

## Product Summary

Device	BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>A</sub> = +25°C
Q1 N-Channel	20V	35mΩ @ V <sub>GS</sub> = 4.5V	4.6A
		43mΩ @ V <sub>GS</sub> = 2.5V	4.1A
Q2 P-Channel	-20V	75mΩ @ V <sub>GS</sub> = -4.5V	-3.1A
		110mΩ @ V <sub>GS</sub> = -2.5V	-2.6A

## Features

- PCB Footprint of 4mm<sup>2</sup>
- Low On-Resistance
- Low Input Capacitance
- Low Profile, 0.6mm Maximum Height
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen- and Antimony-Free. "Green" Device (Note 3)**
- **The DMC2053UFDBQ is suitable for automotive applications requiring specific change control; This part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

## Description and Applications

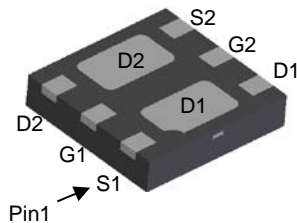
This MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) yet maintain superior switching performance, which makes it ideal for high-efficiency power management applications.

- Load Switch
- Power Management Functions
- Portable Power Adaptors

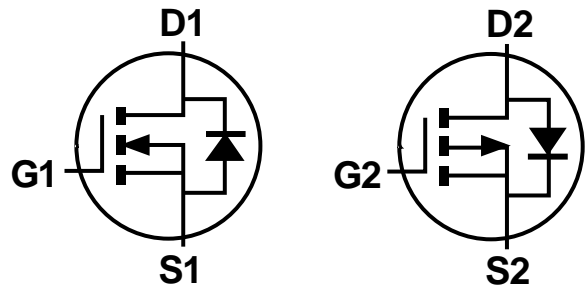
## Mechanical Data

- 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 Lead-Frame. Solderable per MIL-STD-202, Method 208 (e4)
- Terminals Connections: See Diagram Below
- Weight: 0.0065 grams (Approximate)

U-DFN2020-6 (Type B)



Bottom View



N-Channel MOSFET

P-Channel MOSFET

Internal Schematic

## Ordering Information (Note 4)

Part Number	Case	Packaging
DMC2053UFDBQ-7	U-DFN2020-6 (Type B)	3,000/Tape & Reel
DMC2053UFDBQ-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**

**U-DFN2020-6 (Type B)**



H4 = 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

<b>Year</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>	<b>2031</b>
<b>Code</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>0</b>	<b>1</b>

<b>Week</b>	<b>1-26</b>	<b>27-52</b>	<b>53</b>
<b>Code</b>	<b>A-Z</b>	<b>a-z</b>	<b>z</b>

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

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

Characteristic			Symbol	Q1 N-CHANNEL	Q2 P-CHANNEL	Unit
Drain-Source Voltage			$V_{DSS}$	20	-20	V
Gate-Source Voltage			$V_{GSS}$	$\pm 12$	$\pm 12$	V
Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	4.6 3.7	-3.1 -2.5	A
Maximum Continuous Body Diode Forward Current (Note 6)			$I_S$	1.1	-1.05	A
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)			$I_{DM}$	24	-15	A

**Thermal Characteristics**

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	$P_D$	0.82	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	153	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	$P_D$	1.14	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	110	$^\circ\text{C/W}$
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	20	—	—	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	$\mu\text{A}$	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 12\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	0.4	—	1.0	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	24	35	m $\Omega$	$V_{GS} = 4.5\text{V}, I_D = 5\text{A}$
			30	43		$V_{GS} = 2.5\text{V}, I_D = 4\text{A}$
			44	56		$V_{GS} = 1.8\text{V}, I_D = 2\text{A}$
Diode Forward Voltage	$V_{SD}$	—	0.7	1.2	V	$V_{GS} = 0\text{V}, I_S = 1\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	$C_{iss}$	—	369	—	pF	$V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	54	—		
Reverse Transfer Capacitance	$C_{rss}$	—	32	—		
Gate Resistance	$R_g$	—	4.1	—	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ( $V_{GS} = 4.5\text{V}$ )	$Q_g$	—	3.6	—	nC	$V_{DS} = 10\text{V}, I_D = 6\text{A}$
Total Gate Charge ( $V_{GS} = 10\text{V}$ )	$Q_g$	—	7.7	—		
Gate-Source Charge	$Q_{gs}$	—	0.4	—		
Gate-Drain Charge	$Q_{gd}$	—	1.0	—		
Turn-On Delay Time	$t_{D(ON)}$	—	2.6	—	ns	$V_{DS} = 10\text{V}, V_{GS} = 4.5\text{V}, R_g = 6\Omega, R_L = 10\Omega, I_D = 6\text{A}$
Turn-On Rise Time	$t_R$	—	3.0	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	12.5	—		
Turn-Off Fall Time	$t_F$	—	3.6	—		
Reverse Recovery Time	$t_{RR}$	—	6.0	—	ns	$I_F = 1\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge	$Q_{RR}$	—	0.9	—	nC	$I_F = 1\text{A}, di/dt = 100\text{A}/\mu\text{s}$

- Notes:
- Device mounted on FR-4 substrate PCB, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PCB, 2oz copper, with 1inch square copper plate.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

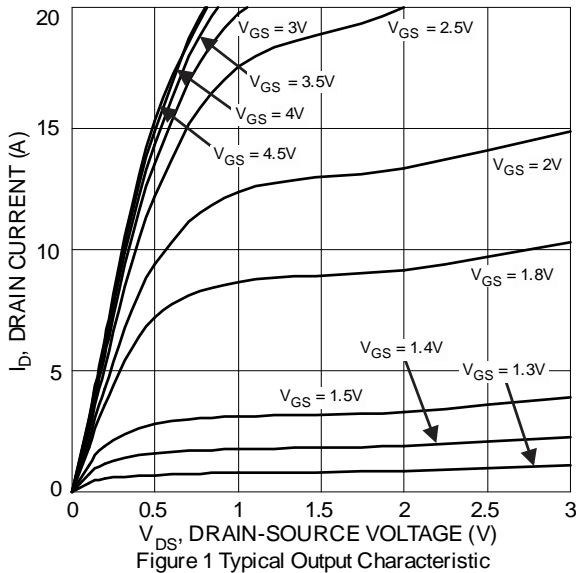


Figure 1 Typical Output Characteristic

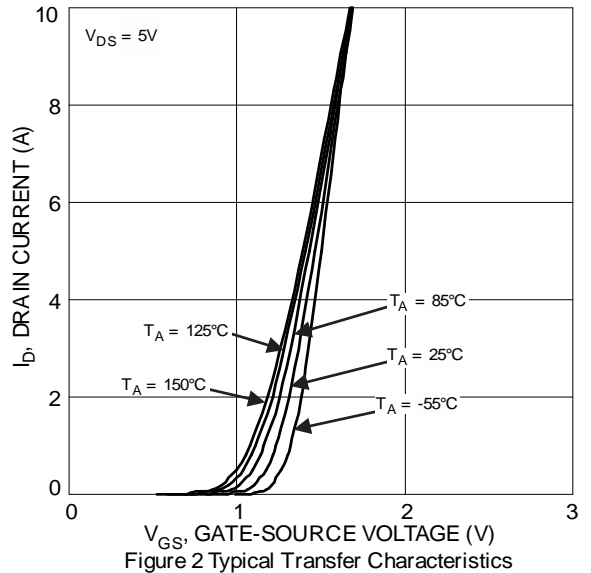


Figure 2 Typical Transfer Characteristics

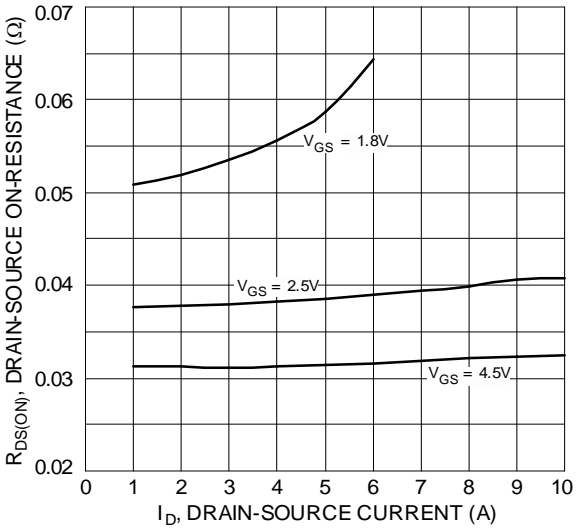


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

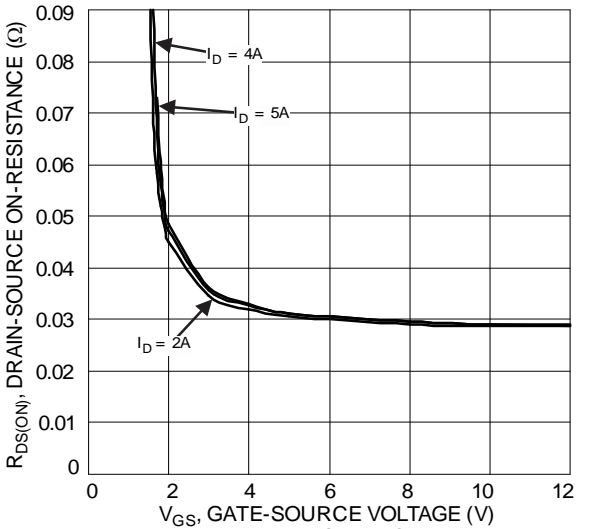


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

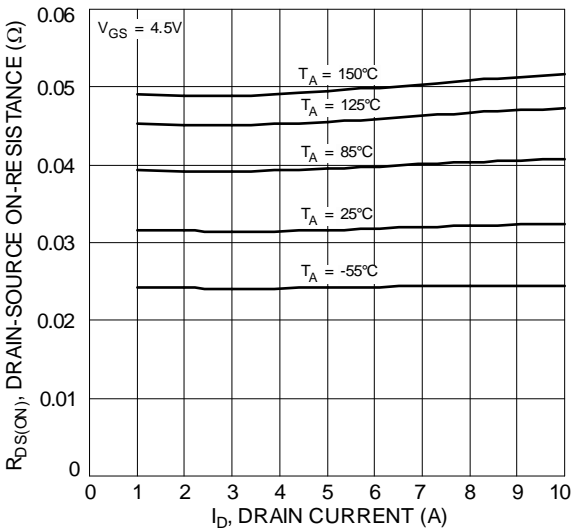


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

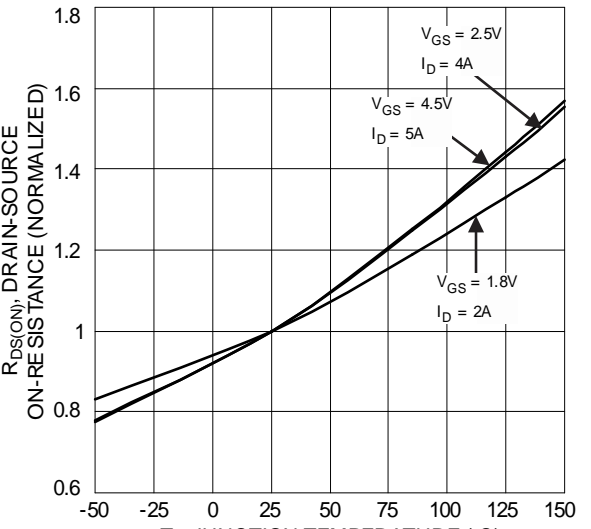


Figure 6 On-Resistance Variation with Temperature

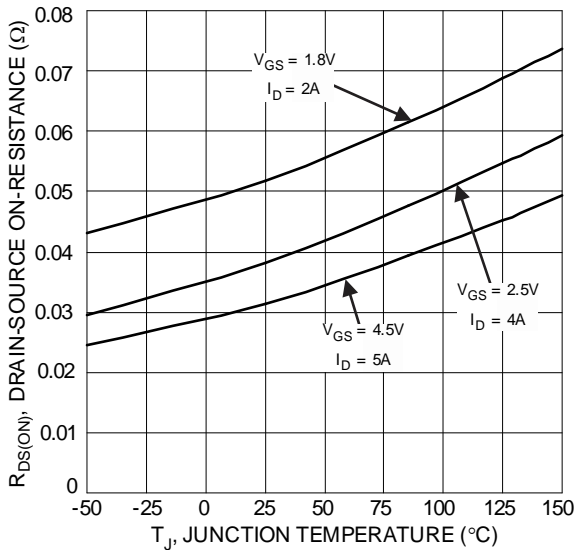


Figure 7 On-Resistance Variation with Temperature

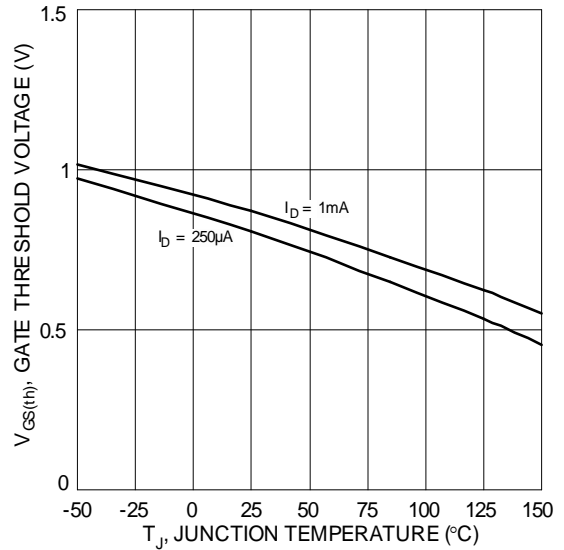


Figure 8 Gate Threshold Variation vs. Junction Temperature

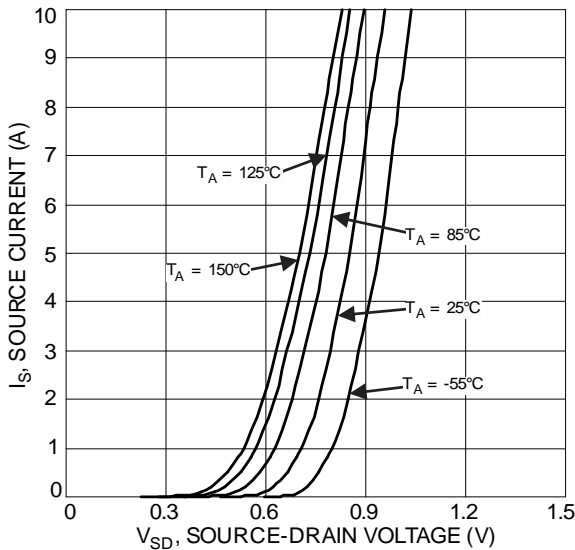


Figure 9 Diode Forward Voltage vs. Current

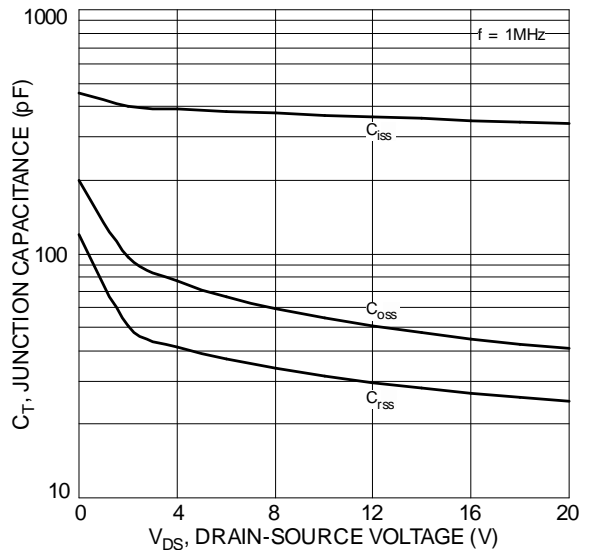


Figure 10 Typical Junction Capacitance

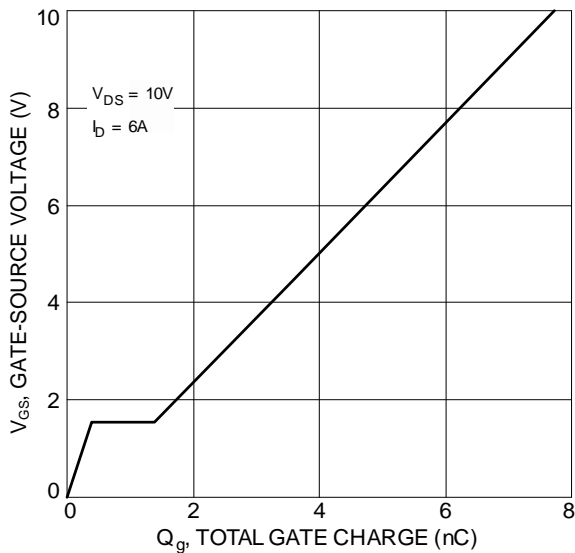


Figure 11 Gate Charge

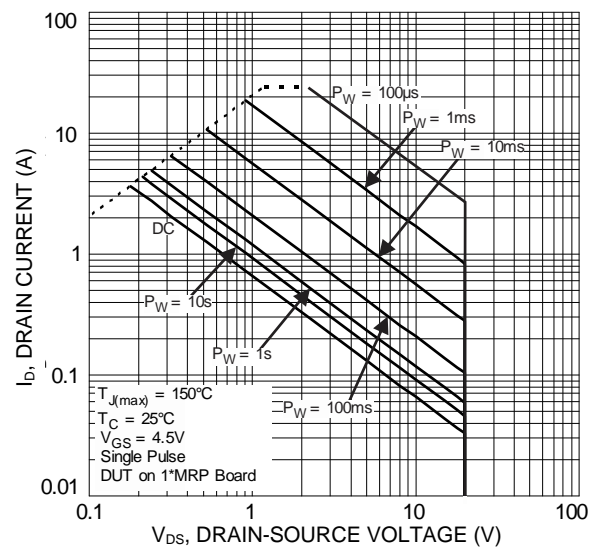


Figure 12 SOA, Safe Operation Area

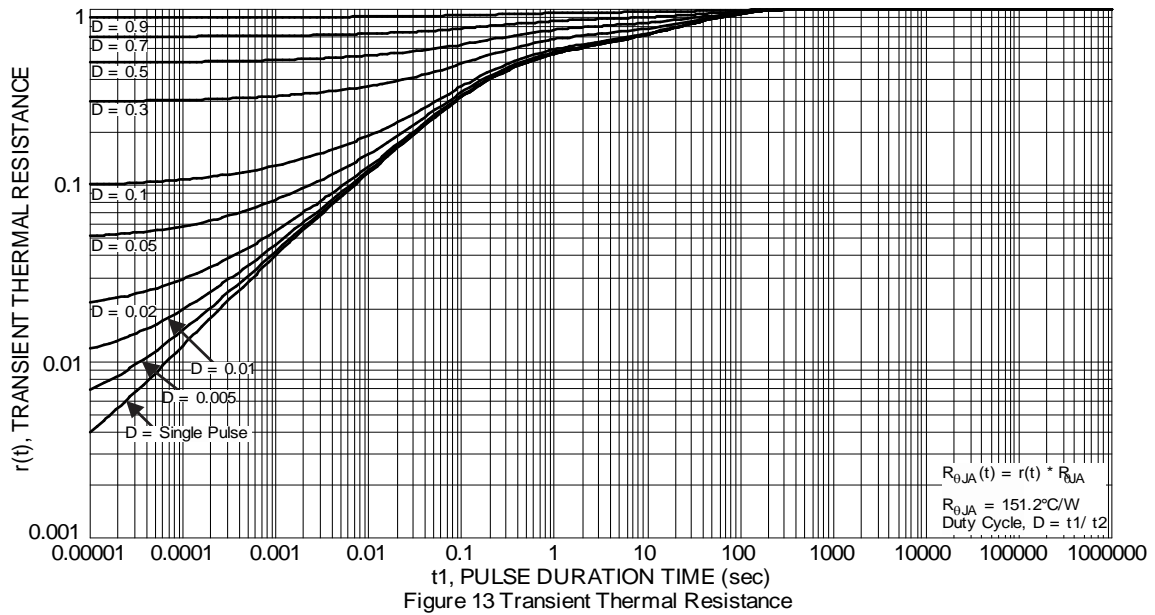


Figure 13 Transient Thermal Resistance

**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 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-20	—	—	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> = -20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10	μA	V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-0.45	—	-1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	57	75	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3.5A
		—	73	110		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -3.0A
		—	105	168		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -2.0A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.7	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -1.0A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	440	—	pF	V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	60	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	48	—	pF	
Gate Resistance	R <sub>g</sub>	—	8.5	—	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>	—	5.9	—	nC	V <sub>DS</sub> = -4V, I <sub>D</sub> = -3.5A
Total Gate Charge (V <sub>GS</sub> = -8V)		—	12.7	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	0.6	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	2.1	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	3.2	—	ns	V <sub>DS</sub> = -4V, V <sub>GS</sub> = -4.5V, R <sub>L</sub> = 4Ω, R <sub>g</sub> = 6Ω
Turn-On Rise Time	t <sub>r</sub>	—	7.8	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	31	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	18	—	ns	
Body Diode Reverse Recovery Time	t <sub>RR</sub>	—	10.5	—	ns	I <sub>S</sub> = -2.0A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	—	3.0	—	nC	I <sub>S</sub> = -2.0A, dI/dt = 100A/μs

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

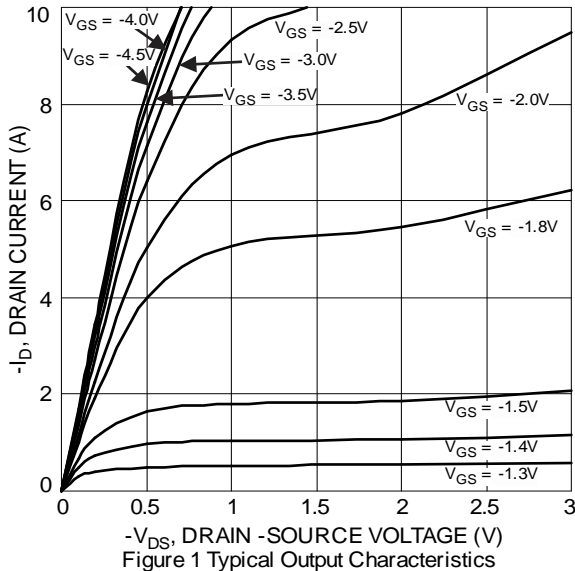


Figure 1 Typical Output Characteristics

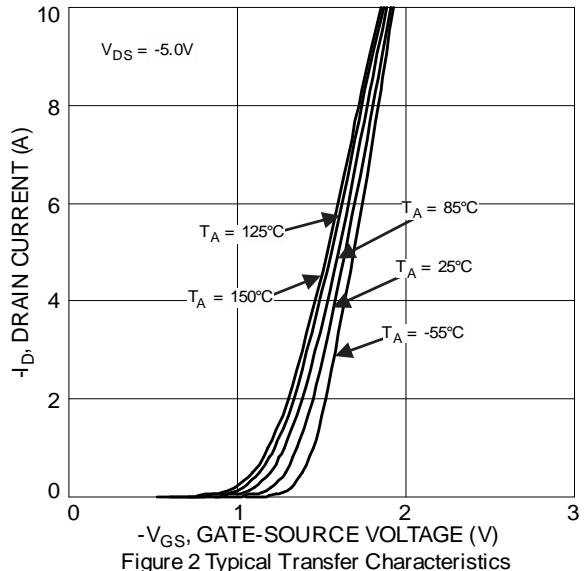


Figure 2 Typical Transfer Characteristics

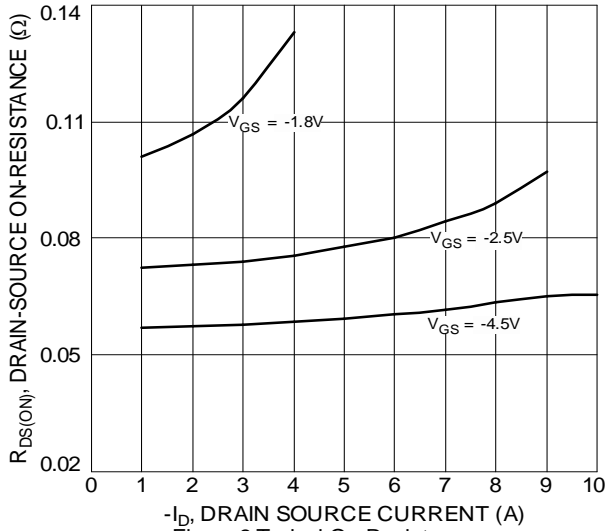


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

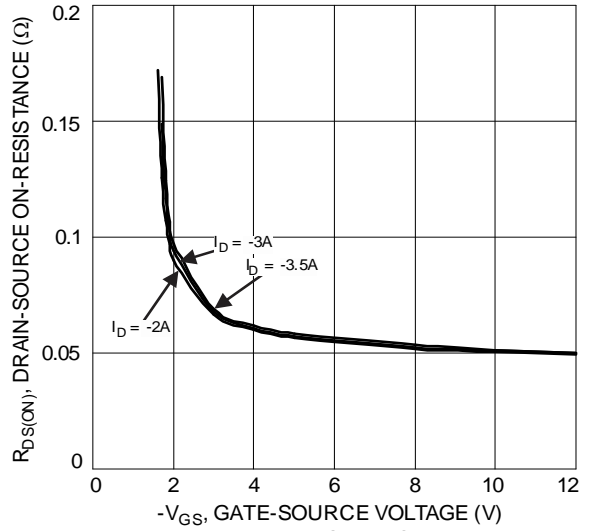


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

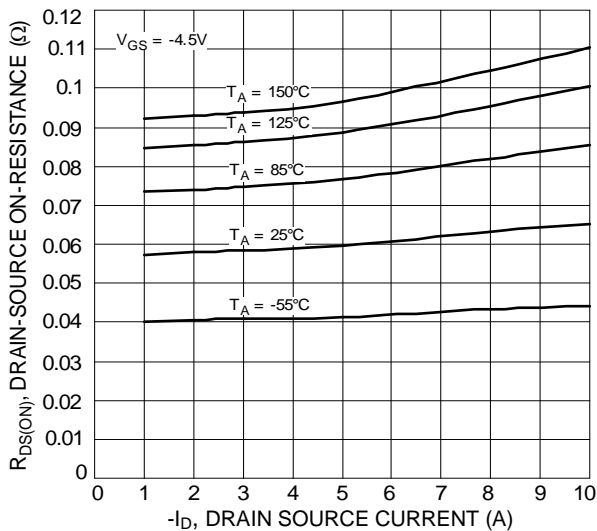


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

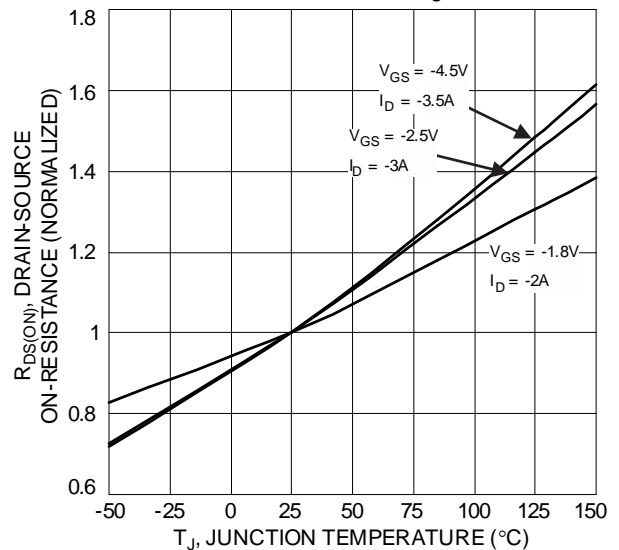


Figure 6 On-Resistance Variation with Temperature



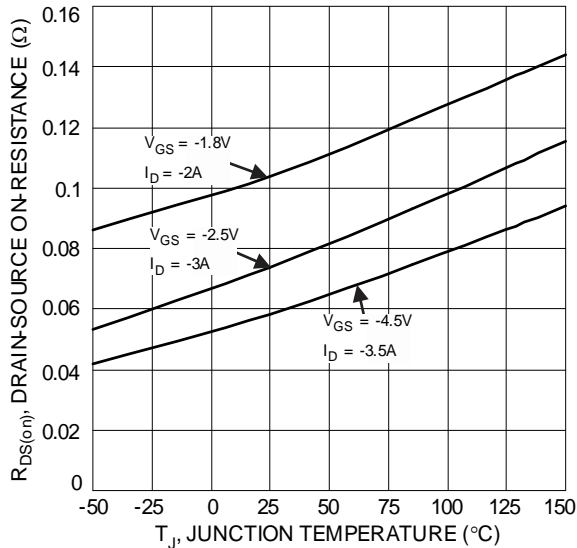


Figure 7 On-Resistance Variation with Temperature

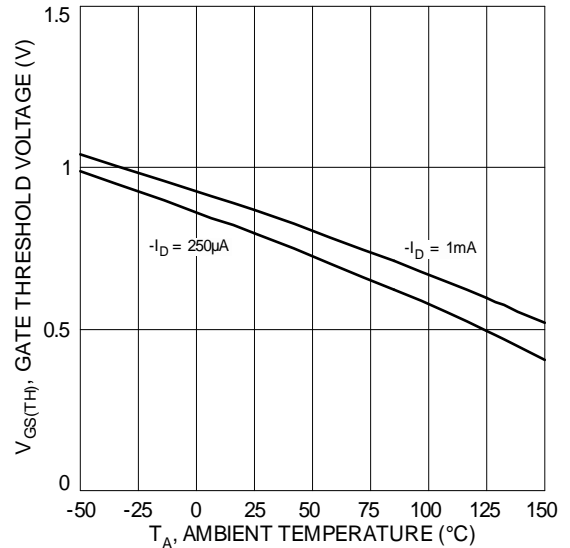


Figure 8 Gate Threshold Variation vs. Ambient Temperature

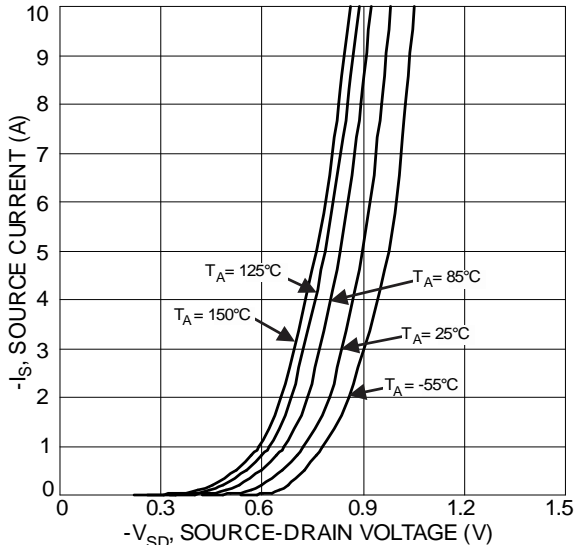


Figure 9 Diode Forward Voltage vs. Current

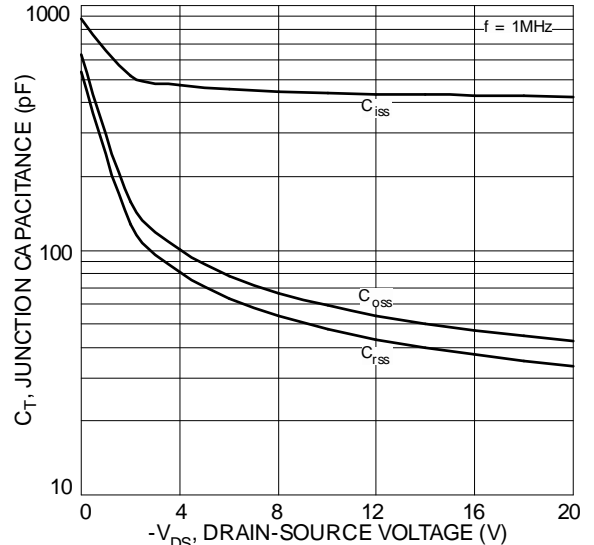


Figure 10 Typical Junction Capacitance

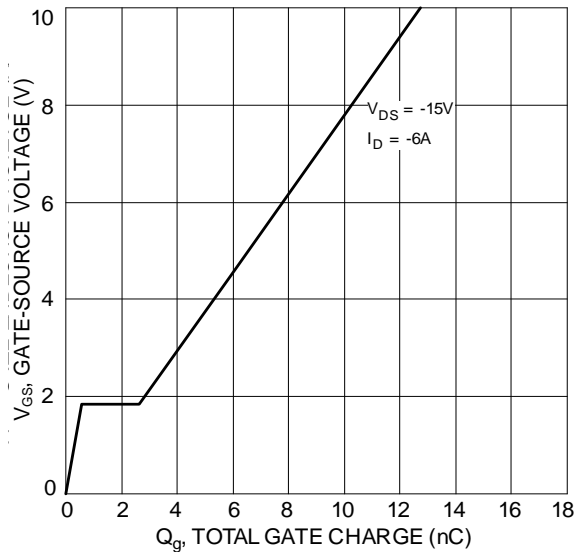


Figure 11 Gate Charge

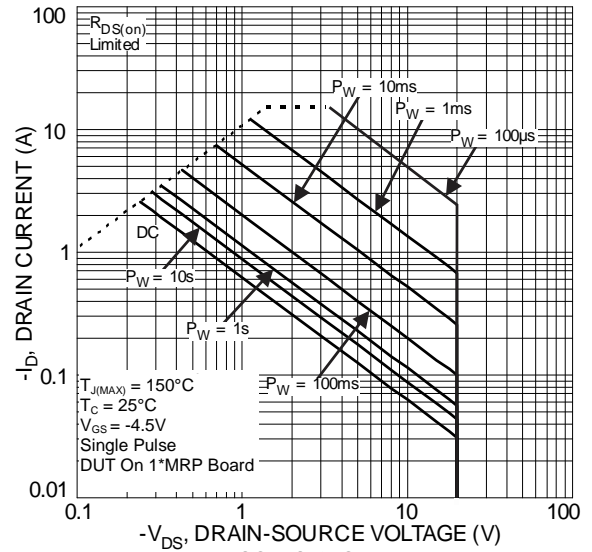
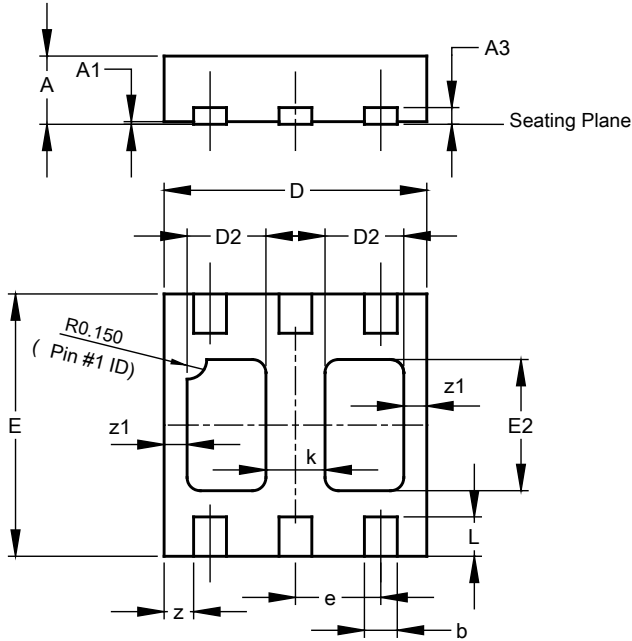


Figure 12 SOA, Safe Operation Area

**Package Outline Dimensions**

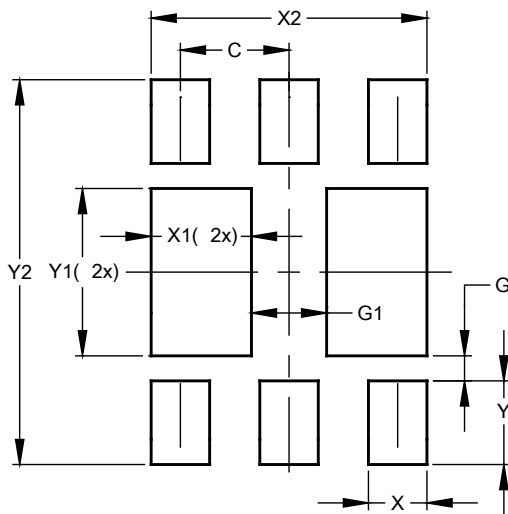
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



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.



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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