12V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)\ max}$	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
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Description

This new generation 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.

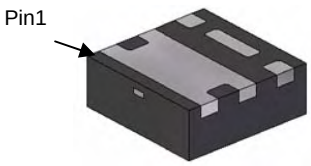
Mechanical Data

- Case: U-DFN2020-6 Type E
- 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: 0.007 grams (approximate)

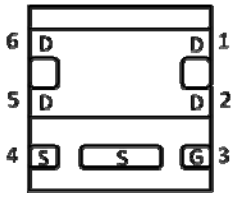
Applications

- Load Switching
- Battery Management Application
- Power Management Functions

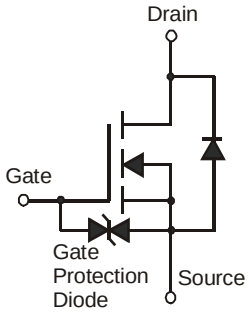
U-DFN2020-6
Type E



Bottom View



Pin Out
Bottom View



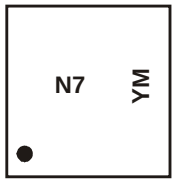
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Marking	Reel size (inches)	Quantity per reel
DMN1019UFDE-7	N7	7	3,000

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
2. See http://www.diodes.com 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 http://www.diodes.com.

Marking Information



N7 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: Y = 2011)
M = Month (ex: 9 = September)

Date Code Key

Year	2011	2012	2013	2014	2015	2016	2017
Code	Y	Z	A	B	C	D	E

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

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

Characteristic			Symbol	Value	Units
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	Units
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

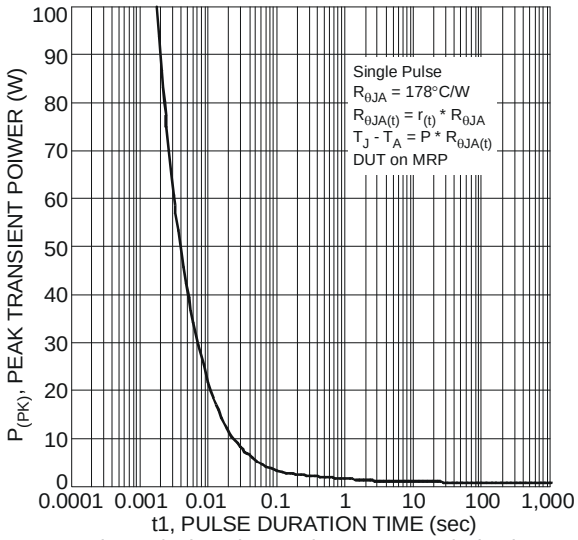


Fig. 1 Single Pulse Maximum Power Dissipation

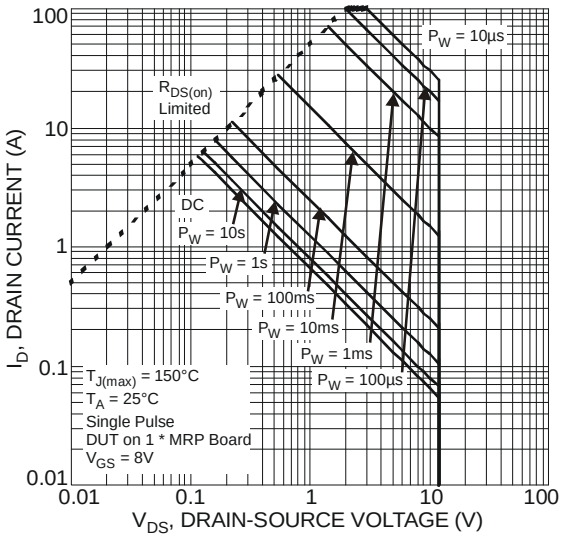


Fig. 2 SOA, Safe Operation Area

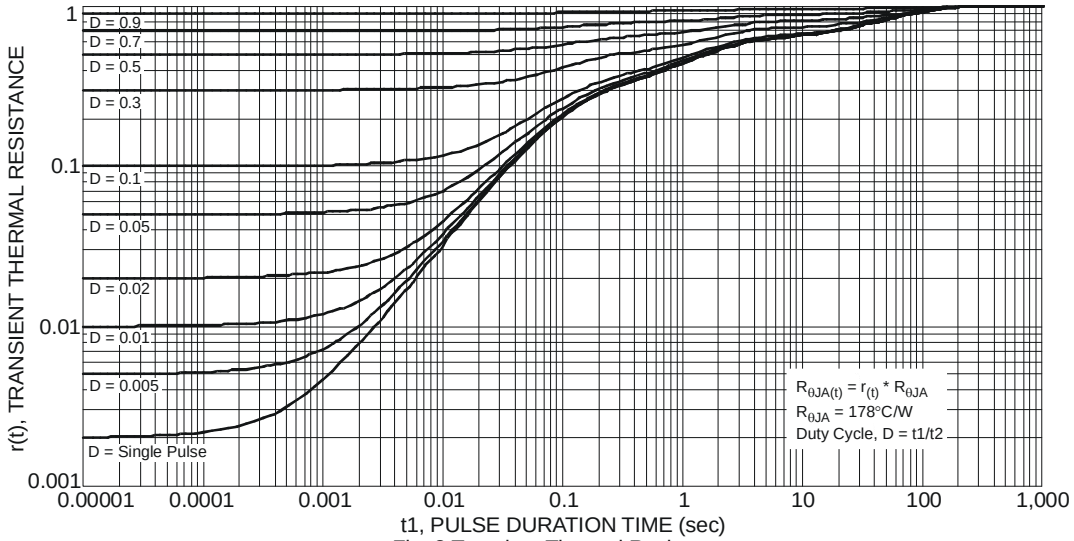


Fig. 3 Transient Thermal Resistance

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 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	μA	V_{DS} = 12V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±2	μA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
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 7)						
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} = 10V, 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:
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.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.

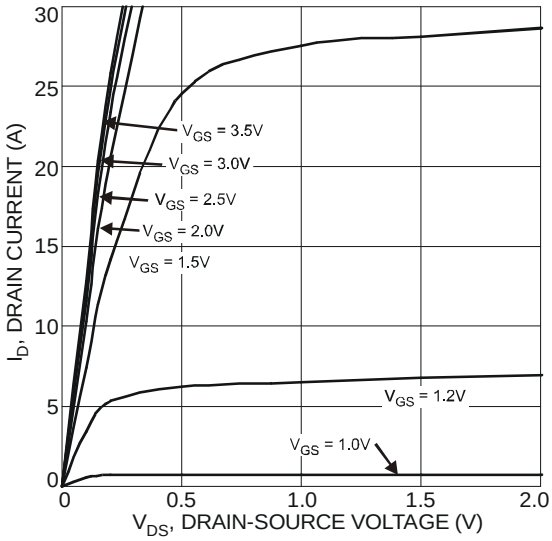


Fig. 4 Typical Output Characteristic

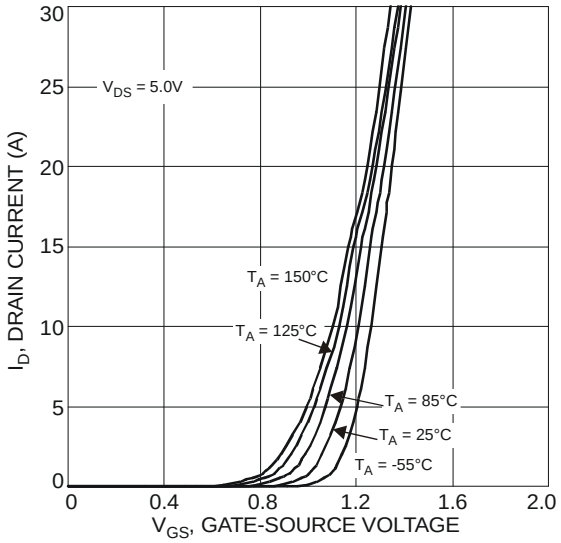


Fig. 5 Typical Transfer Characteristics

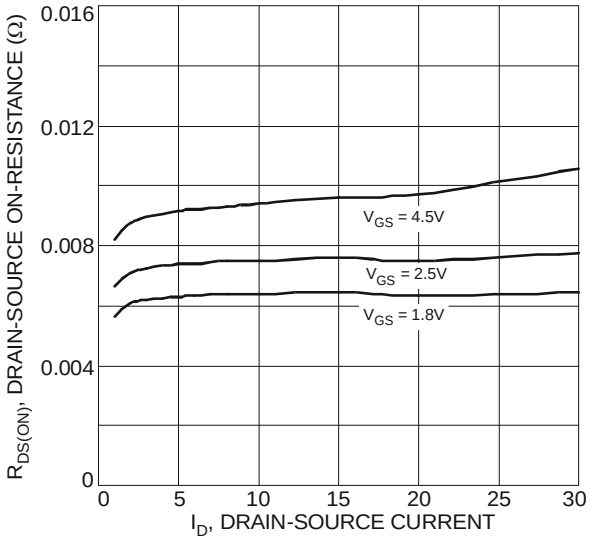


Fig. 6 Typical On-Resistance vs. Drain Current and Gate Voltage

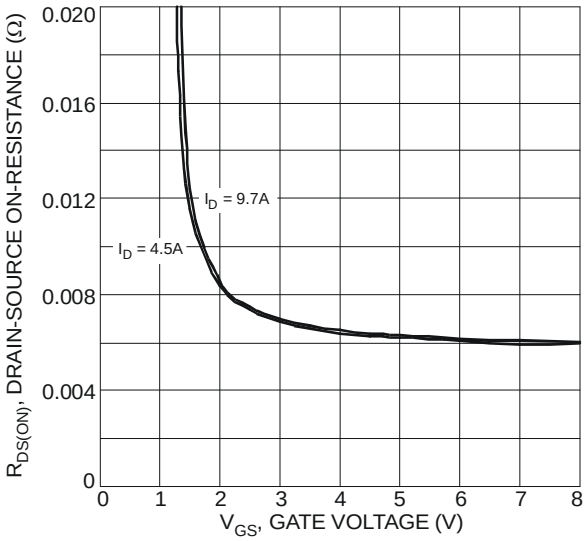


Fig. 7 Typical On-Resistance vs. Gate Voltage

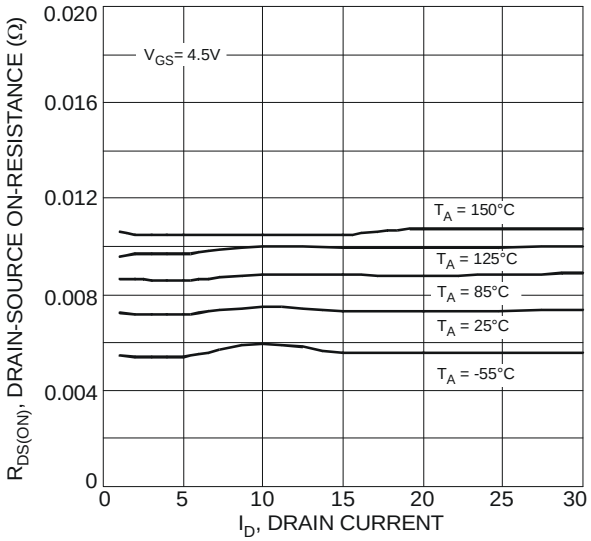


Fig. 8 Typical On-Resistance vs. Drain Current and Temperature

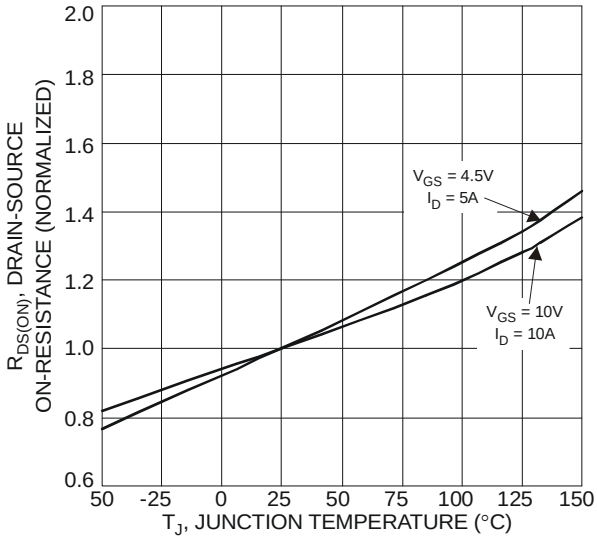


Fig. 9 On-Resistance Variation with Temperature

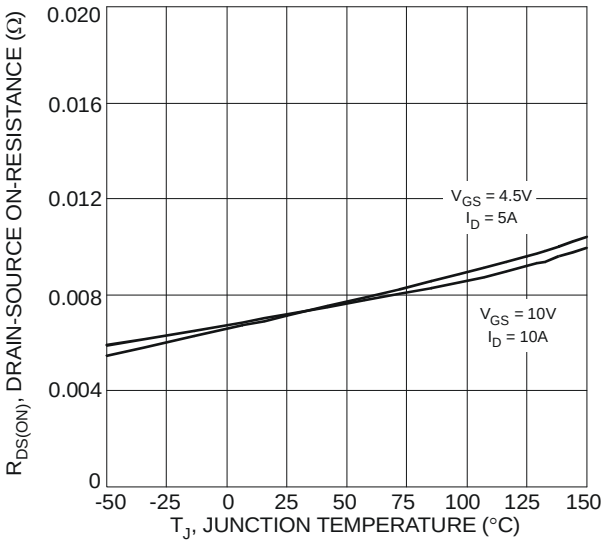


Fig. 10 On-Resistance Variation with Temperature

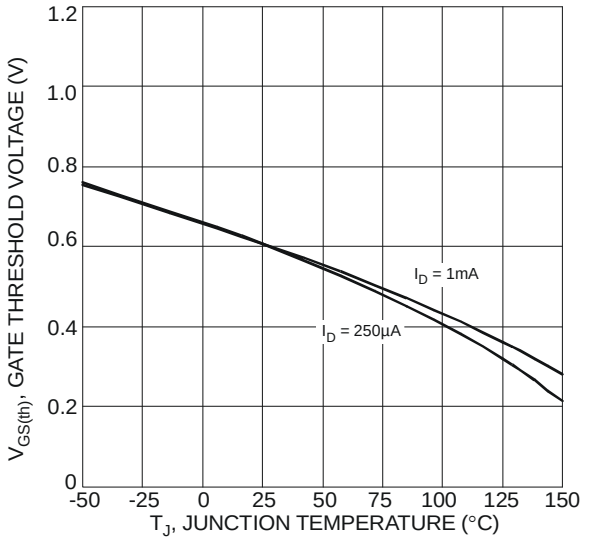


Fig. 11 Gate Threshold Variation vs. Ambient Temperature

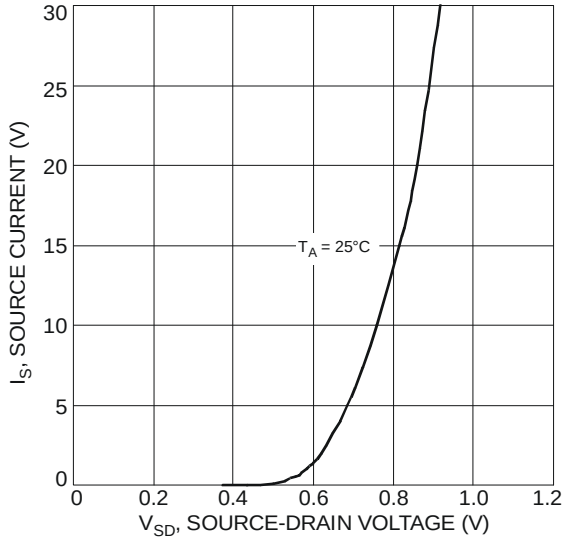


Fig.12 Diode Forward Voltage vs. Current

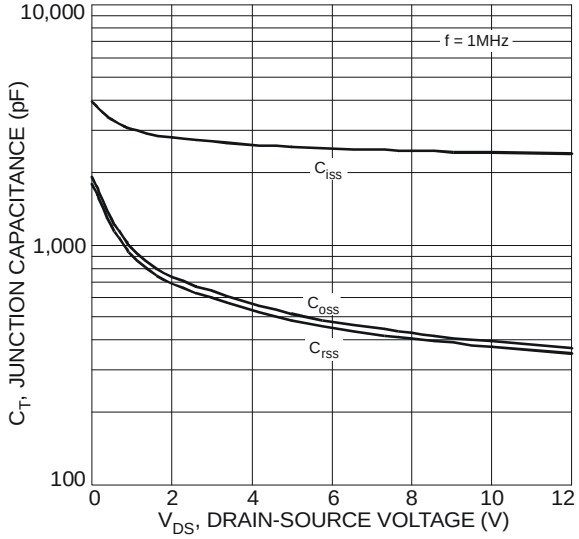


Fig. 13 Typical Junction Capacitance

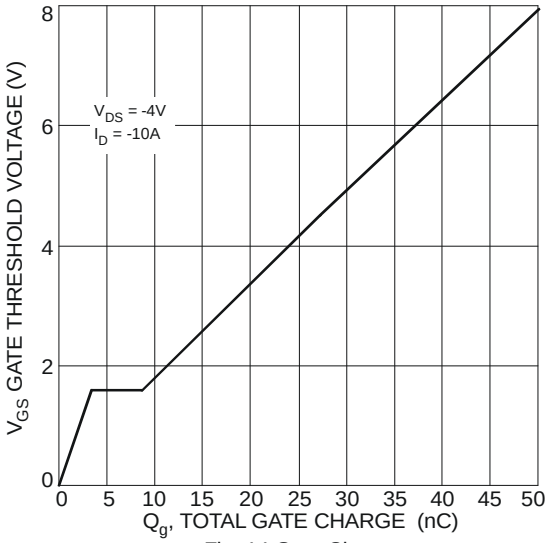
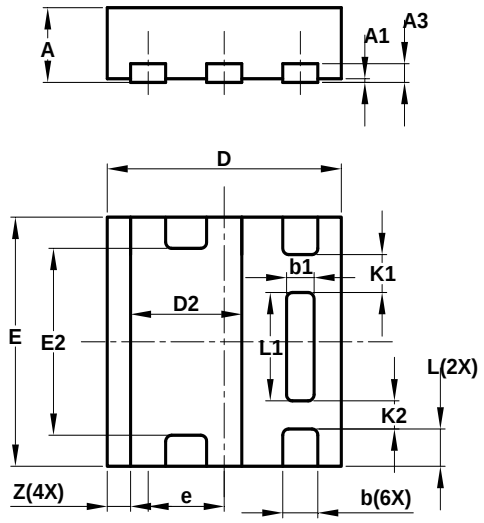


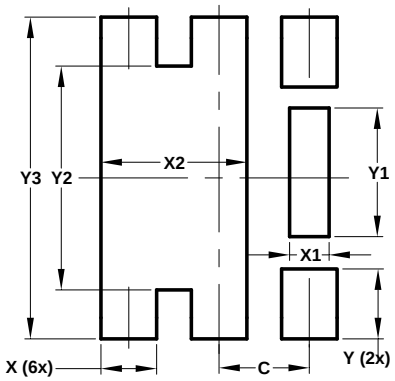
Fig. 14 Gate Charge

Package Outline Dimensions



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



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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