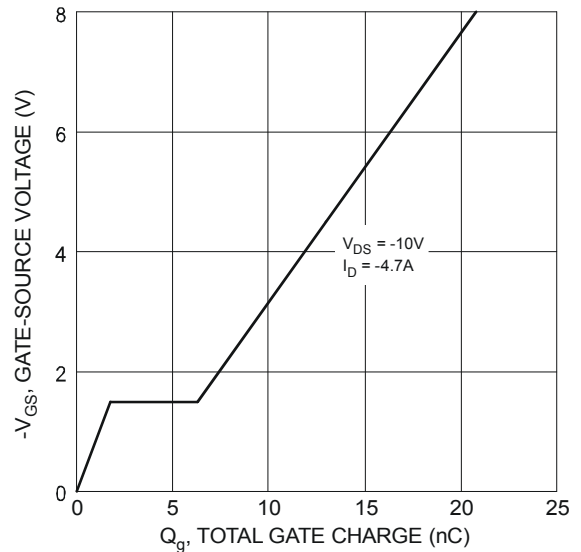


Figure 21 Gate-Charge Characteristics

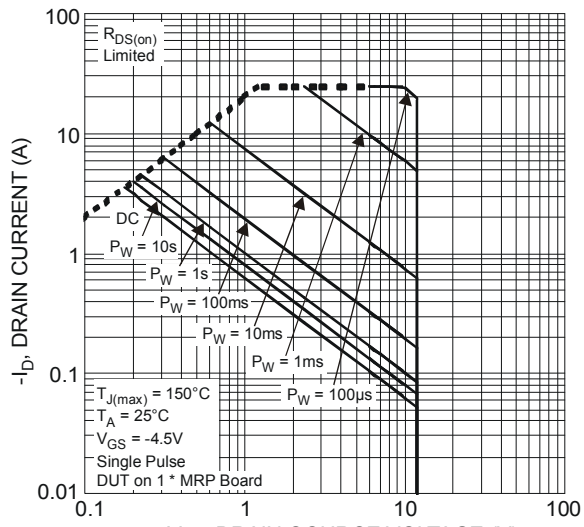


Figure 22 SOA Safe Operation Area

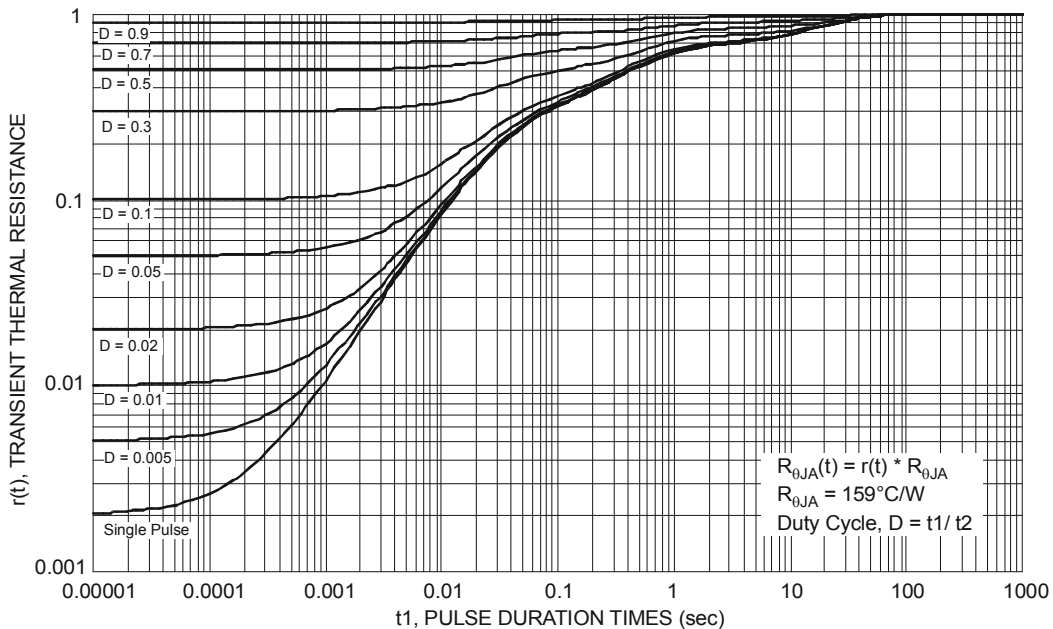
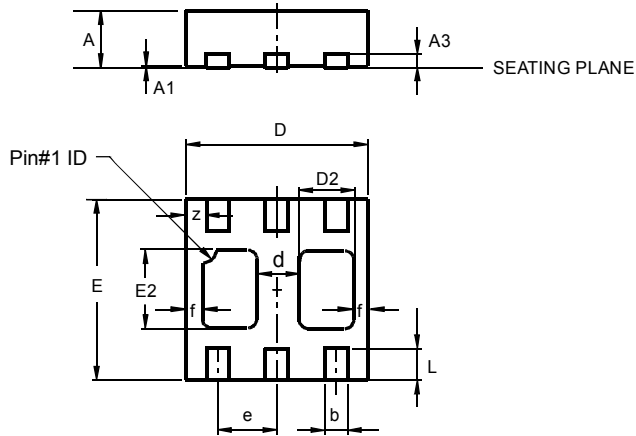


Figure 23 Transient Thermal Resistance

Package Outline Dimensions

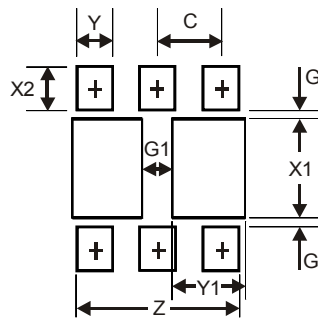
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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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