12V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	Package	I_D Max T_A = +25°C
12V	10mΩ @ V_{GS} = 4.5V	U-DFN2020-6 (Type E)	11A
	12mΩ @ V_{GS} = 2.5V		10
	14mΩ @ V_{GS} = 1.8V		9A
	18mΩ @ V_{GS} = 1.5V		8A
	41mΩ @ V_{GS} = 1.2V		5A

Features

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm^2
- Low Gate Threshold Voltage
- Fast Switching Speed
- 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/**

Description

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

Applications

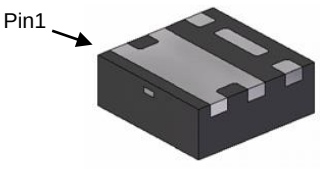
- Load Switching
- Battery Management Application
- Power Management Functions

Mechanical Data

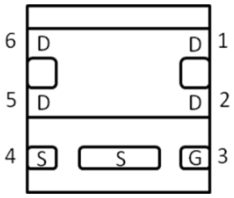
- Case: U-DFN2020-6
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.008 grams (Approximate)



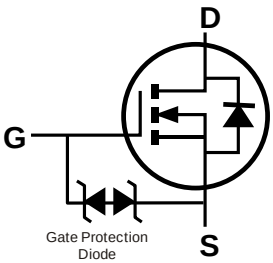
U-DFN2020-6
(Type E)



Bottom View



Pin Out
Bottom View



Equivalent Circuit

Ordering Information (Note 4)

Part Number	Marking	Reel Size (inches)	Quantity Per Reel
DMN1019UFDE-7	N7	7	3,000

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/.

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Marking Information

Site 1



N7 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: H = 2020)
M = Month (ex: 9 = September)

Date Code Key

Year	2011	…	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Code	Y	…	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



N7 = 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	2011	…	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Code	1	…	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

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	12	V
Gate-Source Voltage			V_{GSS}	±8	V
Continuous Drain Current (Note 5) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	11 9	A
	t<5s	T_A = +25°C T_A = +70°C	I_D	14 11	A
Maximum Continuous Body Diode Current			I_S	3.0	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	100	A

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C T_A = +70°C	P_D	0.69 0.44	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State t<5s	$R_{\theta JA}$	182 118	°C/W
Total Power Dissipation (Note 6)	T_A = +25°C T_A = +70°C	P_D	2.17 1.38	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State t<5s	$R_{\theta JA}$	58 38	°C/W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	10	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes: 5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.

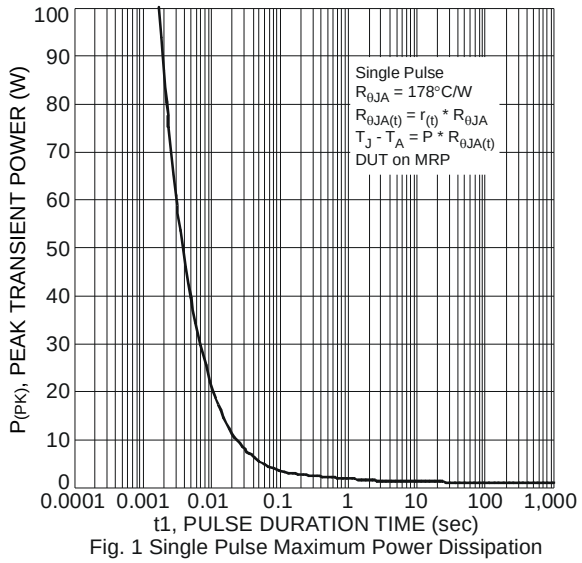


Fig. 1 Single Pulse Maximum Power Dissipation

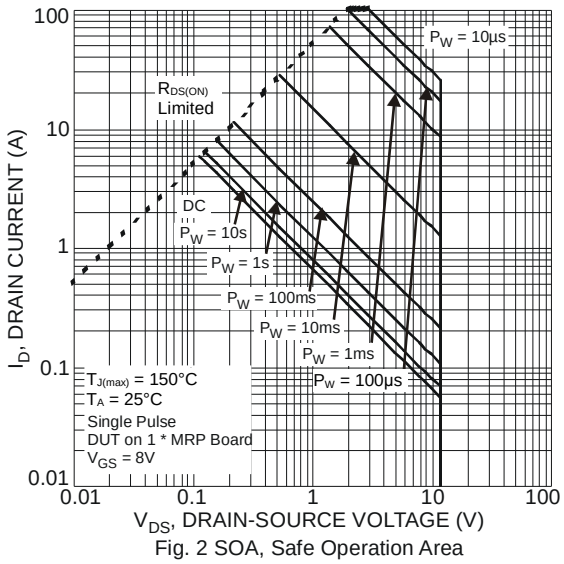


Fig. 2 SOA, Safe Operation Area

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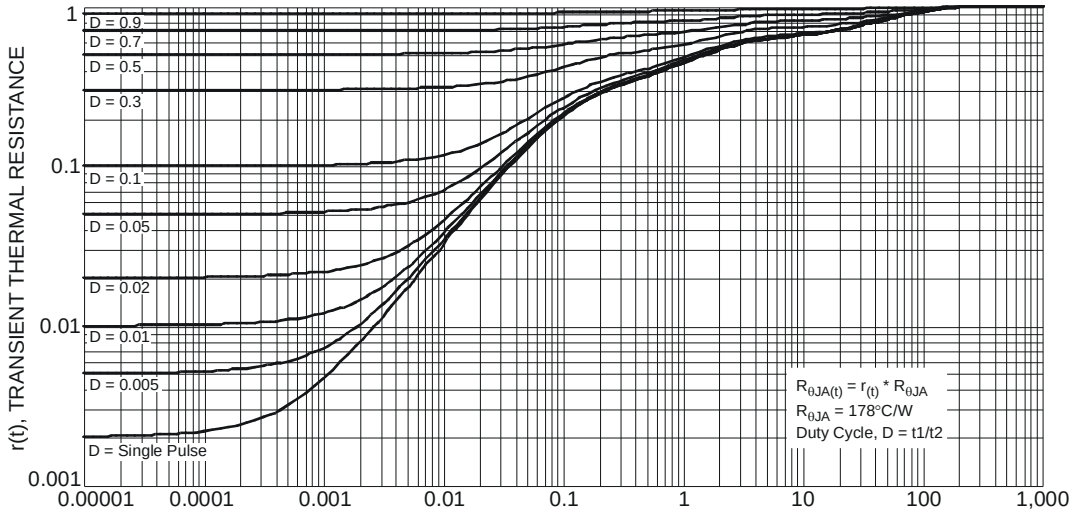


Fig. 3 Transient Thermal Resistance

Electrical Characteristics (@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}	12	—	—	V	V_{GS} = 0V, I_D = 250μA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	1	μA	V_{DS} = 12V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±2	μA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.35	—	0.8	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	7	10	mΩ	V_{GS} = 4.5V, I_D = 9.7A
			8	12		V_{GS} = 2.5V, I_D = 9A
			10	14		V_{GS} = 1.8V, I_D = 8.1A
			14	18		V_{GS} = 1.5V, I_D = 4.5A
			28	41		V_{GS} = 1.2V, I_D = 2.4A
Forward Transfer Admittance	$\|Y_{fs}\|$	—	28	—	S	V_{DS} = 4V, I_D = 9.7A
Diode Forward Voltage	V_{SD}	—	0.8	1.2	V	V_{GS} = 0V, I_S = 10A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	2425	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	396	—		
Reverse Transfer Capacitance	C_{rss}	—	375	—		
Gate Resistance	R_g	—	1.1	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 8V)	Q_g	—	50.6	—	nC	V_{DS} = 4V, I_D = 10A
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	27.3	—		
Gate-Source Charge	Q_{gs}	—	3.4	—		
Gate-Drain Charge	Q_{gd}	—	5.2	—		
Turn-On Delay Time	$t_{D(ON)}$	—	7.6	—	ns	V_{DD} = 4V, V_{GS} = 5V, I_D = 10A, R_G = 1Ω, R_L = 0.4Ω
Turn-On Rise Time	t_R	—	22.2	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	57.6	—		
Turn-Off Fall Time	t_F	—	16.8	—		

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

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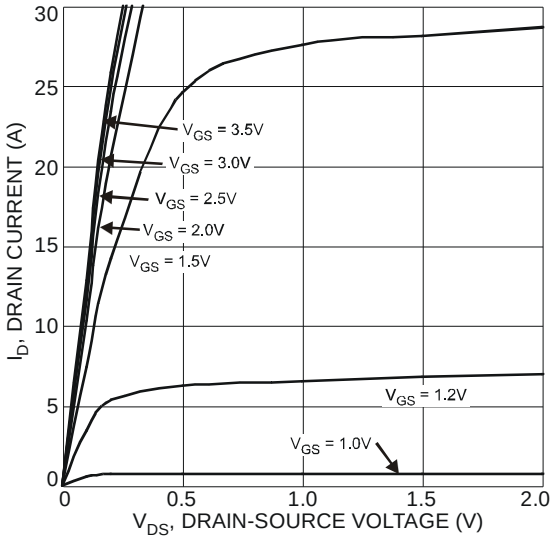


Fig. 4 Typical Output Characteristic

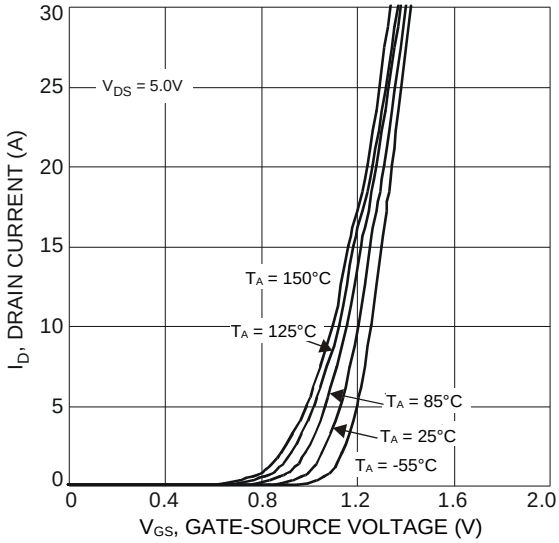


Fig. 5 Typical Transfer Characteristics

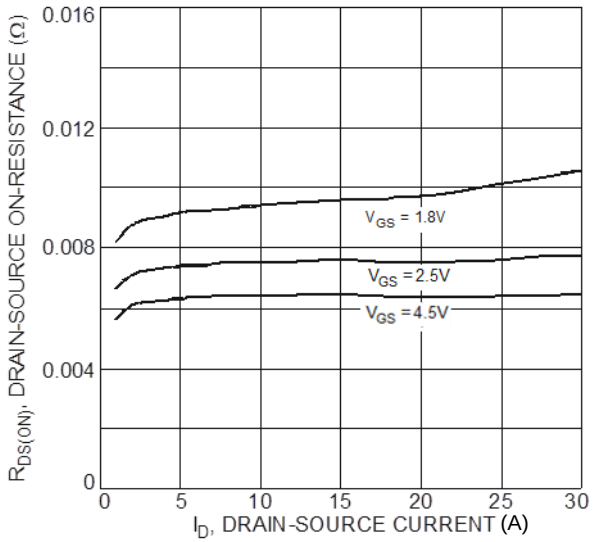


Fig. 6 Typical On-Resistance vs. Drain Current and Gate Voltage

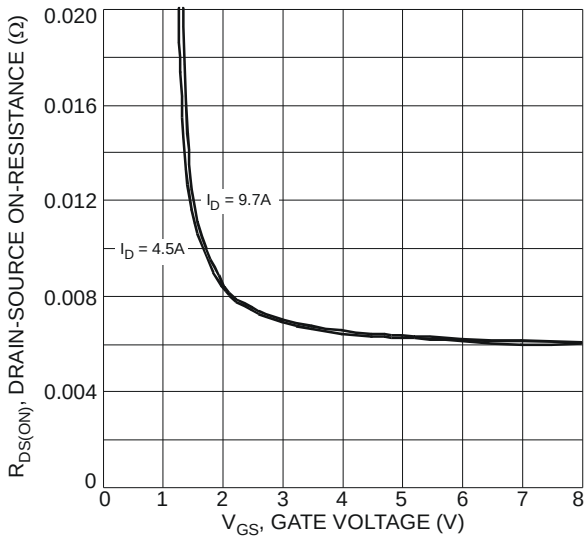


Fig. 7 Typical On-Resistance vs. Gate Voltage

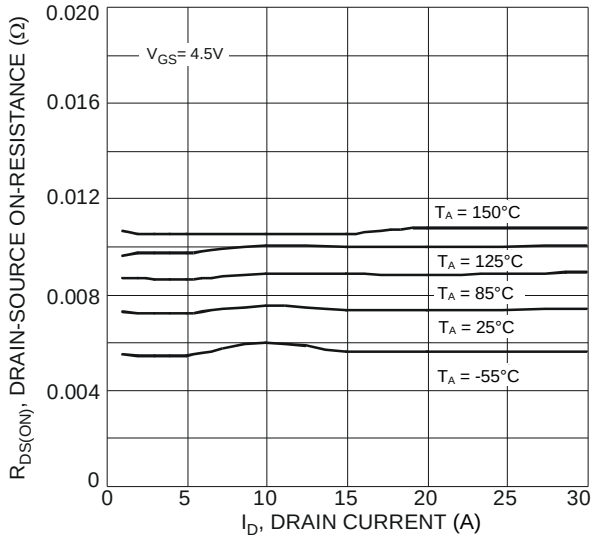


Fig. 8 Typical On-Resistance vs. Drain Current and Temperature

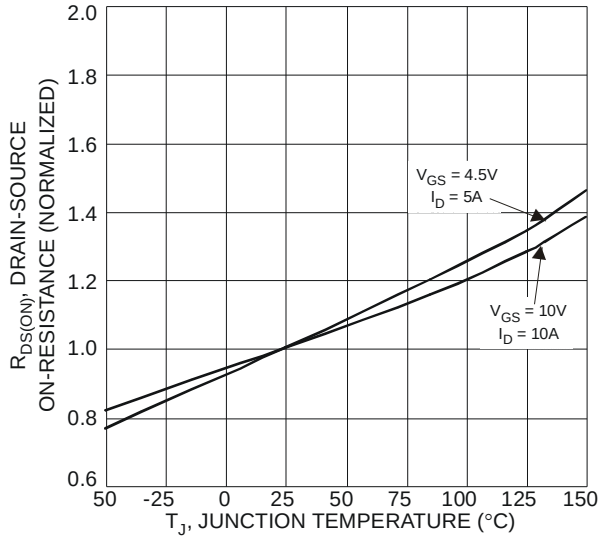


Fig. 9 On-Resistance Variation with Temperature

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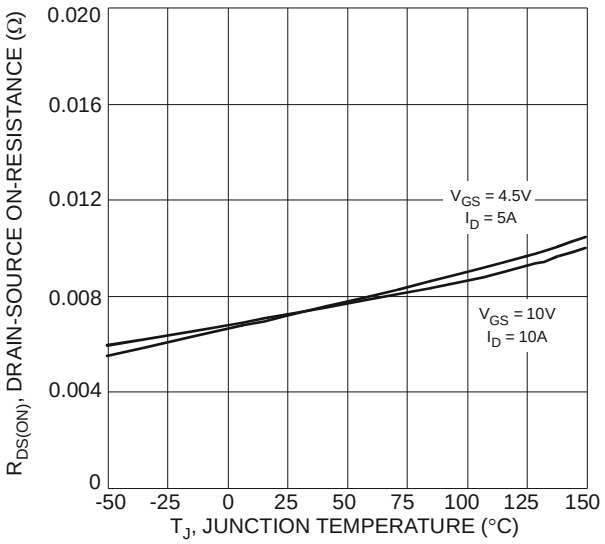


Fig. 10 On-Resistance Variation with Temperature

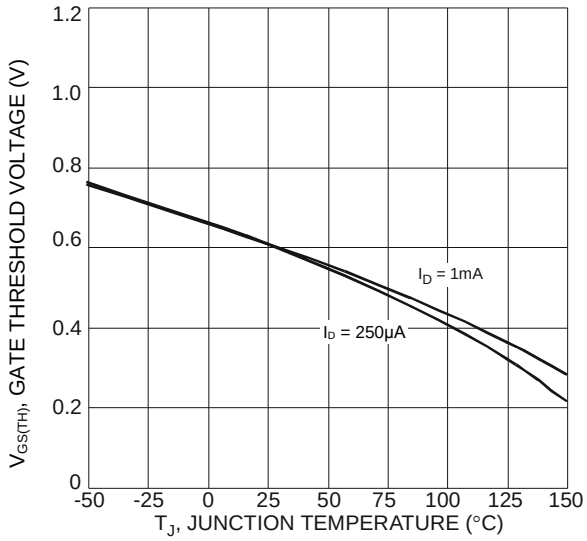


Fig. 11 Gate Threshold Variation vs. Junction Temperature

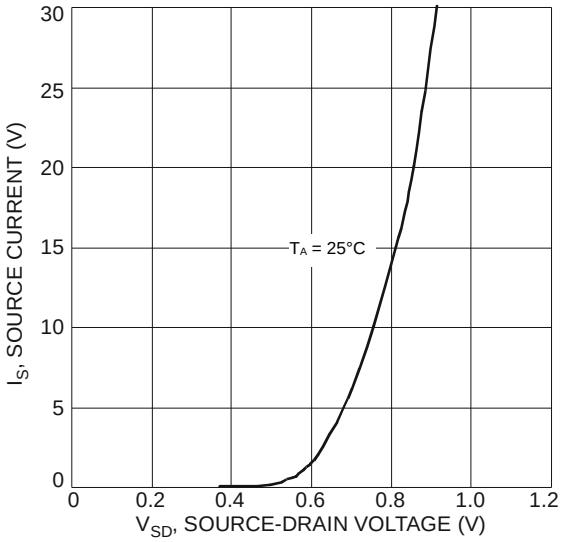


Fig.12 Diode Forward Voltage vs. Current

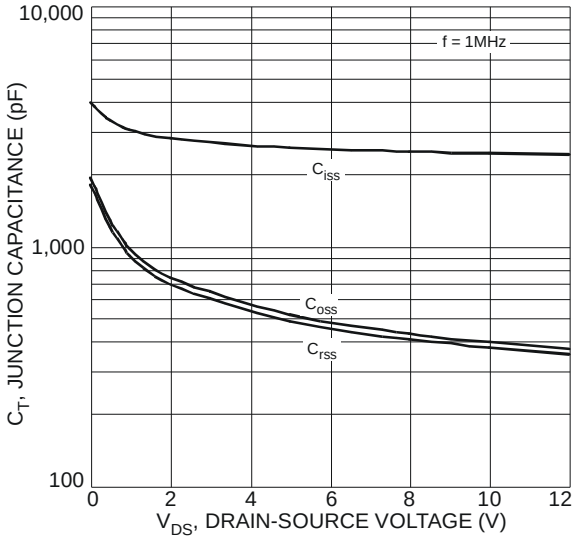


Fig. 13 Typical Junction Capacitance

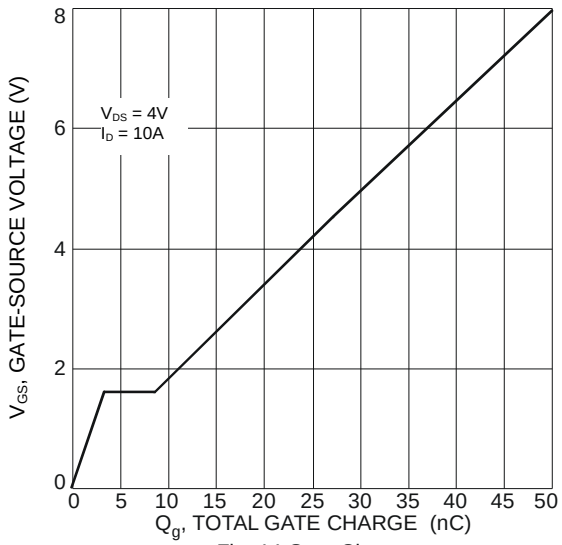


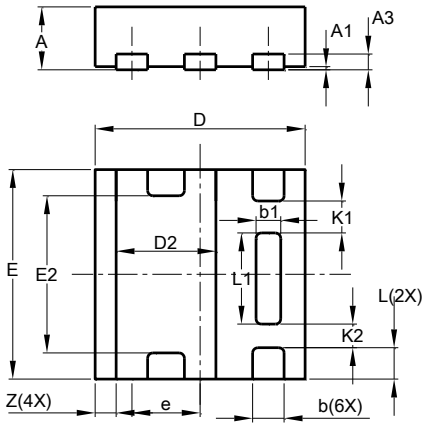
Fig. 14 Gate Charge

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Package Outline Dimensions

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

U-DFN2020-6 (Type E)

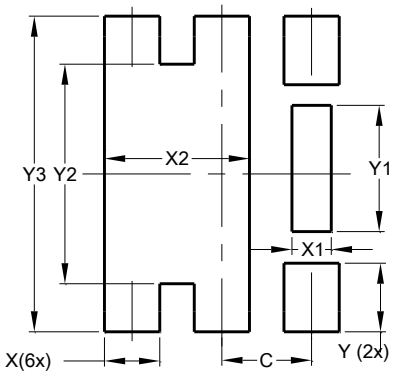


U-DFN2020-6 Type E			
Dim	**Min**	**Max**	**Typ**
A	0.57	0.63	0.60
A1	0	0.05	0.03
A3	–	–	0.15
b	0.25	0.35	0.30
b1	0.185	0.285	0.235
D	1.95	2.05	2.00
D2	0.85	1.05	0.95
E	1.95	2.05	2.00
E2	1.40	1.60	1.50
e	–	–	0.65
L	0.25	0.35	0.30
L1	0.82	0.92	0.87
K1	–	–	0.305
K2	–	–	0.225
Z	–	–	0.20
All Dimensions in mm			

Suggested Pad Layout

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

U-DFN2020-6 (Type E)



Dimensions	Value (in mm)
C	0.650
X	0.400
X1	0.285
X2	1.050
Y	0.500
Y1	0.920
Y2	1.600
Y3	2.300

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