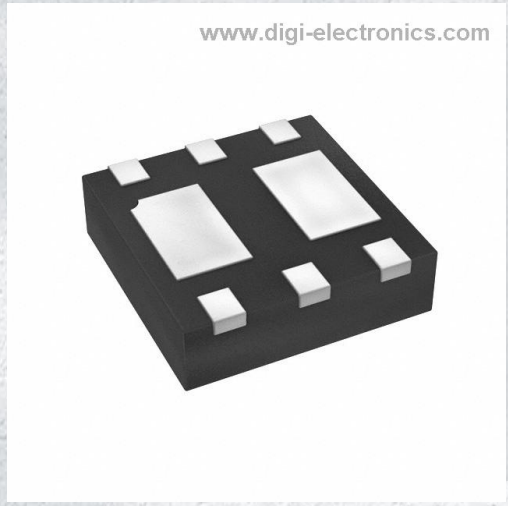
DMC1030UFDB-13 Datasheet



https://www.DiGi-Electronics.com

DiGi Electronics Part Number	DMC1030UFDB-13-DG
Manufacturer	Diodes Incorporated
Manufacturer Product Number	DMC1030UFDB-13
Description	MOSFET N/P-CH 12V 5.1A 6UDFN
Detailed Description	Mosfet Array 12V 5.1A (Ta), 3.9A (Ta) 1.36W (Ta) Surface Mount U-DFN2020-6 (Type B)

Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
DMC1030UFDB-13	Diodes Incorporated
Series:	Product Status:
-	Active
Technology:	Configuration:
MOSFET (Metal Oxide)	N and P-Channel Complementary
FET Feature:	Drain to Source Voltage (Vdss):
-	12V
Current - Continuous Drain (Id) @ 25°C:	Rds On (Max) @ Id, Vgs:
5.1A (Ta), 3.9A (Ta)	34mOhm @ 4.6A, 4.5V, 59mOhm @ 3.6A, 4.5V
Vgs(th) (Max) @ Id:	Gate Charge (Qg) (Max) @ Vgs:
1V @ 250µA	12.2nC @ 4.5V, 13nC @ 4.5V
Input Capacitance (Ciss) (Max) @ Vds:	Power - Max:
1003pF @ 6V, 1028pF @ 6V	1.36W (Ta)
Operating Temperature:	Grade:
-55°C ~ 150°C (TJ)	Automotive
Qualification:	Mounting Type:
AEC-Q101	Surface Mount
Package / Case:	Supplier Device Package:
6-UDFN Exposed Pad	U-DFN2020-6 (Type B)
Base Product Number:	
DMC1030	

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8541.29.0095	

Lead-free Green

DMC1030UFDB

COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

Device	BV_{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

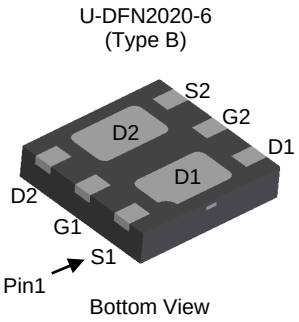
- Load Switch
- Power Management Functions
- Portable Power Adaptors

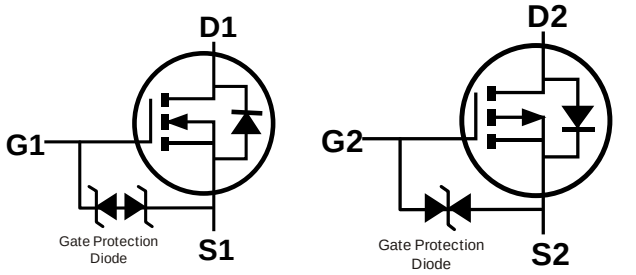
Features

- 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)**
- **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/**
- **An Automotive-Compliant Part is Available Under Separate Datasheet (DMC1030UFDBQ)**

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)





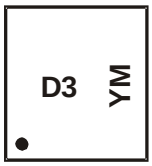
Ordering Information (Note 4)

Part Number	Case	Packaging
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) & 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



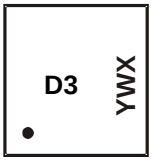
D3 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: H = 2020)
M = Month (ex: 9 = September)

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



D3 = 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}	12	-12	V
Gate-Source Voltage			V_{GSS}	±8	±8	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	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	Unit
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	$R_{\theta JA}$	92	°C/W
	t < 5s		66	
Thermal Resistance, Junction to Case (Note 5)		$R_{\theta JC}$	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:
5. Device mounted on 1" × 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.

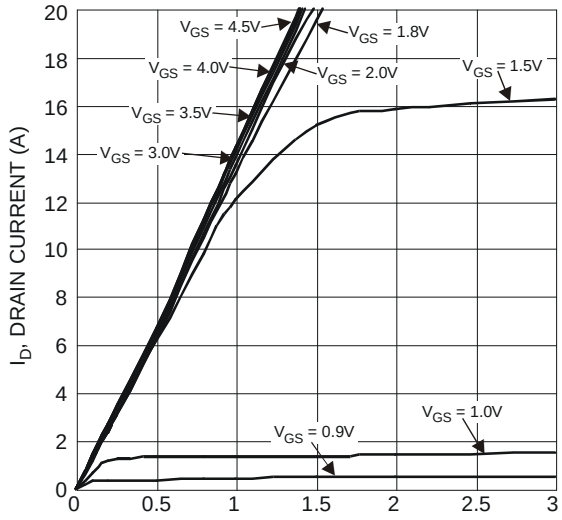


Figure 1 Typical Output Characteristics

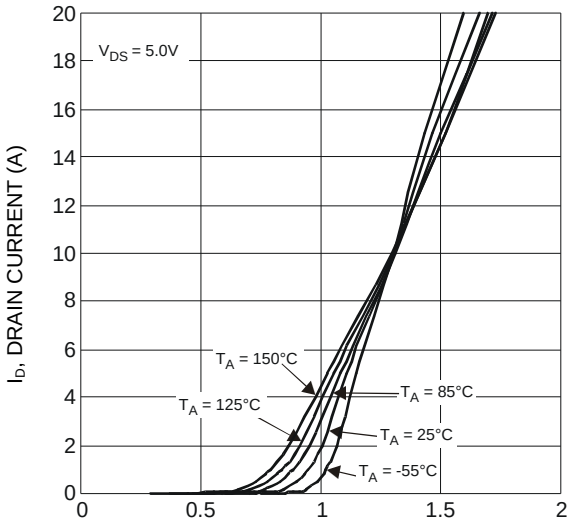


Figure 2 Typical Transfer Characteristics

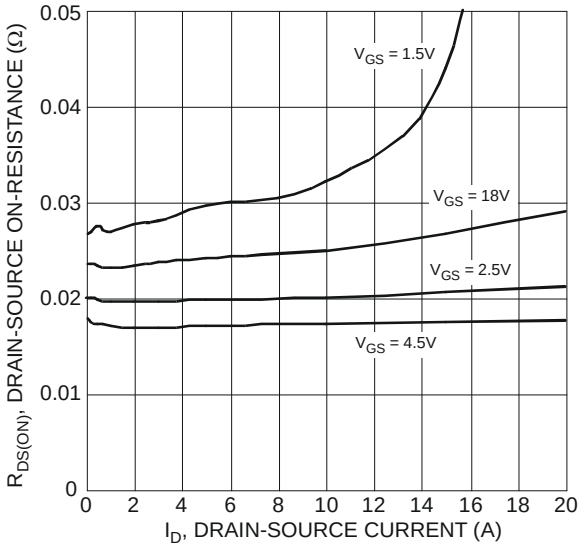


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

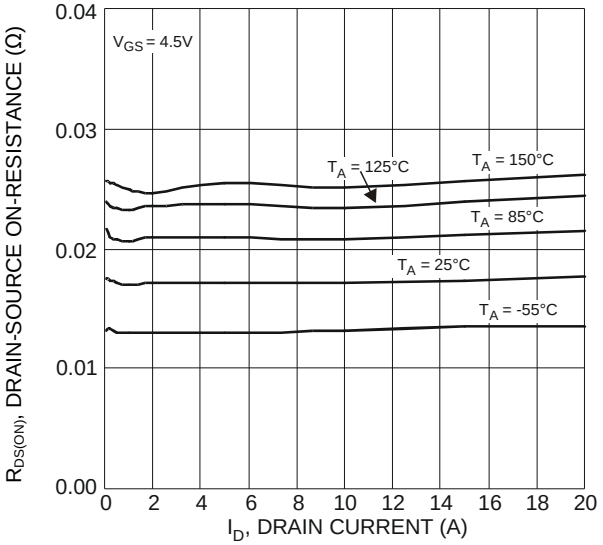


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

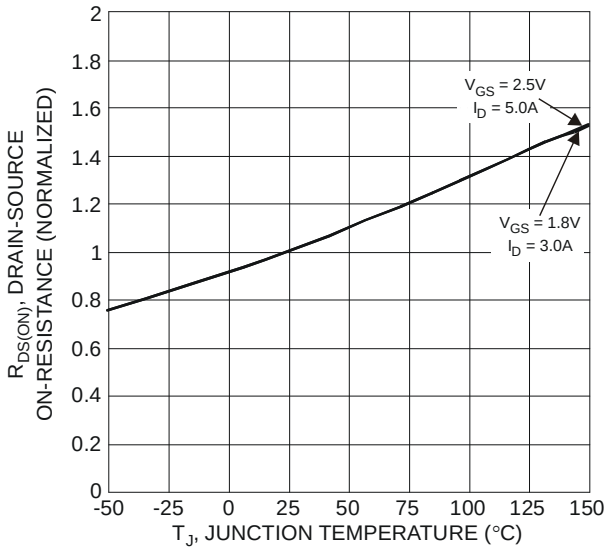


Figure 5 On-Resistance Variation with Temperature

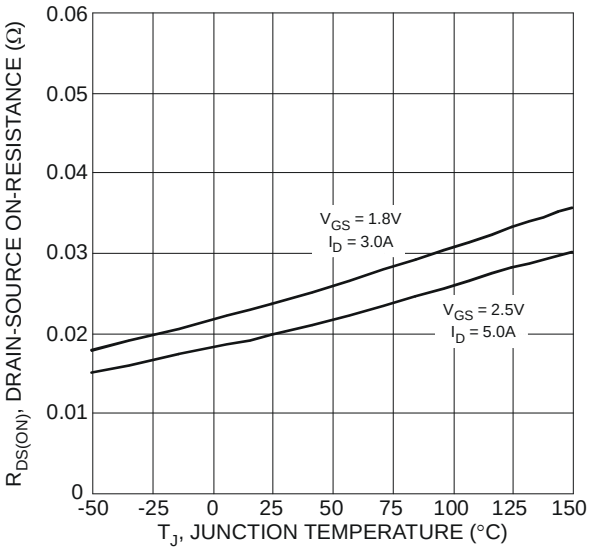


Figure 6 On-Resistance Variation with Temperature

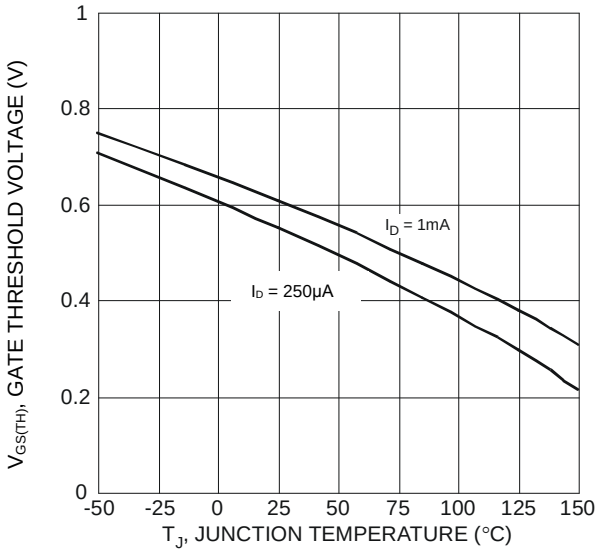


Figure 7 Gate Threshold Variation vs. Junction Temperature

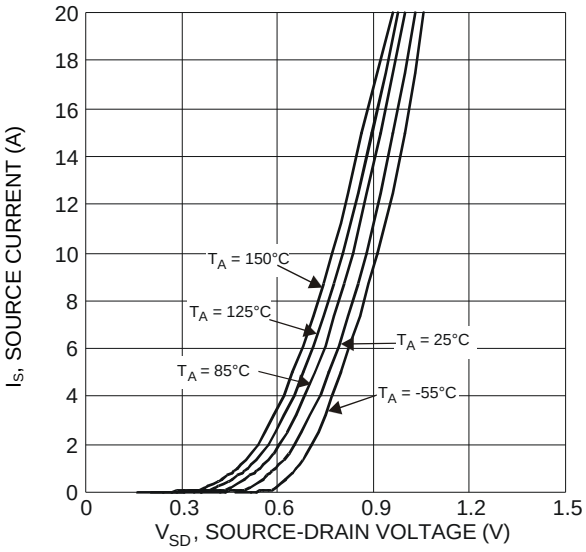


Figure 8 Diode Forward Voltage vs. Current

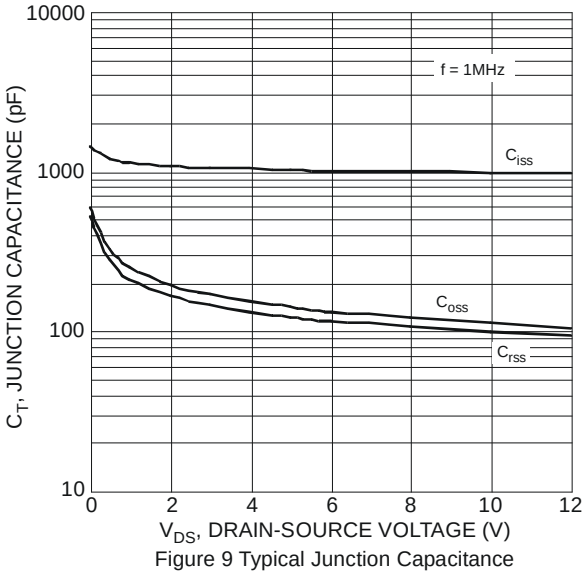


Figure 9 Typical Junction Capacitance

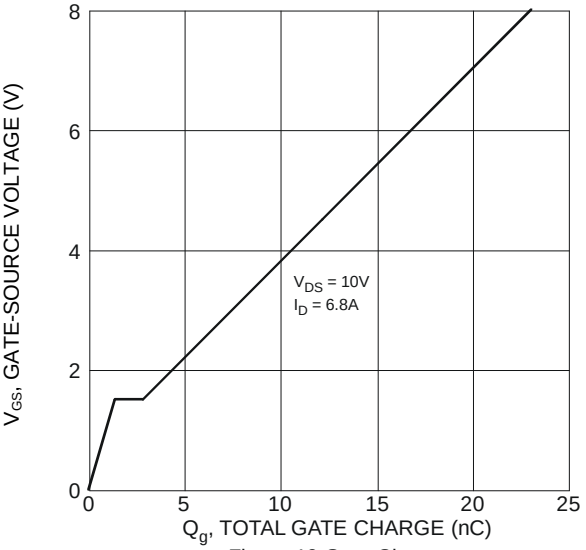


Figure 10 Gate Charge

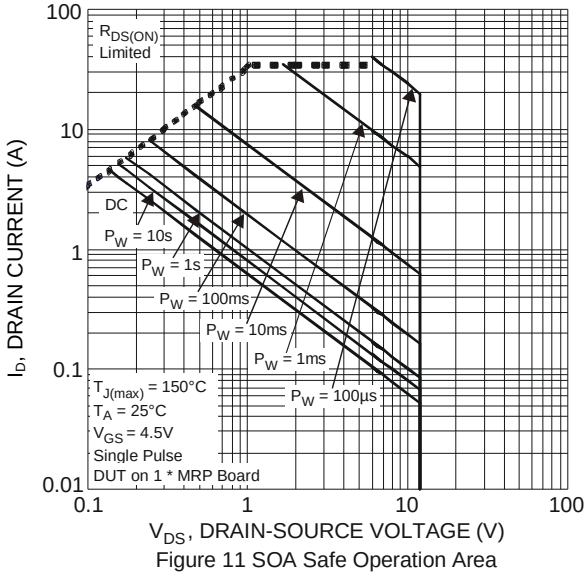


Figure 11 SOA Safe Operation Area

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}	—	—	±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	$R_{DS(ON)}$	—	37	59	mΩ	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 = 1.0MHz
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 = 1MHz
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	V_{DD} = -6V, V_{GS} = -4.5V, R_L = 1.6Ω, R_G = 1Ω
Turn-On Rise Time	t_R	—	12.8	—	ns	
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/μs
Body Diode Reverse Recovery Charge	Q_{RR}	—	7.8	—	nC	I_S = -3.6A, 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.

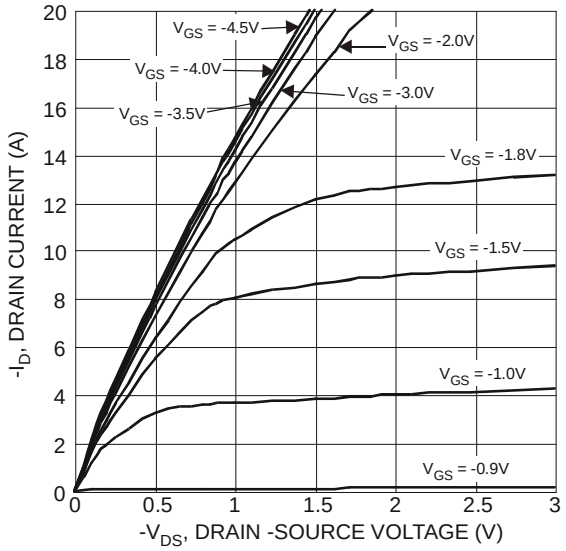


Figure 12 Typical Output Characteristics

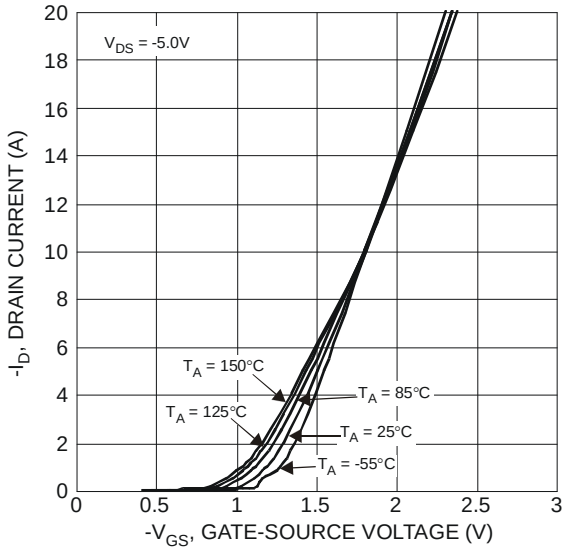


Figure 13 Typical Transfer Characteristics

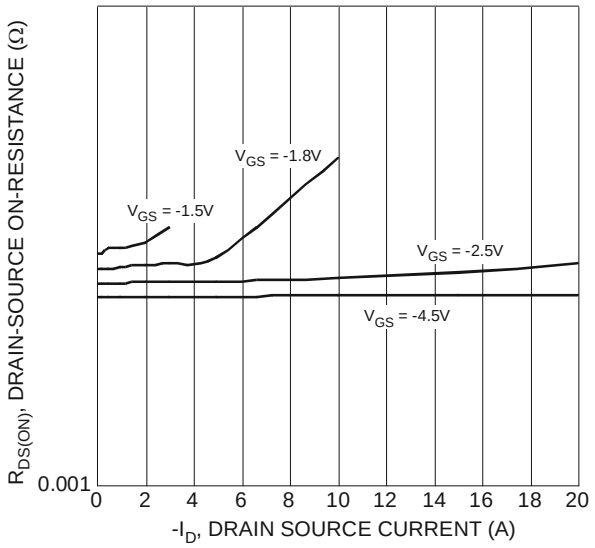


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

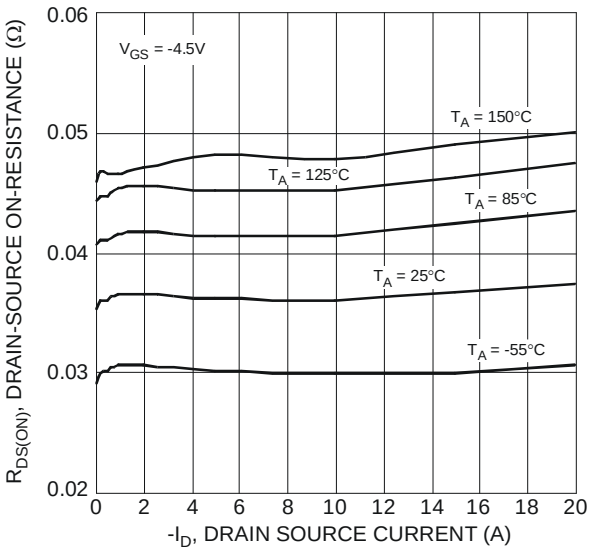


Figure 15 Typical On-Resistance vs. Drain Current and Temperature

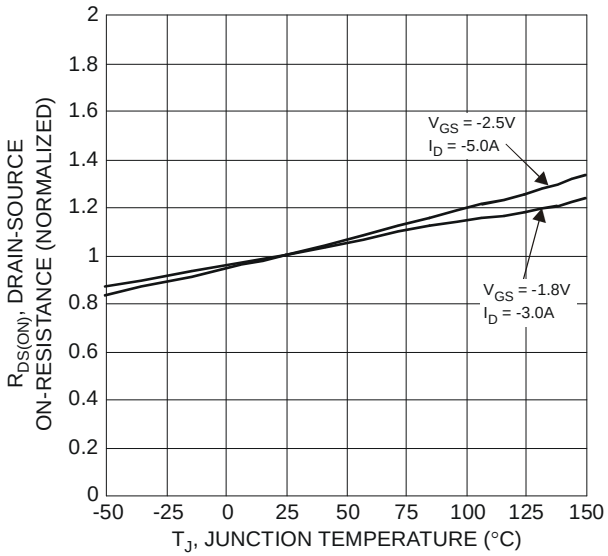


Figure 16 On-Resistance Variation with Temperature

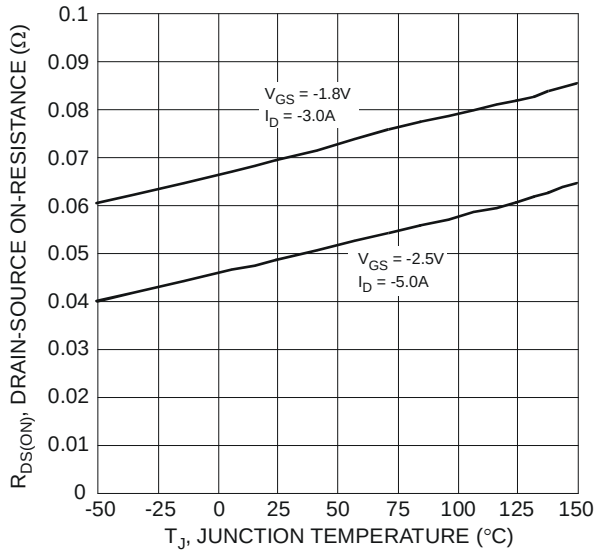


Figure 17 On-Resistance Variation with Temperature

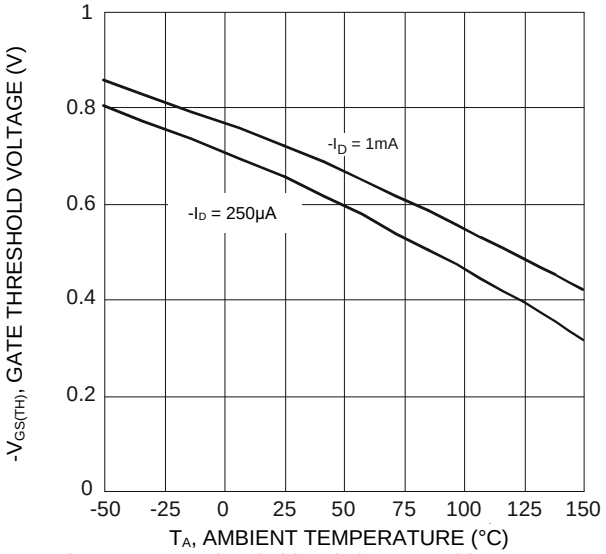


Figure 18 Gate Threshold Variation vs. Ambient Temperature

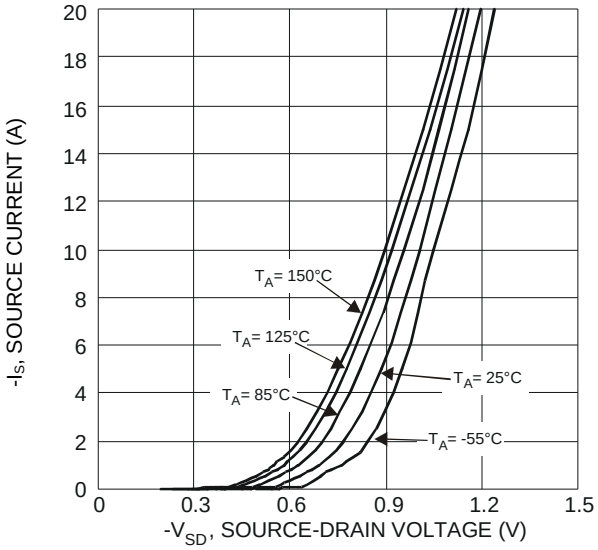


Figure 19 Diode Forward Voltage vs. Current

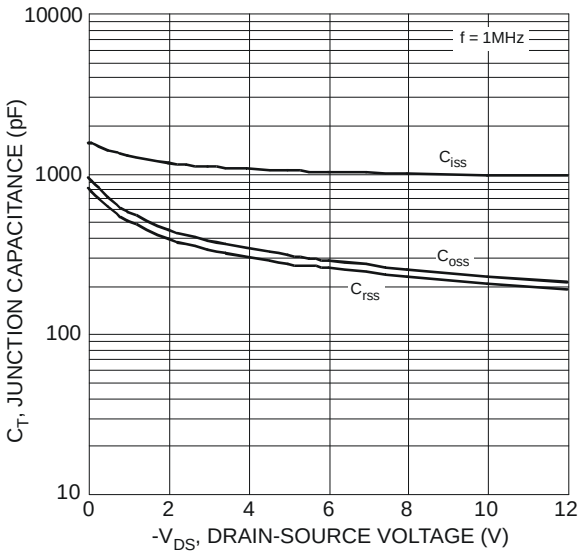


Figure 20 Typical Junction Capacitance

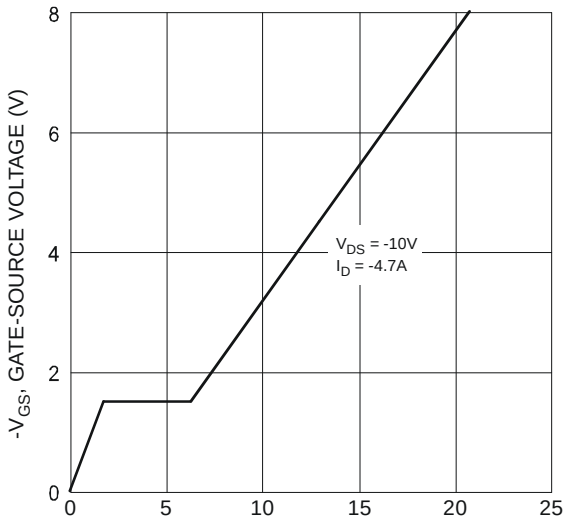


Figure 21 Gate-Charge Characteristics

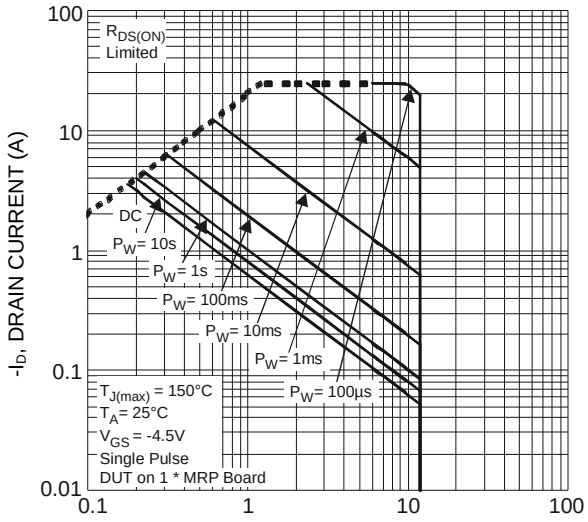


Figure 22 SOA Safe Operation Area

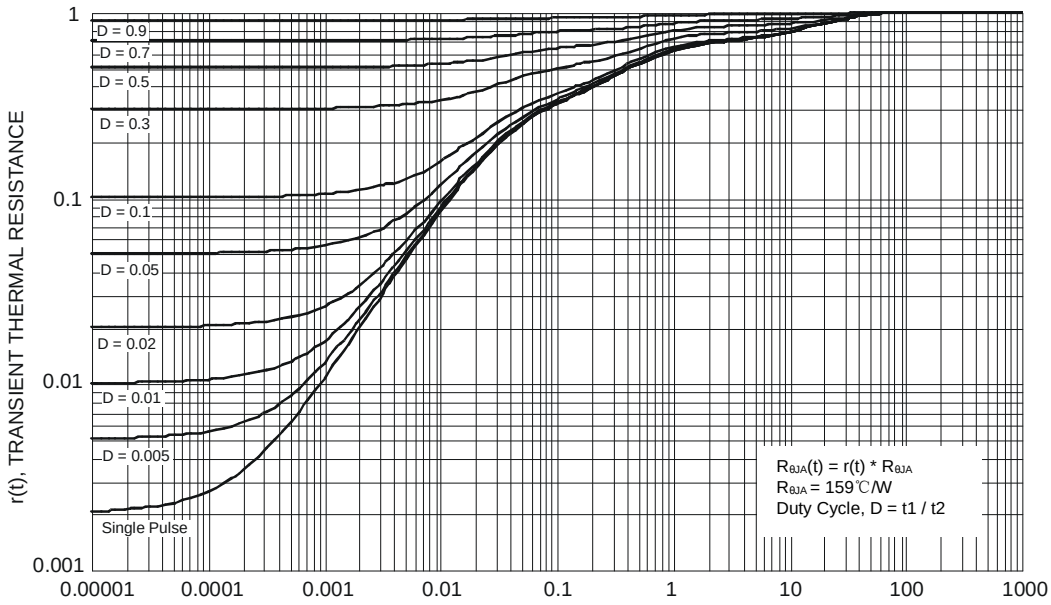
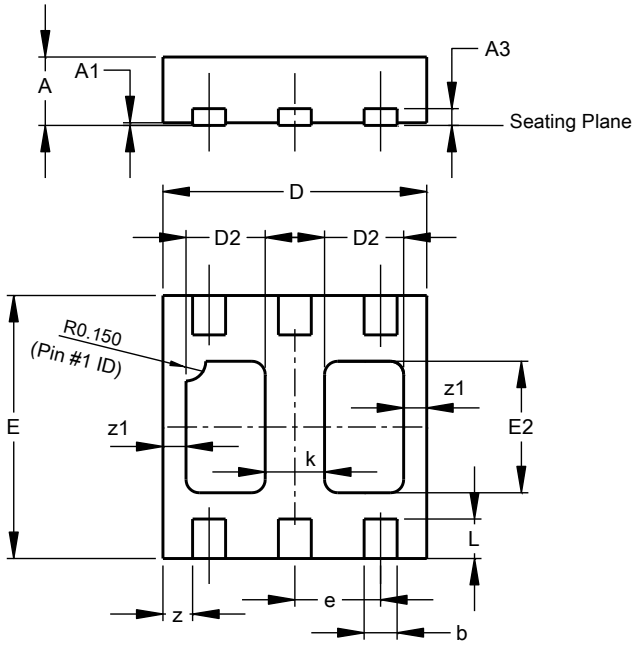


Figure 23 Transient Thermal Resistance

Package Outline Dimensions

Please see 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

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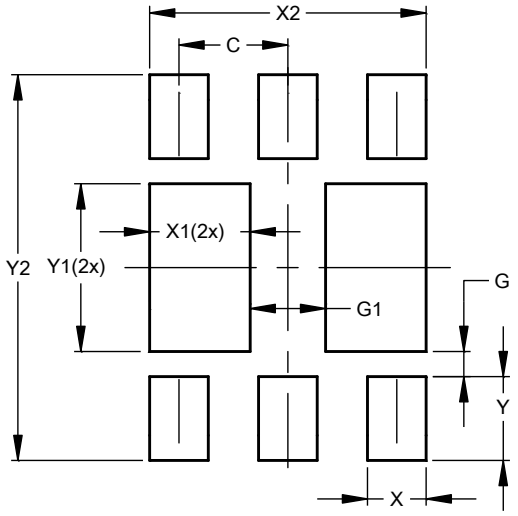
U-DFN2020-6 (Type B)



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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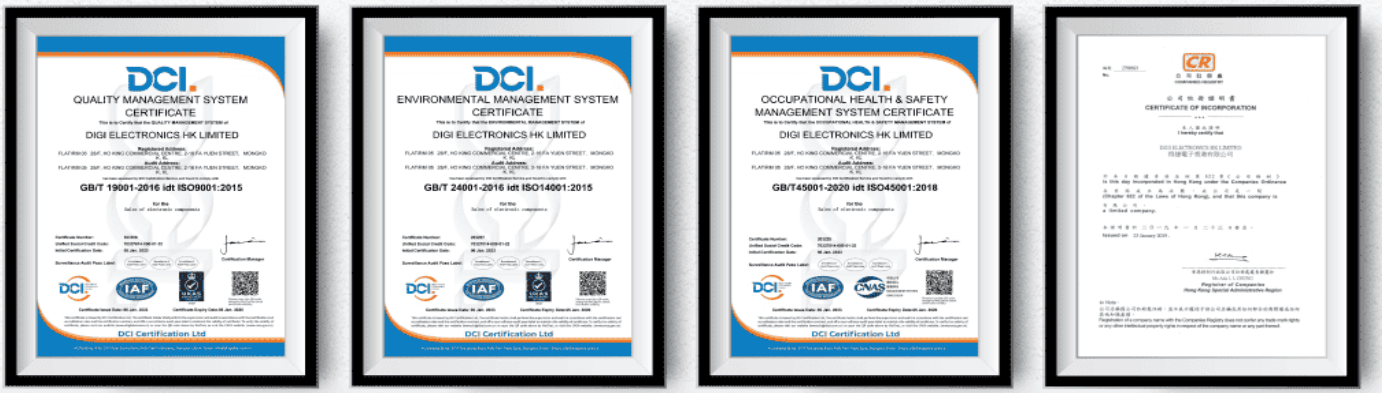

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