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DMC2053UFDB

COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

Device	BV_{DSS}	$R_{DS(ON)}$ Max	I_D MAX T_A = +25°C
Q1 N-Channel	20V	35mΩ @ V_{GS} = 4.5V	4.6A
		43mΩ @ V_{GS} = 2.5V	4.1A
Q2 P-Channel	-20V	75mΩ @ V_{GS} = -4.5V	-3.1A
		110mΩ @ V_{GS} = -2.5V	-2.6A

Features

- PCB Footprint of 4mm²
- 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)**
- **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 or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Description and Applications

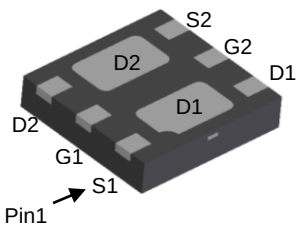
This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, which makes it ideal for high-efficiency power management applications.

- Load Switch
- Power Management Functions
- Portable Power Adaptors

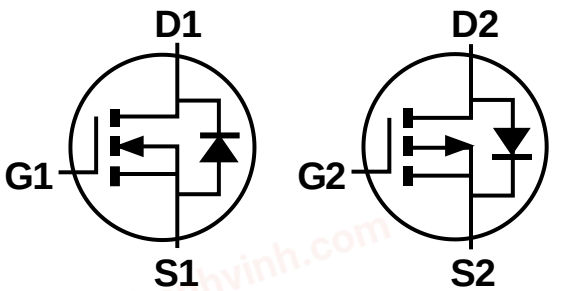
Mechanical Data

- Case 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)

U-DFN2020-6 (Type B)



Bottom View



N-Channel MOSFET P-Channel MOSFET

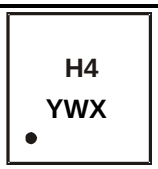
Internal Schematic

Ordering Information (Note 4)

Part Number	Case	Packaging
DMC2053UFDB-7	U-DFN2020-6 (Type B)	3,000/Tape & Reel
DMC2053UFDB-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



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

Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Code	9	0	1	2	3	4	5	6	7	8	9	0

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

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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 6) N-Channel: V_{GS} = 4.5V P-Channel: V_{GS} = -4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	4.6 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 (10µs Pulse, Duty Cycle = 1%)			I_{DM}	24	-15	A

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	0.82	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\Theta JA}$	153	°C/W
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	1.14	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\Theta JA}$	110	°C/W
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 7)						
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} = ±12V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.4	—	1.0	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	24	35	mΩ	V_{GS} = 4.5V, I_D = 5A
			30	43		V_{GS} = 2.5V, I_D = 4A
			44	56		V_{GS} = 1.8V, I_D = 2A
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	369	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	54	—		
Reverse Transfer Capacitance	C_{rss}	—	32	—		
Gate Resistance	R_g	—	4.1	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	3.6	—	nC	V_{DS} = 10V, I_D = 6A
Total Gate Charge (V_{GS} = 10V)	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} = 10V, V_{GS} = 4.5V, R_g = 6Ω, R_L = 10Ω, I_D = 6A
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 = 1A, di/dt = 100A/µs
Reverse Recovery Charge	Q_{RR}	—-	0.9	—	nC	I_F = 1A, di/dt = 100A/µs

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

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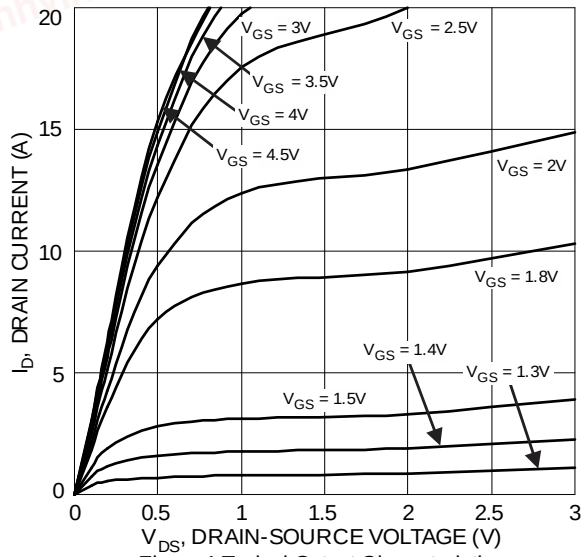

Figure 1 Typical Output Characteristic

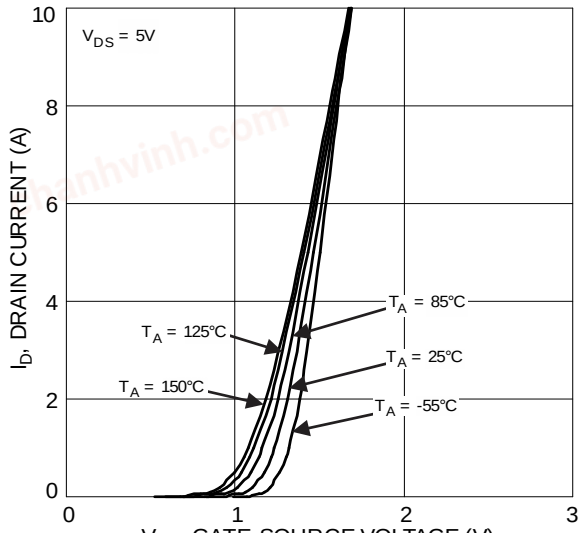

Figure 2 Typical Transfer Characteristics

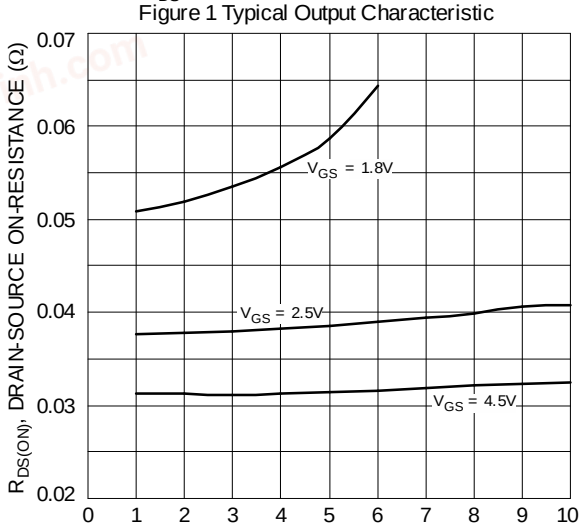

Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

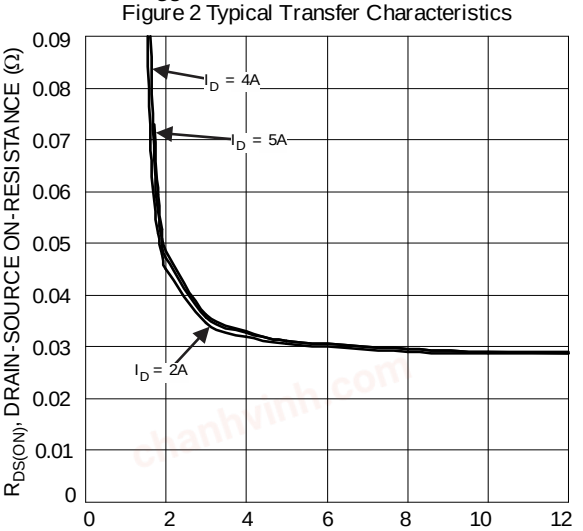

Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

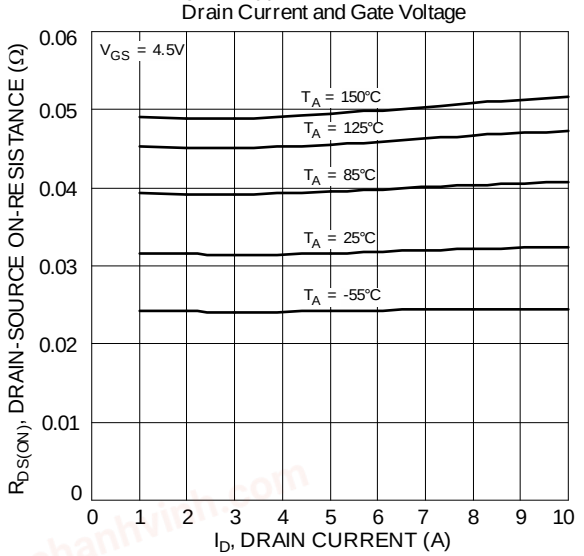

Figure 5 Typical On-Resistance vs. Drain Current and Temperature

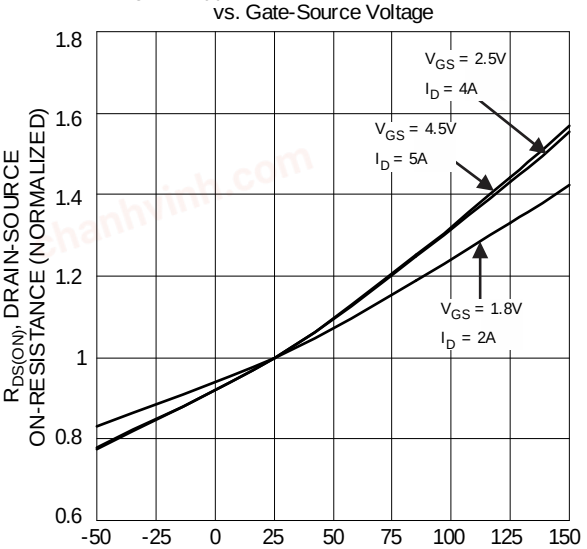

Figure 6 On-Resistance Variation with Temperature

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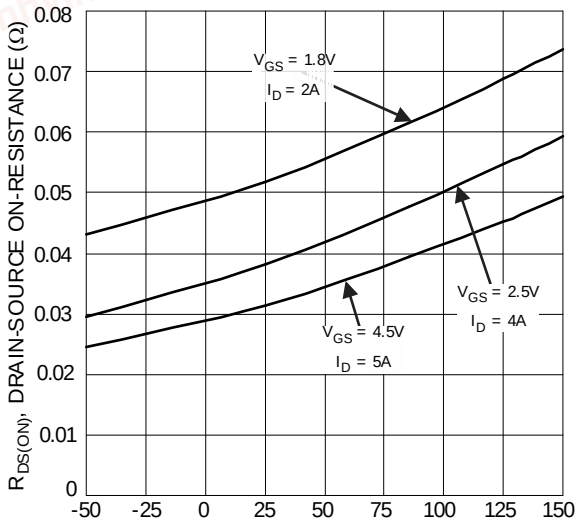

Figure 7 On-Resistance Variation with Temperature

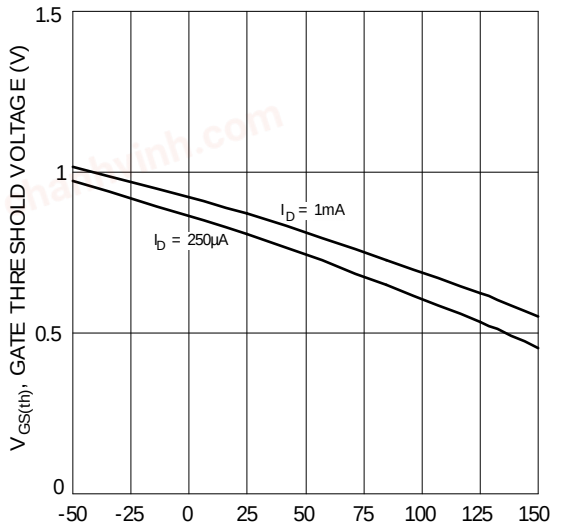

Figure 8 Gate Threshold Variation vs. Junction Temperature

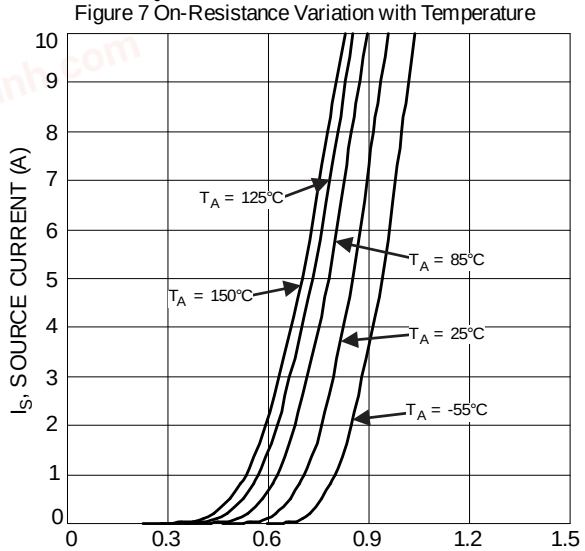

Figure 9 Diode Forward Voltage vs. Current

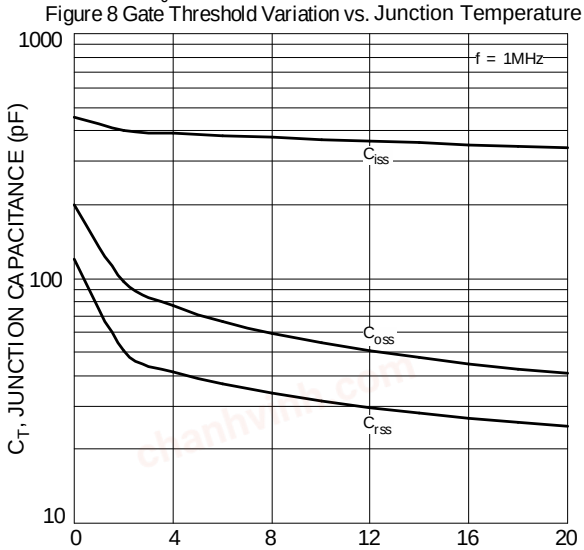

Figure 10 Typical Junction Capacitance

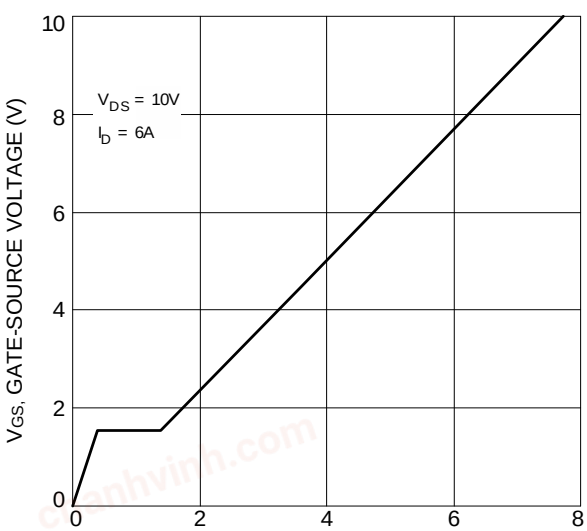

Figure 11 Gate Charge

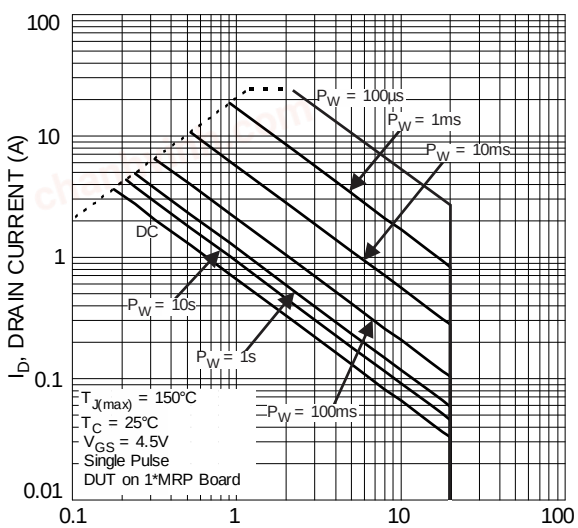

Figure 12 SOA, Safe Operation Area

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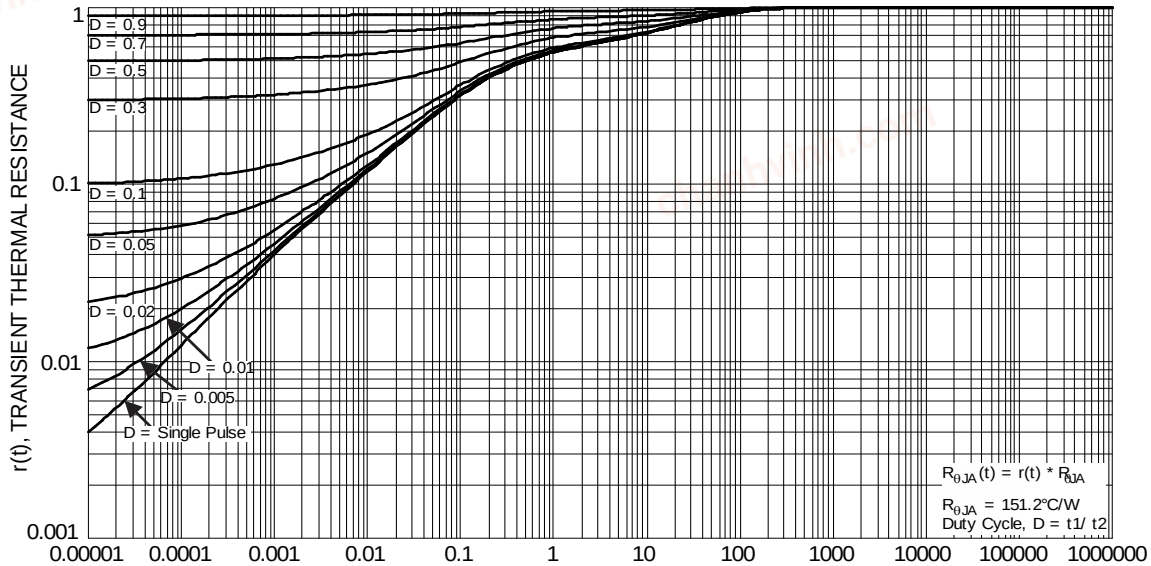

Figure 13 Transient Thermal Resistance

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
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} = ±12V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.45	—	-1.0	V	V_{DS} = V_{GS}, I_D = -250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	57	75	mΩ	V_{GS} = -4.5V, I_D = -3.5A
		—	73	110		V_{GS} = -2.5V, I_D = -3.0A
		—	105	168		V_{GS} = -1.8V, I_D = -2.0A
Diode Forward Voltage	V_{SD}	—	-0.7	-1.2	V	V_{GS} = 0V, I_S = -1.0A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	440	—	pF	V_{DS} = -10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	60	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	48	—	pF	
Gate Resistance	R_g	—	8.5	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	5.9	—	nC	V_{DS} = -4V, I_D = -3.5A
Total Gate Charge (V_{GS} = -8V)		—	12.7	—	nC	
Gate-Source Charge	Q_{gs}	—	0.6	—	nC	
Gate-Drain Charge	Q_{gd}	—	2.1	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	3.2	—	ns	V_{DS} = -4V, V_{GS} = -4.5V, R_L = 4Ω, R_g = 6Ω
Turn-On Rise Time	t_R	—	7.8	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	31	—	ns	
Turn-Off Fall Time	t_F	—	18	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	10.5	—	ns	I_S = -2.0A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q_{RR}	—	3.0	—	nC	I_S = -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.

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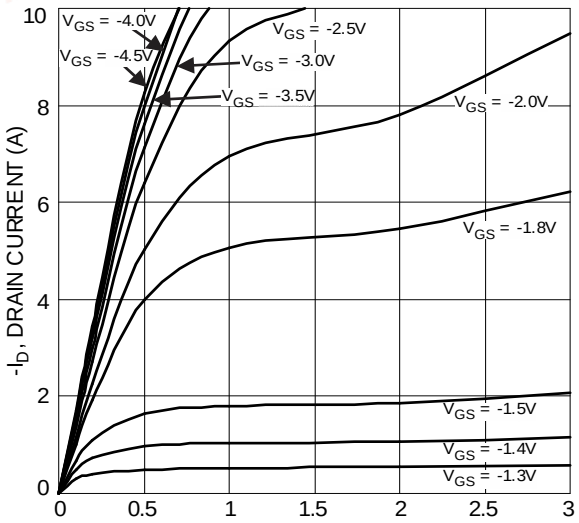

Figure 14 Typical Output Characteristics

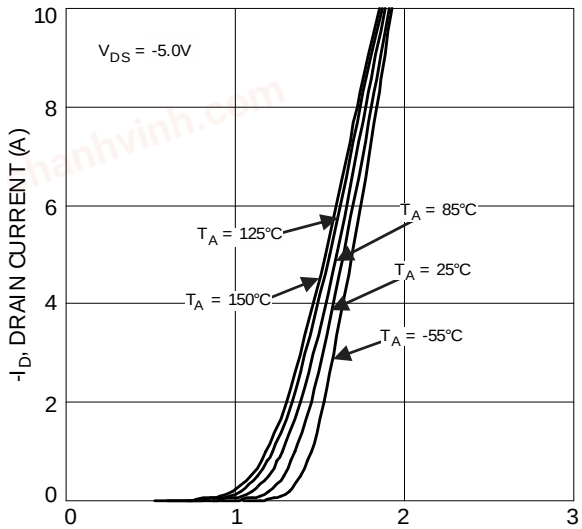

Figure 15 Typical Transfer Characteristics

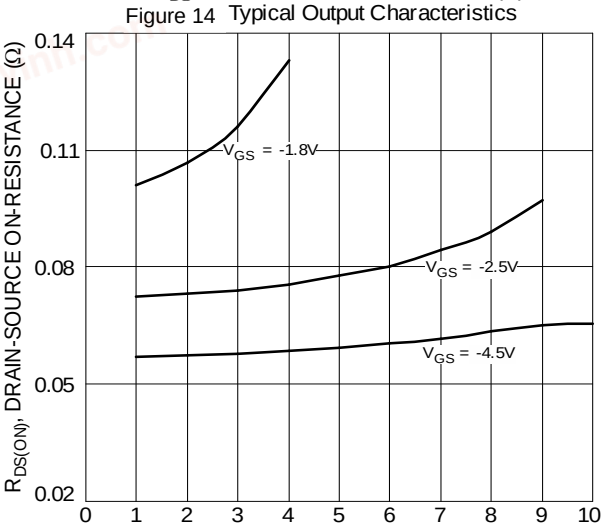

Figure 16 Typical On-Resistance vs. Drain Current and Gate Voltage

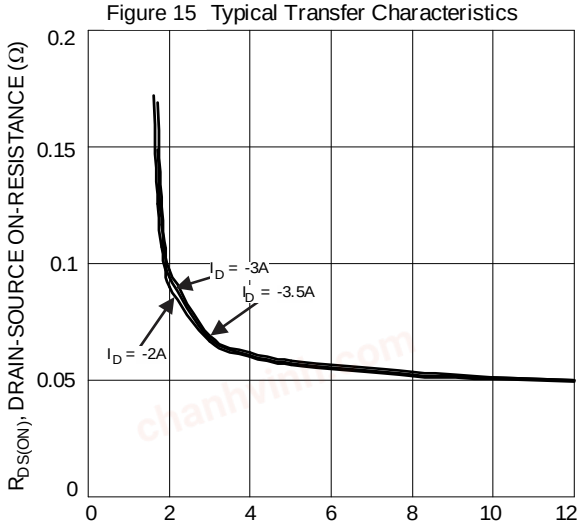

Figure 17 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

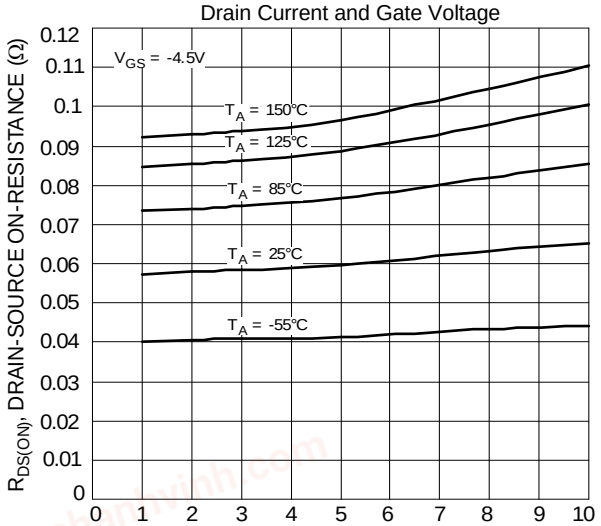

Figure 18 Typical On-Resistance vs. Drain Current and Temperature

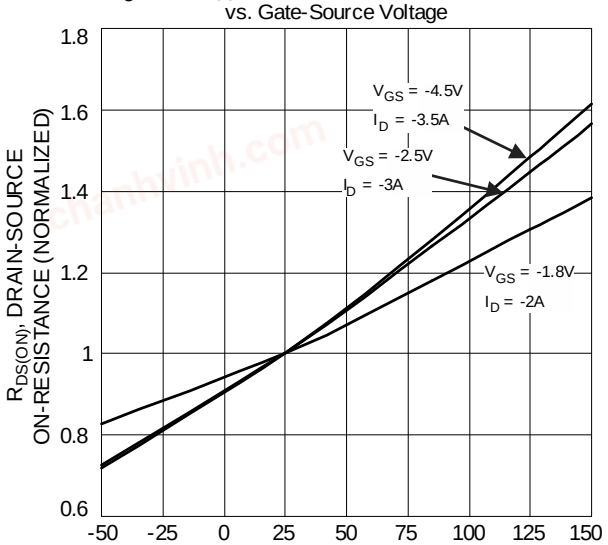

Figure 19 On-Resistance Variation with Temperature

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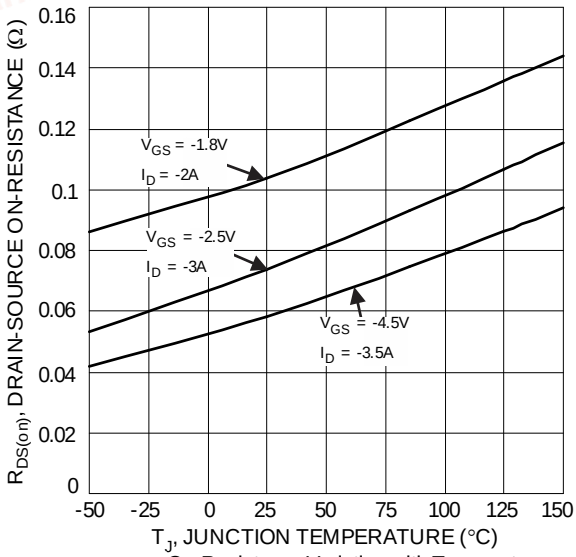

Figure 20 On-Resistance Variation with Temperature

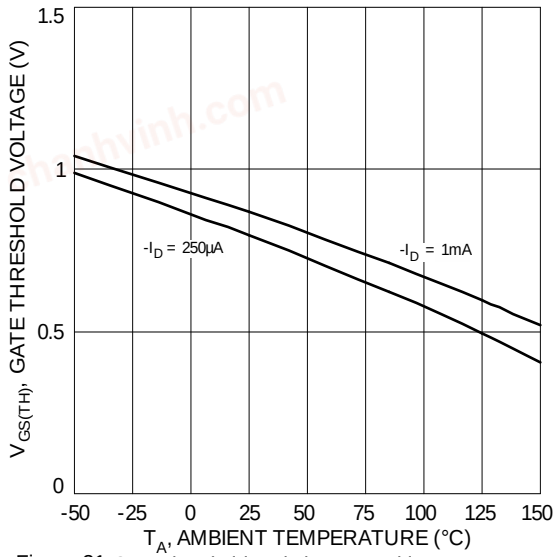

Figure 21 Gate Threshold Variation vs. Ambient Temperature

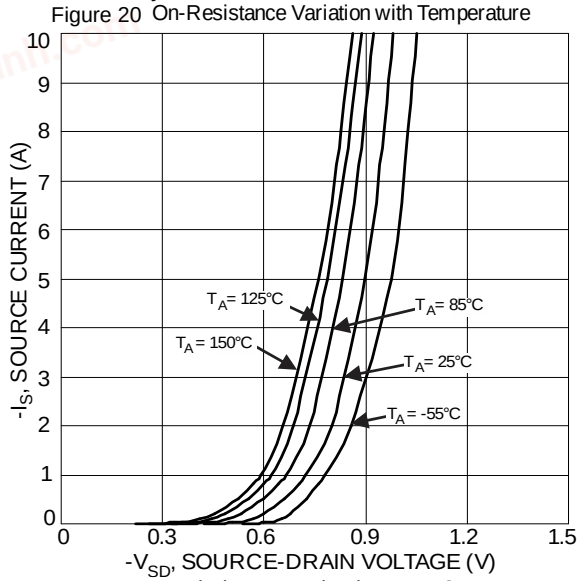

Figure 22 Diode Forward Voltage vs. Current

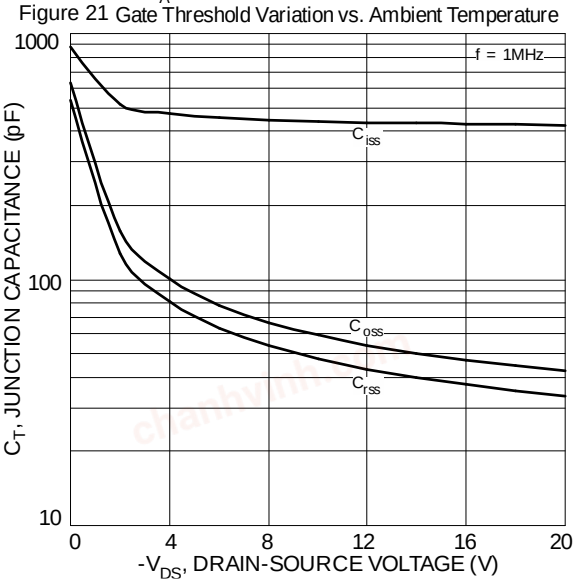

Figure 23 Typical Junction Capacitance

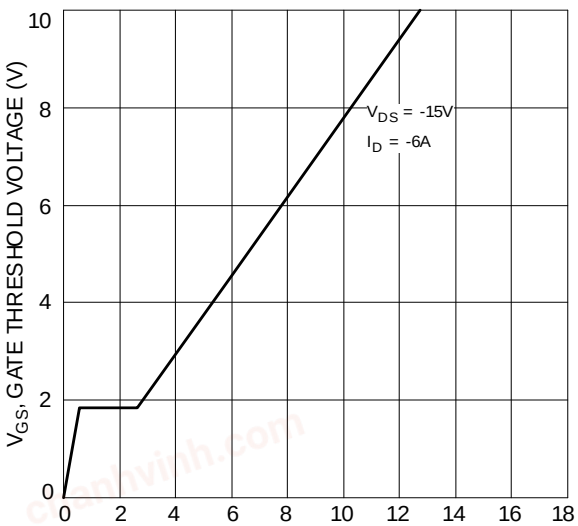

Figure 24 Gate Charge

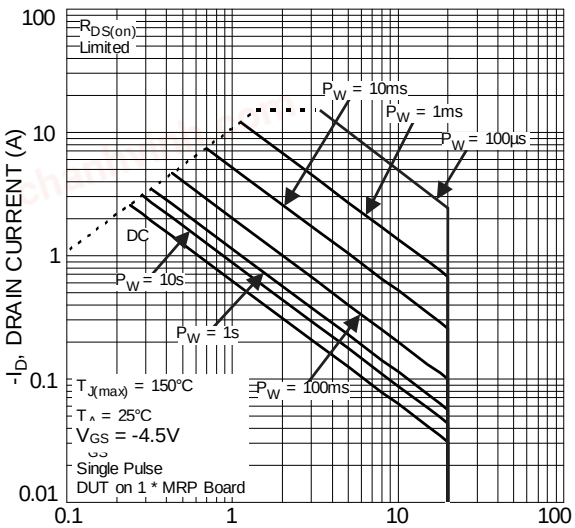

Figure 25 SOA, Safe Operation Area

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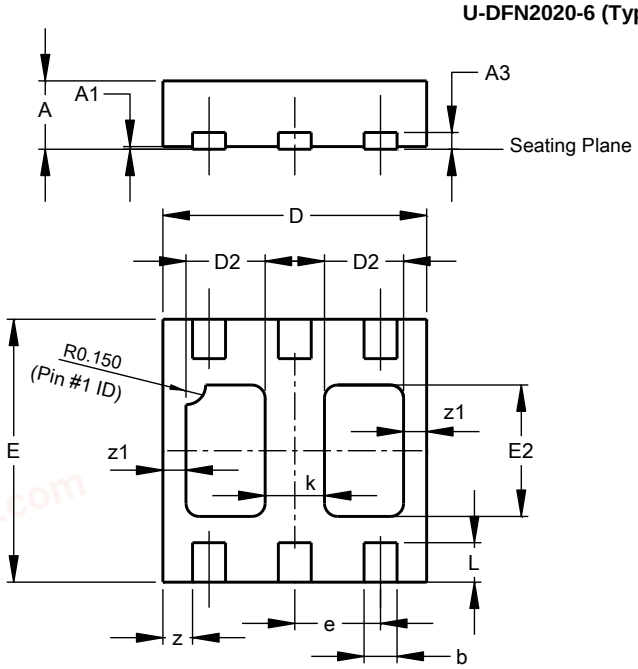
Package Outline Dimensions

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

U-DFN2020-6 (Type B)

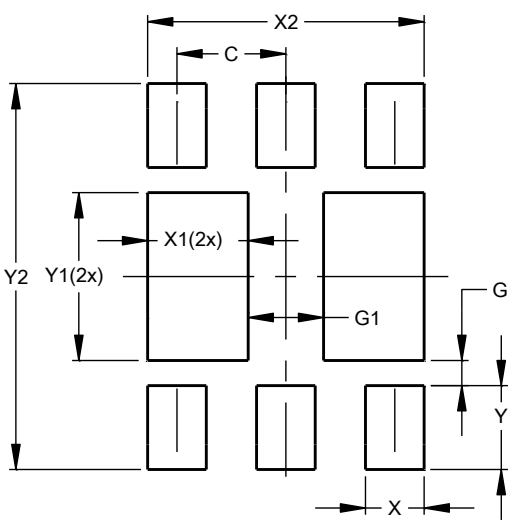


U-DFN2020-6 Type B			
Dim	**Min**	**Max**	**Typ**
A	0.545	0.605	0.575
A1	0.00	0.05	0.02
A3	-	-	0.13
b	0.20	0.30	0.25
D	1.95	2.075	2.00
D2	0.50	0.70	0.60
e	-	-	0.65
E	1.95	2.075	2.00
E2	0.90	1.10	1.00
k	-	-	0.45
L	0.25	0.35	0.30
z	-	-	0.225
z1	-	-	0.175
All Dimensions in mm			

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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