

Product Summary

Device	BV _{DSS}	R _{DS(ON)} MAX	I _D MAX T _A = +25°C
Q1 N-Channel	20V	40mΩ @ V _{GS} = 4.5V	4.7A
		65mΩ @ V _{GS} = 2.5V	3.7A
Q2 P-Channel	-20V	90mΩ @ V _{GS} = -4.5V	-3.2A
		137mΩ @ V _{GS} = -2.5V	-2.6A

Description

This MOSFET is 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)**
- **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 [contact us](mailto:contact@diodes.com) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

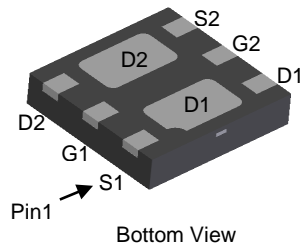
Mechanical Data

- 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
- Terminal Connections: See Diagram Below
- Weight: 0.008 grams (Approximate)

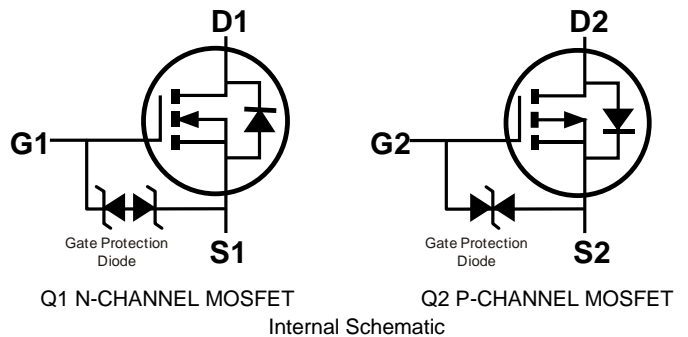


ESD PROTECTED

U-DFN2020-6 (Type B)



Bottom View



Ordering Information (Note 4)

Part Number	Case	Packaging
DMC2041UFDB -7	U-DFN2020-6 (Type B)	3,000/Tape & Reel
DMC2041UFDB -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

Site 1



D4 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: H = 2020)
 M = Month (ex: 9 = September)

Date Code Key

Year	2014	...	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Code	B	...	H	I	J	K	L	M	N	O	P	R

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

Site 2



D4 = Product Type Marking Code
 YWX = Date Code Marking
 Y = Year (ex: 0 = 2020)
 W = Week (ex: a = Week 27; z Represents Week 52 and 53)
 X = Internal Code (ex: U = Monday)

Date Code Key

Year	2014	...	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Code	4	...	0	1	2	3	4	5	6	7	8	9

Week	1-26	27-52	53
Code	A-Z	a-z	z

Internal Code	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Code	T	U	V	W	X	Y	Z

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Q1 N-CHANNEL	Q2 P-CHANNEL	Unit
Drain-Source Voltage			V _{DSS}	20	-20	V
Gate-Source Voltage			V _{GSS}	±12	±12	V
Continuous Drain Current (Note 5) N-Channel: V _{GS} = 4.5V P-Channel: V _{GS} = -4.5V	Steady State	T _A = +25°C T _A = +70°C	I _D	4.7 3.8	-3.2 -2.5	A
	t < 5s	T _A = +25°C T _A = +70°C	I _D	6.1 4.9	-4.1 -3.2	A
Maximum Continuous Body Diode Forward Current (Note 5)			I _S	2	-1.5	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I _{DM}	30	-18	A

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	Steady State	P _D	1.4	W
	t < 5s		2.2	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R _{θJA}	92	°C/W
	t < 5s		55	
Thermal Resistance, Junction to Case (Note 5)		R _{θJC}	30	
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}	20	—	—	V	V _{GS} = 0V, I _D = 250µA
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	—	—	1.0	µA	V _{DS} = 20V, 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)}	0.35	—	1.4	V	V _{DS} = V _{GS} , I _D = 250µA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	23	40	mΩ	V _{GS} = 4.5V, I _D = 4.2A
		—	26	65		V _{GS} = 2.5V, I _D = 3.3A
Diode Forward Voltage	V _{SD}	—	0.7	1.2	V	V _{GS} = 0V, I _S = 4.4A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C _{ISS}	—	713	—	pF	V _{DS} = 10V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{OSS}	—	80	—	pF	
Reverse Transfer Capacitance	C _{RSS}	—	68	—	pF	
Gate Resistance	R _g	—	15	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 4.5V)	Q _g	—	8	—	nC	V _{DS} = 10V, I _D = 5.5A
Total Gate Charge (V _{GS} = 8V)		—	15	—	nC	
Gate-Source Charge	Q _{gs}	—	1.0	—	nC	
Gate-Drain Charge	Q _{gd}	—	1.1	—	nC	
Turn-On Delay Time	t _{D(ON)}	—	3.6	—	ns	V _{DD} = 10V, V _{GS} = 4.5V, R _L = 2.3Ω, R _g = 1Ω
Turn-On Rise Time	t _r	—	15.9	—	ns	
Turn-Off Delay Time	t _{D(OFF)}	—	16.0	—	ns	
Turn-Off Fall Time	t _f	—	2.6	—	ns	
Body Diode Reverse Recovery Time	t _{RR}	—	6.6	—	ns	I _S = 4.4A, dI/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q _{RR}	—	1.2	—	nC	I _S = 4.4A, dI/dt = 100A/µs

Notes: 5. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.
6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to product testing.

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}	-20	—	—	V	V _{GS} = 0V, I _D = -250μA
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	—	—	-1.0	μA	V _{DS} = -20V, 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)}	-0.35	—	-1.4	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	59	90	mΩ	V _{GS} = -4.5V, I _D = -2.9A
		—	76	137		V _{GS} = -2.5V, I _D = -2.3A
Diode Forward Voltage	V _{SD}	—	-0.65	-1.2	V	V _{GS} = 0V, I _S = -3.0A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C _{iss}	—	881	—	pF	V _{DS} = -10V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	—	84	—	pF	
Reverse Transfer Capacitance	C _{rss}	—	67	—	pF	
Gate Resistance	R _g	—	14.3	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = -4.5V)	Q _g	—	11	—	nC	V _{DS} = -10V, I _D = -3.7A
Total Gate Charge (V _{GS} = -8V)		—	18	—		
Gate-Source Charge	Q _{gs}	—	1.5	—	nC	
Gate-Drain Charge	Q _{gd}	—	2.3	—	nC	
Turn-On Delay Time	t _{d(ON)}	—	5.0	—	ns	
Turn-On Rise Time	t _r	—	9.5	—	ns	V _{DD} = -10V, V _{GS} = -4.5V, R _L = 3.3Ω, R _g = 1Ω
Turn-Off Delay Time	t _{d(OFF)}	—	29.7	—	ns	
Turn-Off Fall Time	t _f	—	20.4	—	ns	
Body Diode Reverse Recovery Time	t _{RR}	—	23.6	—	ns	I _S = -3.0A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q _{RR}	—	11.4	—	nC	I _S = -3.0A, dI/dt = 100A/μs

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

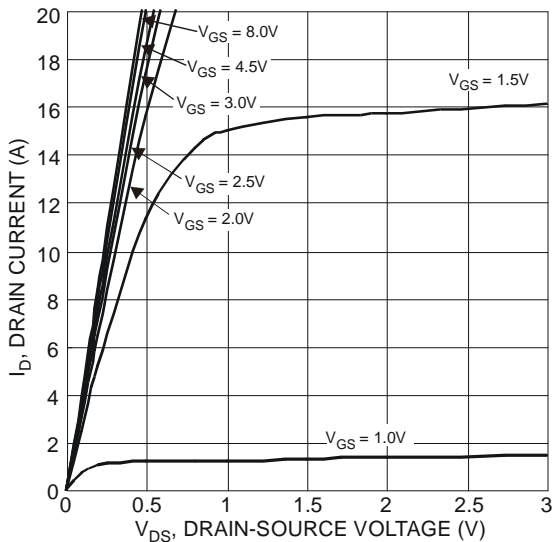


Figure 1 Typical Output Characteristics

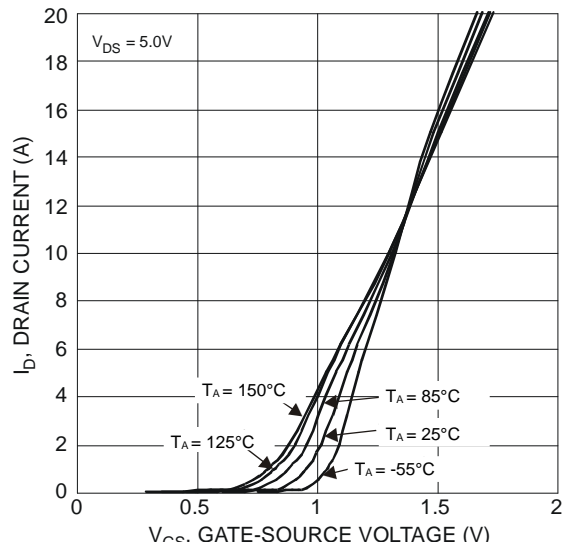


Figure 2 Typical Transfer Characteristics

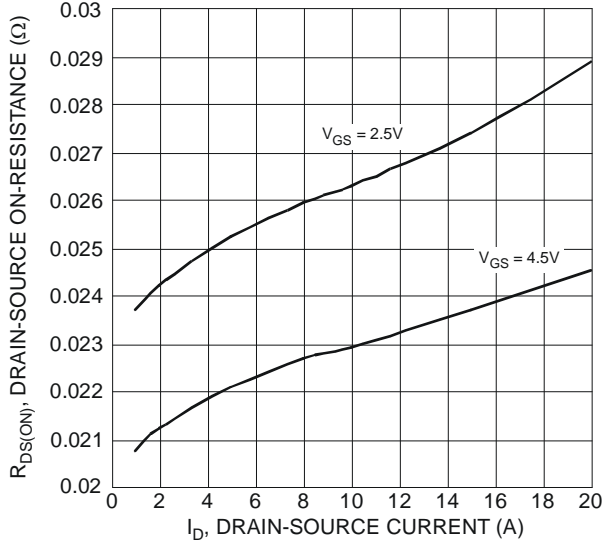


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

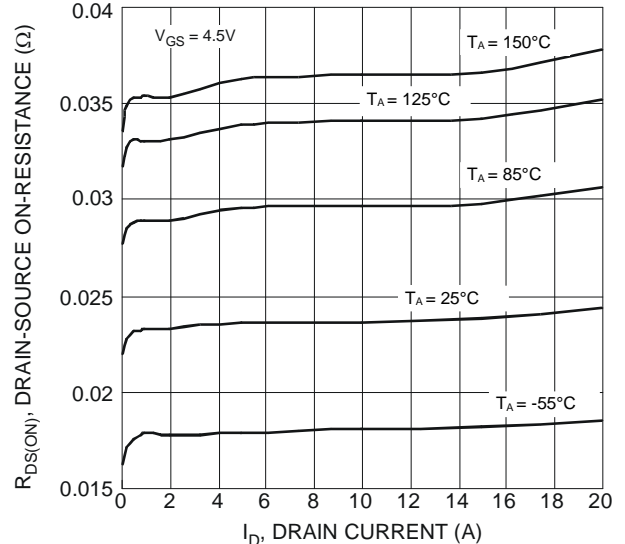


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

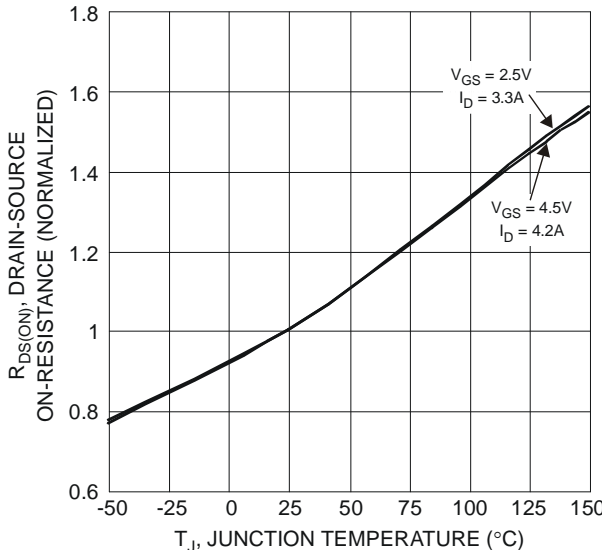


Figure 5 On-Resistance Variation with Temperature

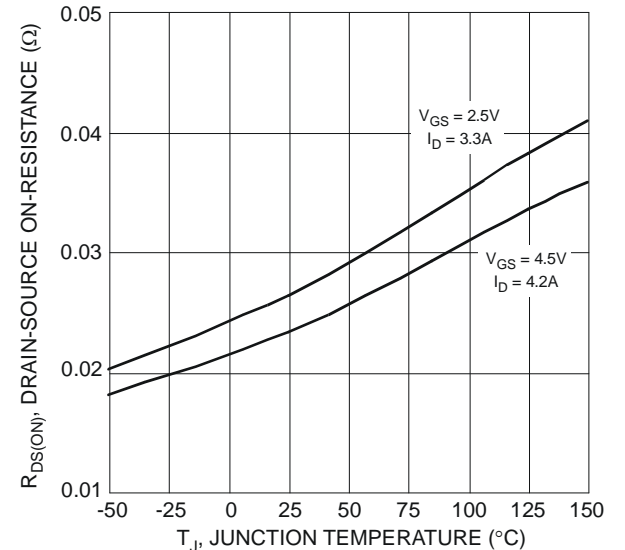


Figure 6 On-Resistance Variation with Temperature

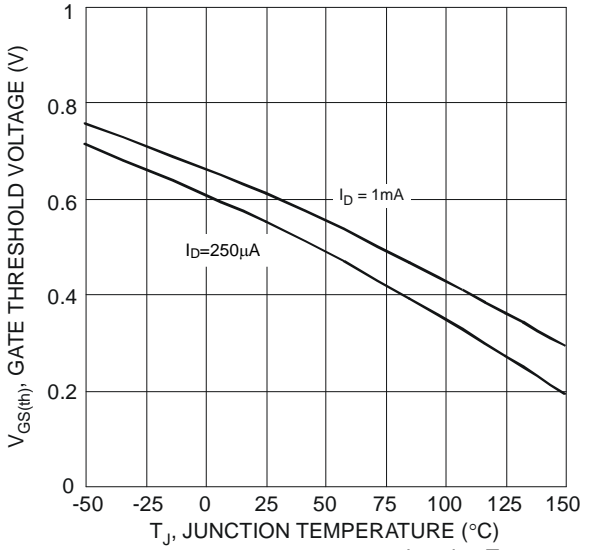


Figure 7 Gate Threshold Variation vs. Junction Temperature

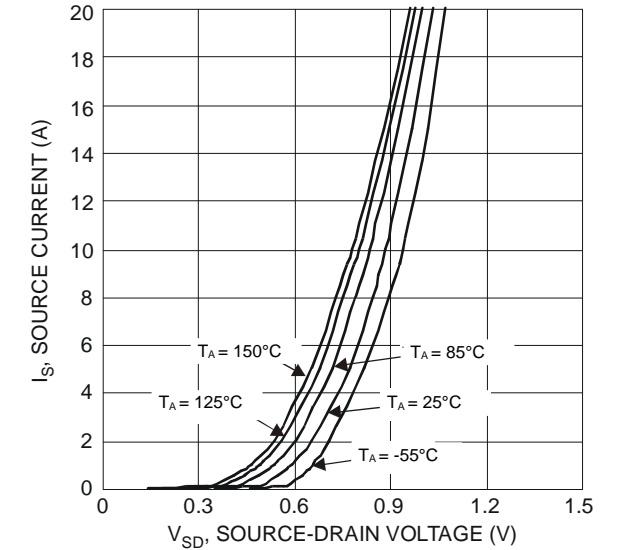


Figure 8 Diode Forward Voltage vs. Current

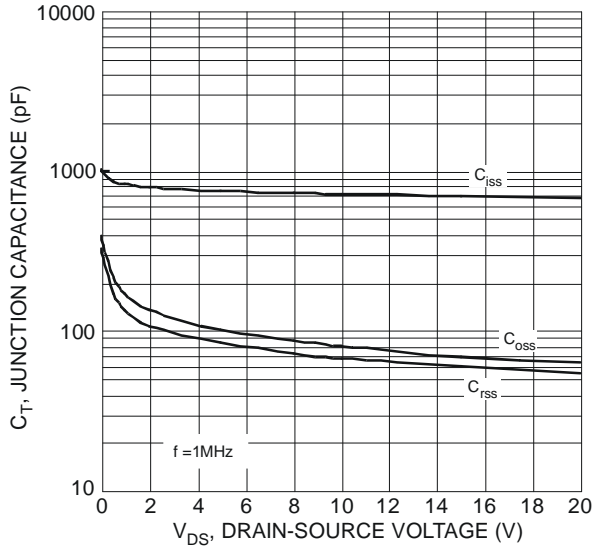


Figure 9 Typical Junction Capacitance

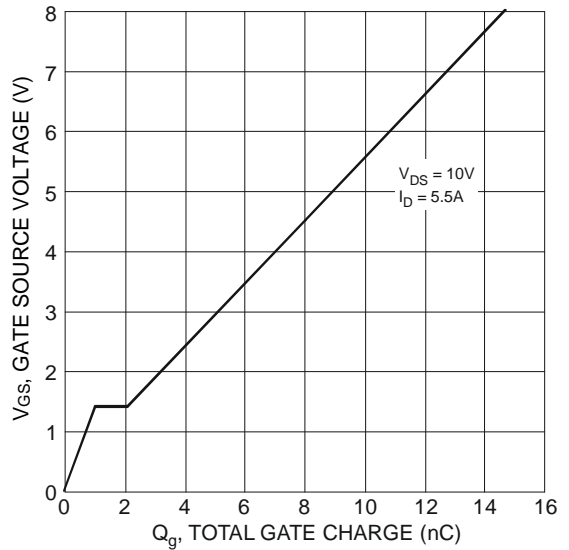


Figure 10 Gate Charge

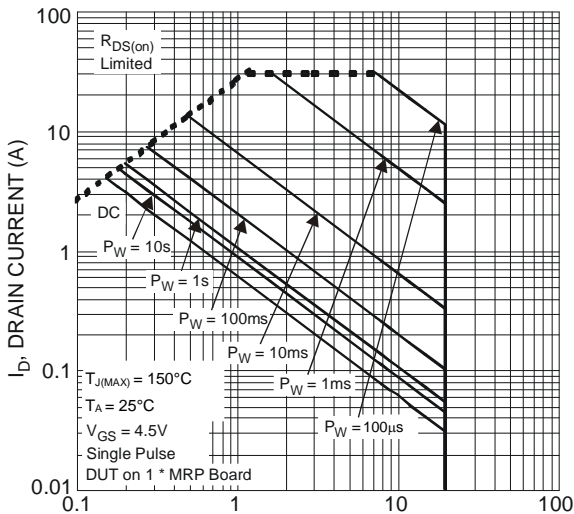


Figure 11 SOA, Safe Operation Area

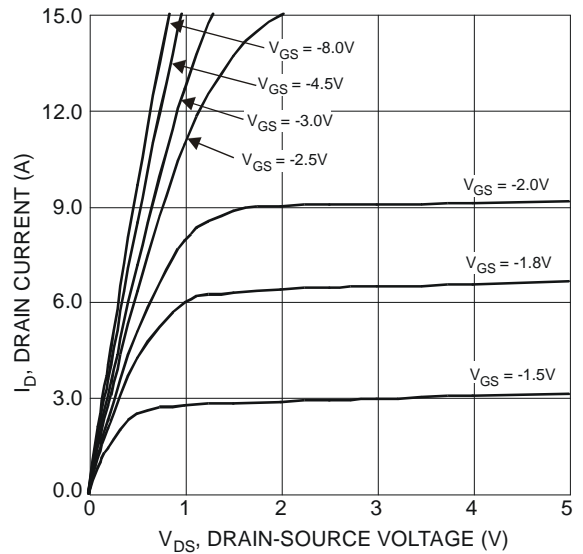


Figure 12 Typical Output Characteristics

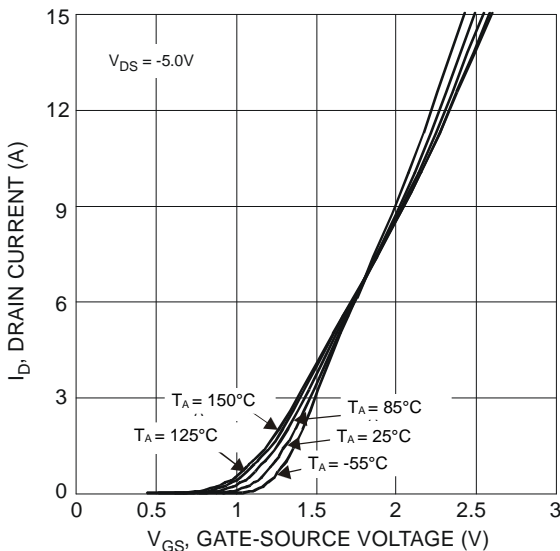


Figure 13 Typical Transfer Characteristics

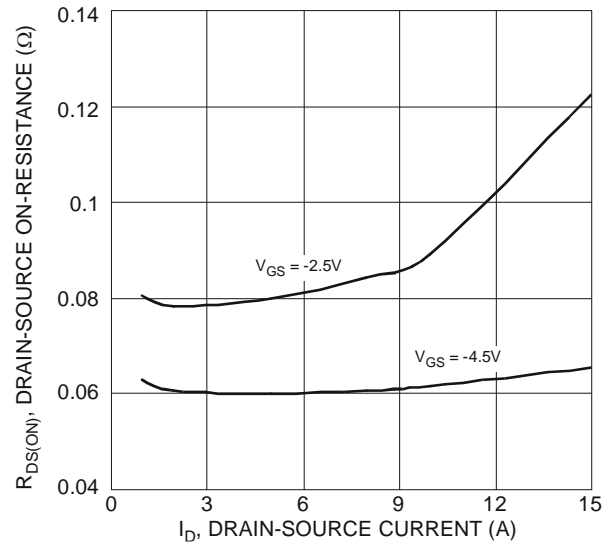


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

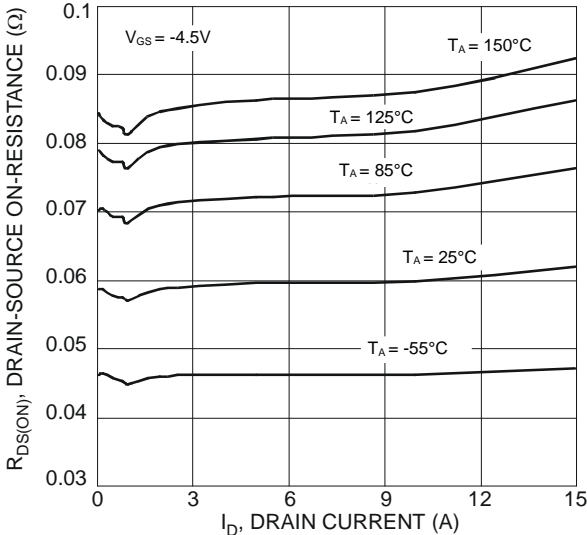


Figure 15 Typical On-Resistance vs. Drain Current and Temperature

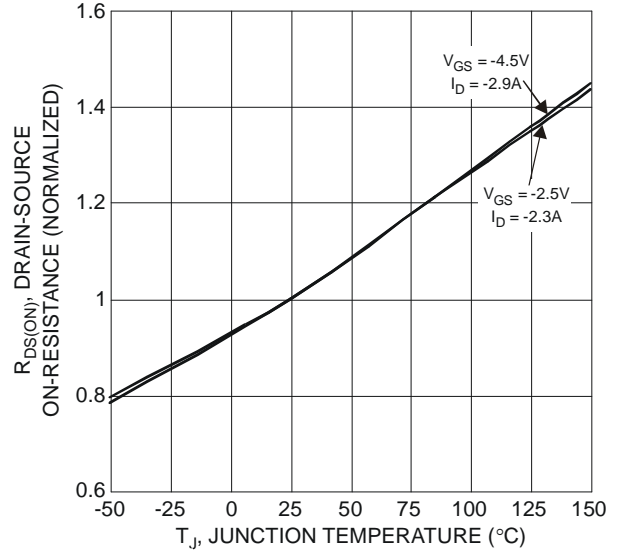


Figure 16 On-Resistance Variation with Temperature

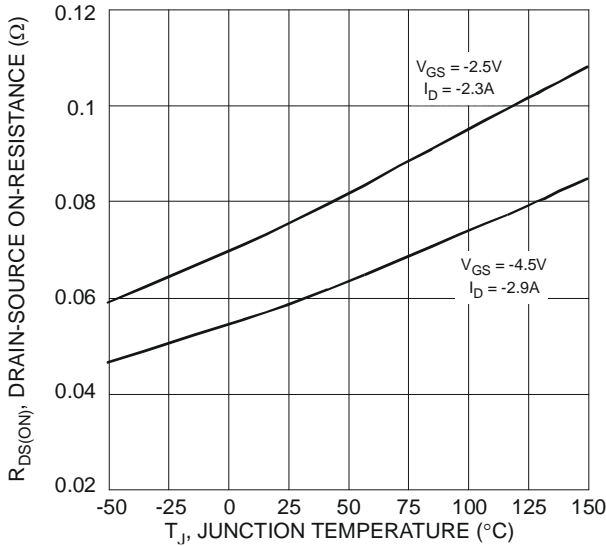


Figure 17 On-Resistance Variation with Temperature

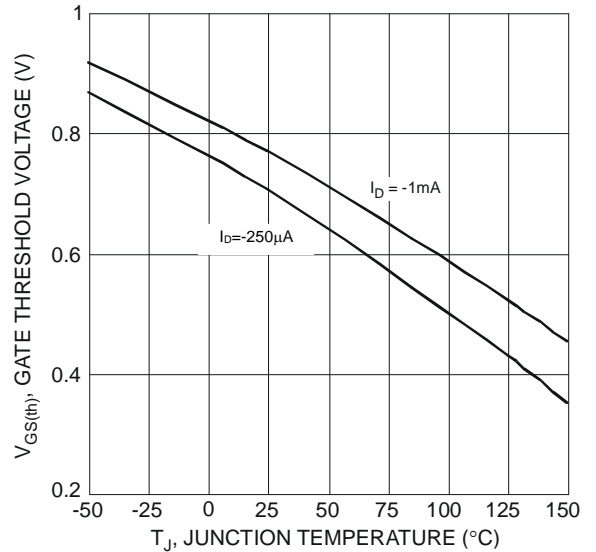


Figure 18 Gate Threshold Variation vs. Junction Temperature

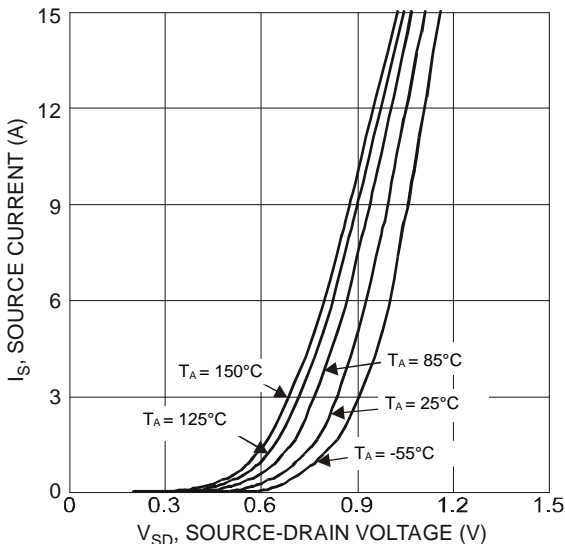


Figure 19 Diode Forward Voltage vs. Current

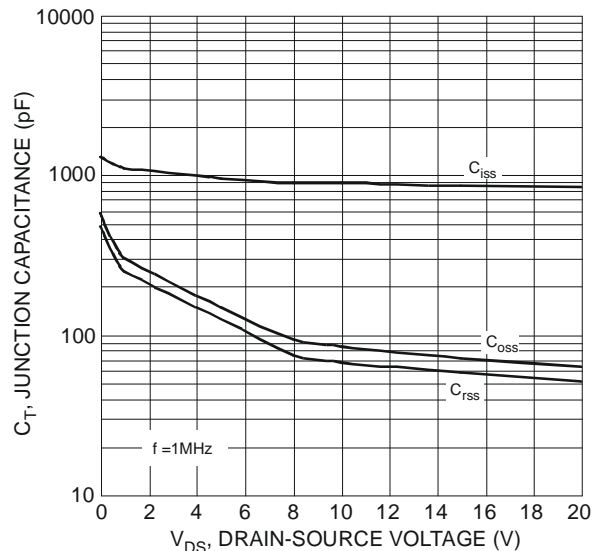
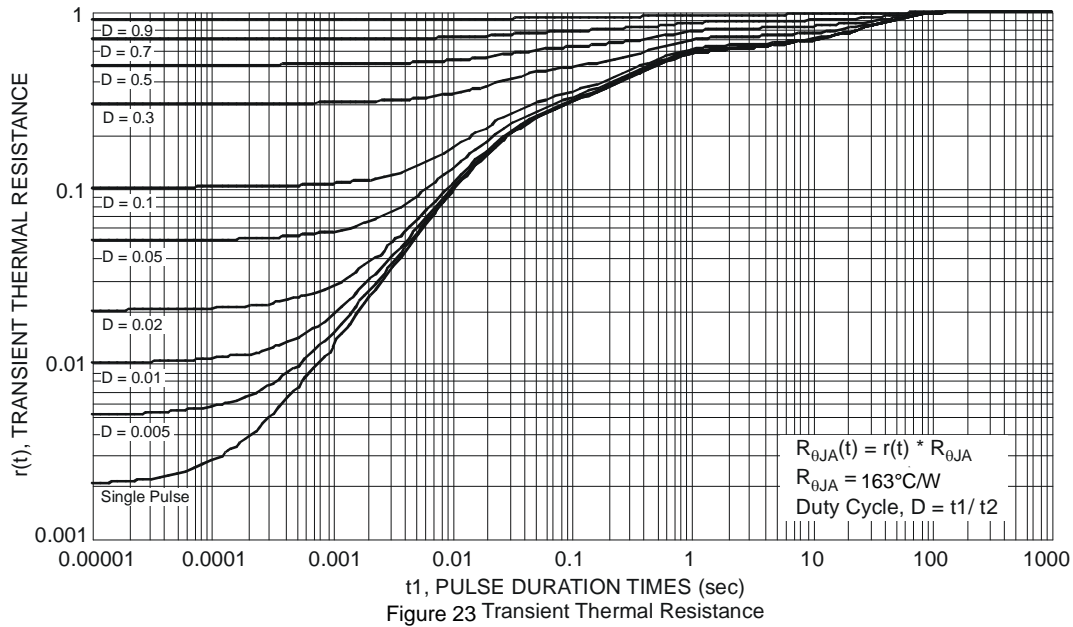
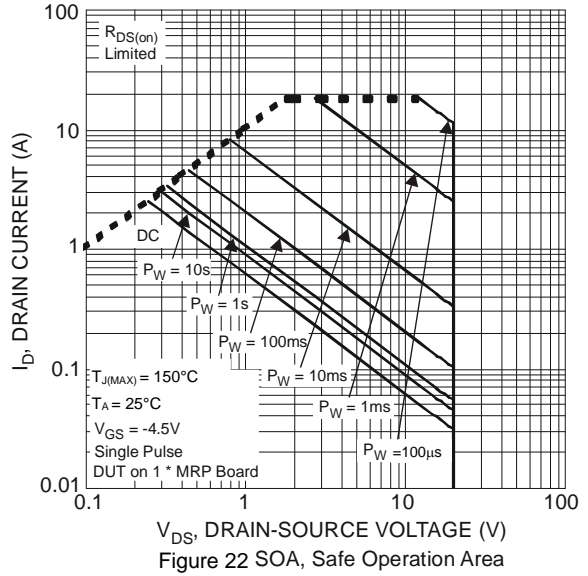
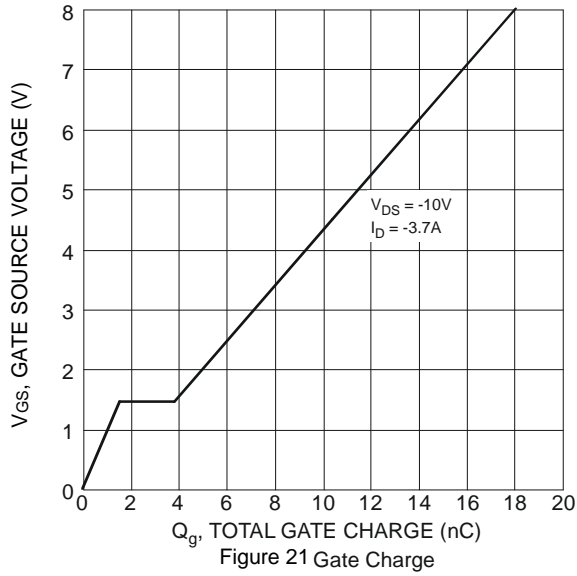


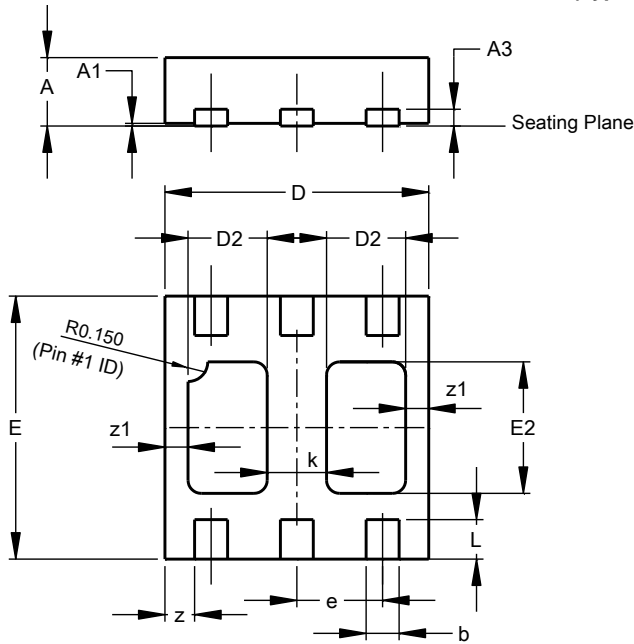
Figure 20 Typical Junction Capacitance



Package Outline Dimensions

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

U-DFN2020-6 (Type B)

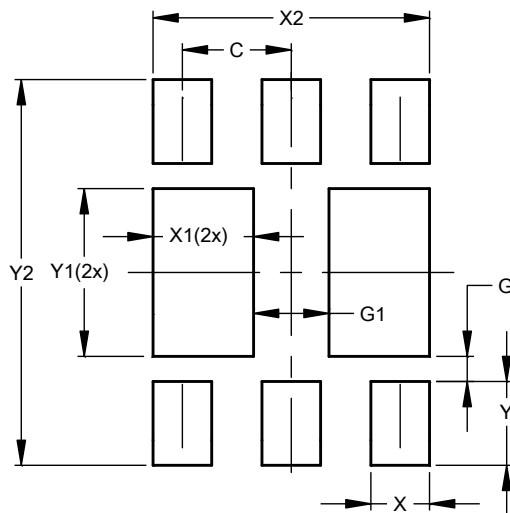


U-DFN2020-6 Type B			
Dim	Min	Max	Typ
A	0.545	0.605	0.575
A1	0.00	0.05	0.02
A3	-	-	0.13
b	0.20	0.30	0.25
D	1.95	2.075	2.00
D2	0.50	0.70	0.60
e	-	-	0.65
E	1.95	2.075	2.00
E2	0.90	1.10	1.00
k	-	-	0.45
L	0.25	0.35	0.30
z	-	-	0.225
z1	-	-	0.175
All Dimensions in mm			

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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