

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>A</sub> = +25°C
-12V	16mΩ @ V <sub>GS</sub> = -4.5V	-9.1A
	21.5mΩ @ V <sub>GS</sub> = -2.5V	-7.9A
	26mΩ @ V <sub>GS</sub> = -1.8V	-7.0A
	32mΩ @ V <sub>GS</sub> = -1.5V	-6.3A

## Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Engine Management Systems
- DC-DC Converters
- Body Control Electronics

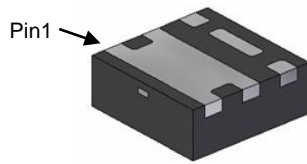
## Features

- 0.6mm Profile – Ideal For Low Profile Applications
- PCB Footprint of 4mm<sup>2</sup>
- Low Gate Threshold Voltage
- Fast Switching Speed
- ESD Protected to 3kV
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

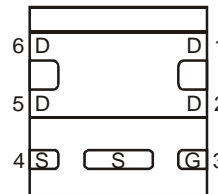
## Mechanical Data

- 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: 0.0065 grams (Approximate)

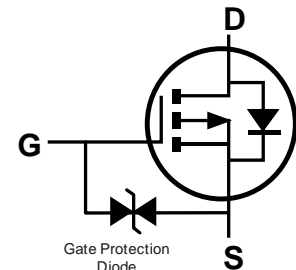
U-DFN2020-6 (Type E)



Bottom View



Pin Out  
Bottom View



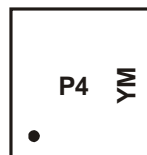
Internal Schematic

## Ordering Information (Note 5)

Part Number	Marking	Reel Size (inches)	Quantity Per Reel
DMP1022UFDEQ-7	P4	7	3,000

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/product-compliance-definitions/>.
  5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



P4 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: E = 2017)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2011	~	2015	2016	2017	2018	2019	2020	2021	2022	2023
Code	Y	~	C	D	E	F	G	H	I	J	K

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			$V_{DSS}$	-12	V
Gate-Source Voltage			$V_{GSS}$	$\pm 8$	V
Continuous Drain Current (Note 7) $V_{GS} = -4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	-9.1 -7.2	A
	$t < 5\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	-11.2 -9.0	A
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)			$I_{DM}$	-90	A
Continuous Source-Drain Diode Current		$T_A = +25^\circ\text{C}$ $T_C = +25^\circ\text{C}$	$I_S$	-2.5 -7.1	A
Pulsed Source-Drain Diode Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)			$I_{SM}$	-50	A

**Thermal Characteristics**

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	$P_D$	0.66	W
	$T_A = +70^\circ\text{C}$		0.42	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	189	$^\circ\text{C/W}$
	$t < 5\text{s}$		123	
Total Power Dissipation (Note 7)	$T_A = +25^\circ\text{C}$	$P_D$	2.03	W
	$T_A = +70^\circ\text{C}$		1.3	
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	61	$^\circ\text{C/W}$
	$t < 5\text{s}$		40	
Thermal Resistance, Junction to Case (Note 6)	Steady State	$R_{\theta JC}$	9.3	
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

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

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-12	—	—	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>	—	—	-3.5	μA	V <sub>DS</sub> = -12V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10	μA	V <sub>GS</sub> = ±5V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-0.35	—	-0.8	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
V <sub>GS(TH)</sub> Temperature Coefficient	ΔV <sub>GS(TH)</sub> /ΔT <sub>J</sub>	—	2.5	—	mV/°C	I <sub>D</sub> = -250μA
On-State Drain Current	I <sub>D(ON)</sub>	-10	—	—	A	V <sub>GS</sub> = -4.5V, V <sub>DS</sub> < -5A
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	12	16	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -8.2A
			15	21.5		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -7.2A
			20	26		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -6.6A
			23	32		V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -1A
			80	160		V <sub>GS</sub> = -1.2V, I <sub>D</sub> = -1A
Forward Transfer Admittance	Y <sub>fs</sub>	—	12	—	S	V <sub>DS</sub> = -4V, I <sub>D</sub> = -8.2A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.8	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -8A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	2,953	—	pF	V <sub>DS</sub> = -4V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	756	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	678	—		
Gate Resistance	R <sub>g</sub>	—	8.6	18	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge	Q <sub>g</sub>	—	28.4	42.6	nC	V <sub>GS</sub> = -5V, V <sub>DS</sub> = -4V, I <sub>D</sub> = -10A
Total Gate Charge	Q <sub>g</sub>	—	25.3	38		
Gate-Source Charge	Q <sub>gs</sub>	—	2.3	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	7.2	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	20	30	ns	V <sub>DS</sub> = -4V, V <sub>GS</sub> = -4.5V, R <sub>G</sub> = 1Ω, R <sub>L</sub> = 0.4Ω, I <sub>D</sub> = -9.8A
Turn-On Rise Time	t <sub>R</sub>	—	28	42		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	117	176		
Turn-Off Fall Time	t <sub>F</sub>	—	93	139		
<b>BODY DIODE CHARACTERISTICS</b>						
Diode Forward Voltage	V <sub>SD</sub>	—	-0.8	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -9.8A
Continuous Source-Drain Diode Current (Note 6)	I <sub>S</sub>	—	—	-2.5	A	T <sub>A</sub> = +25°C
		—	—	-7.1		T <sub>C</sub> = +25°C
Pulse Diode Forward Current (Note 8)	I <sub>SM</sub>	—	—	-50		—
Body Diode Reverse Recovery Time (Note 8)	t <sub>RR</sub>	—	28	56	ns	I <sub>S</sub> = -9.8A, dI/dt = 100A/μs
Reverse Recovery Fall Time	t <sub>a</sub>	—	10	—		
Reverse Recovery Rise Time	t <sub>b</sub>	—	18	—		
Body Diode Reverse Recovery Charge (Note 8)	Q <sub>RR</sub>	—	13	26	nC	

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

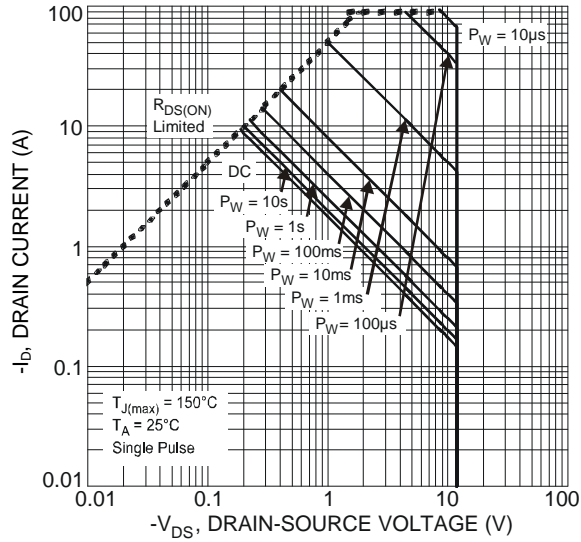


Fig. 1 SOA, Safe Operation Area

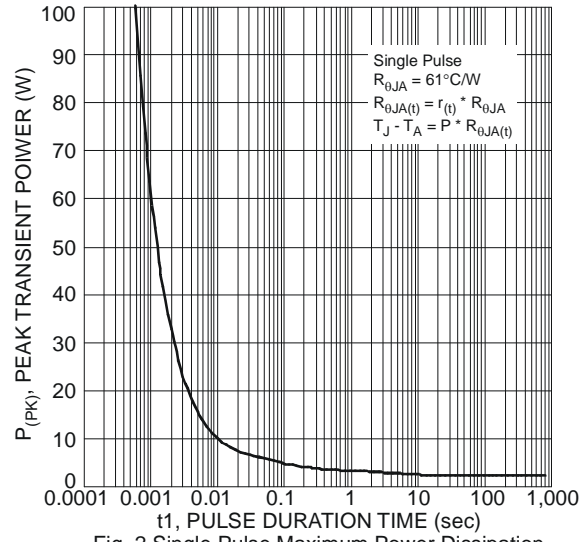


Fig. 2 Single Pulse Maximum Power Dissipation

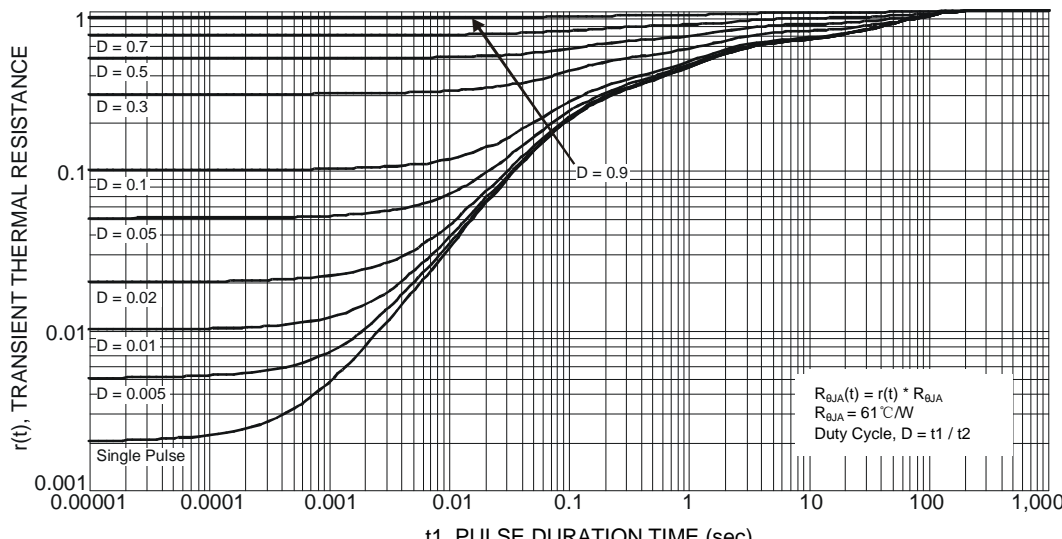


Fig. 3 Transient Thermal Resistance

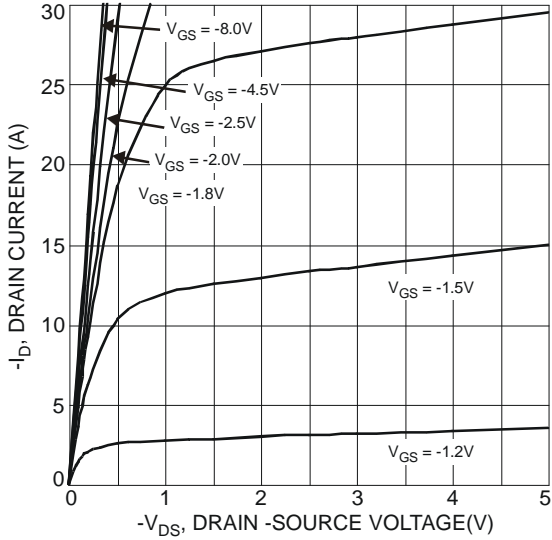


Fig. 4 Typical Output Characteristics

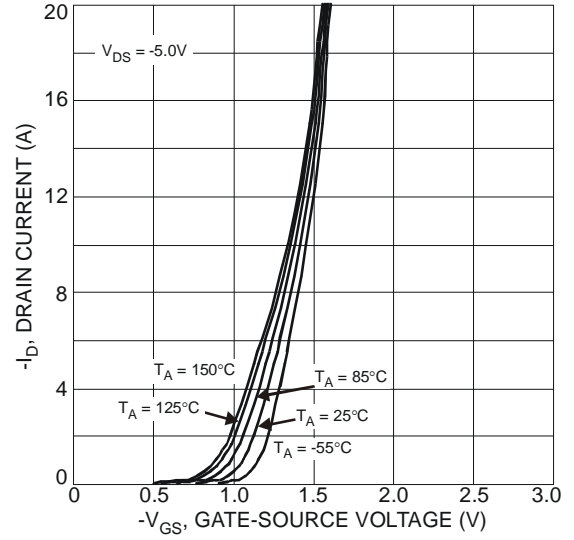


Fig. 5 Typical Transfer Characteristics

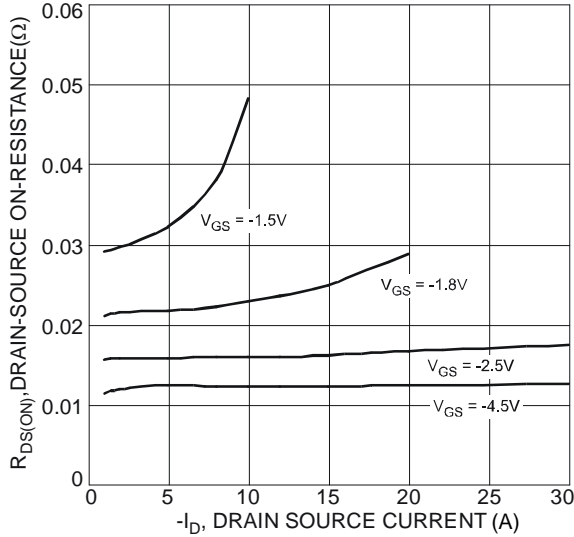


Fig. 6 Typical On-Resistance vs. Drain Current and Gate Voltage

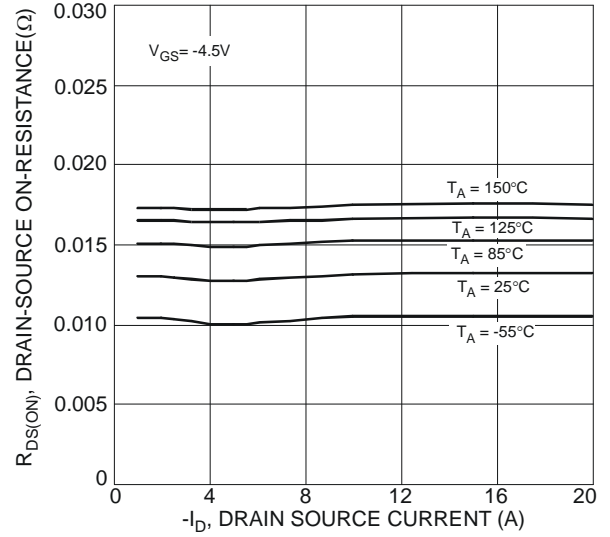


Fig. 7 Typical On-Resistance vs. Drain Current and Temperature

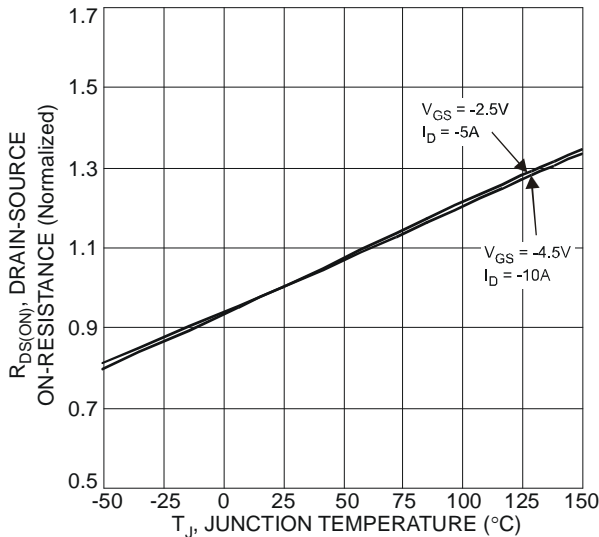


Fig. 8 On-Resistance Variation with Temperature

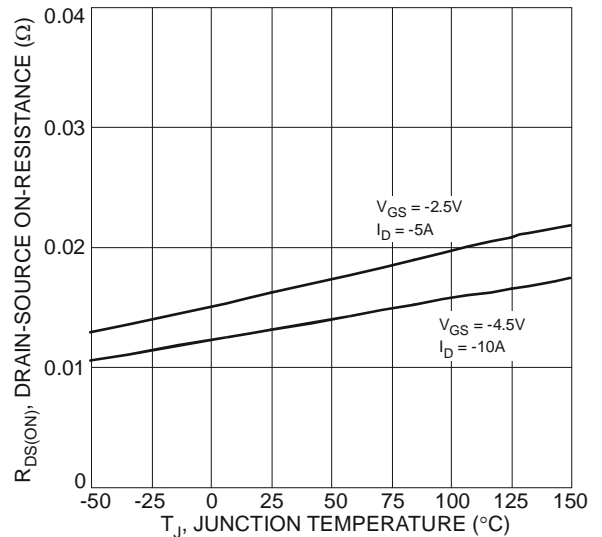


Fig. 9 On-Resistance Variation with Temperature

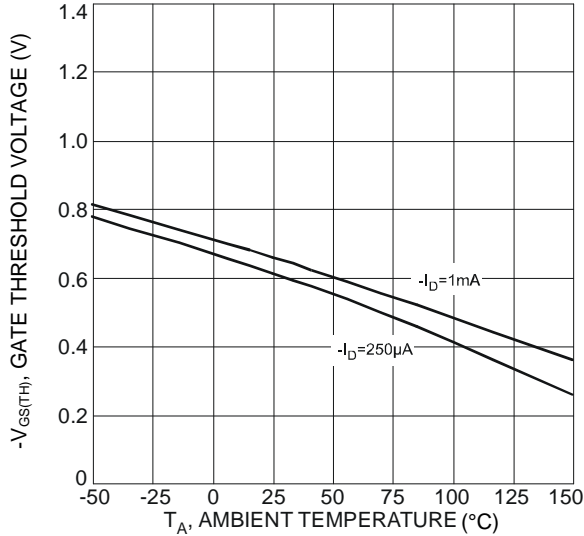


Fig. 10 Gate Threshold Variation vs. Ambient Temperature

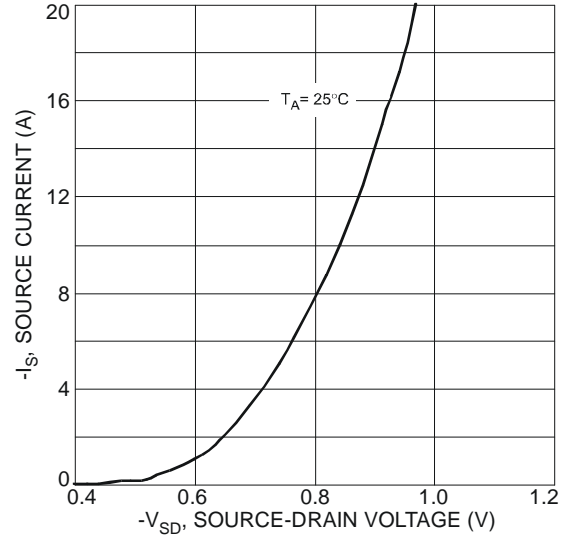


Fig. 11 Diode Forward Voltage vs. Current

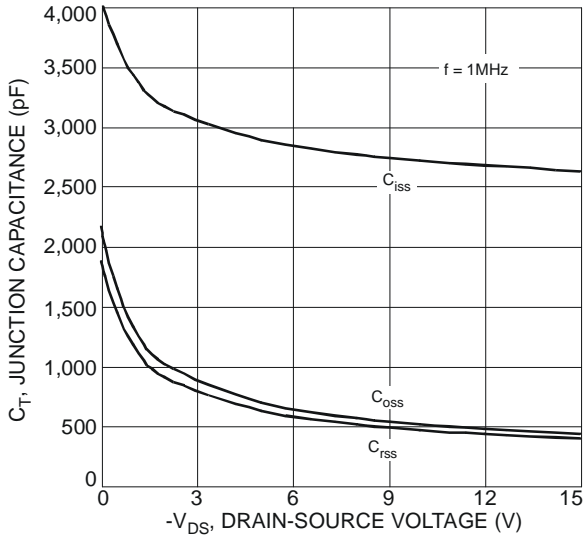


Fig. 12 Typical Junction Capacitance

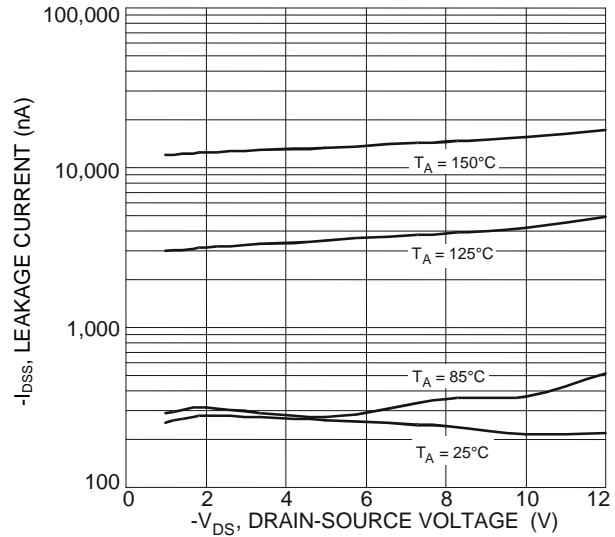


Fig. 13 Typical Drain-Source Leakage Current vs. Voltage

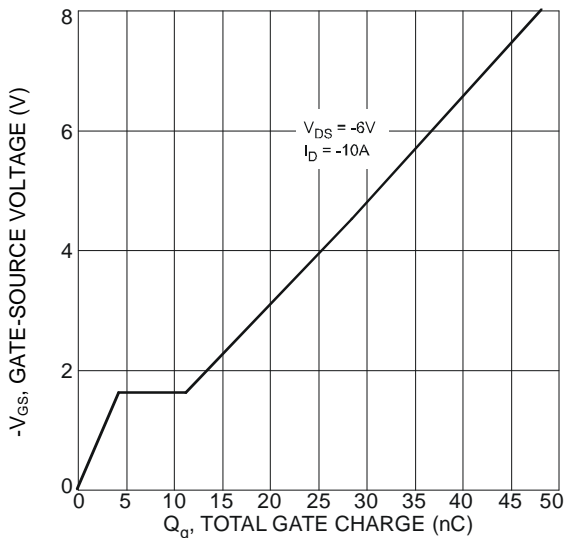
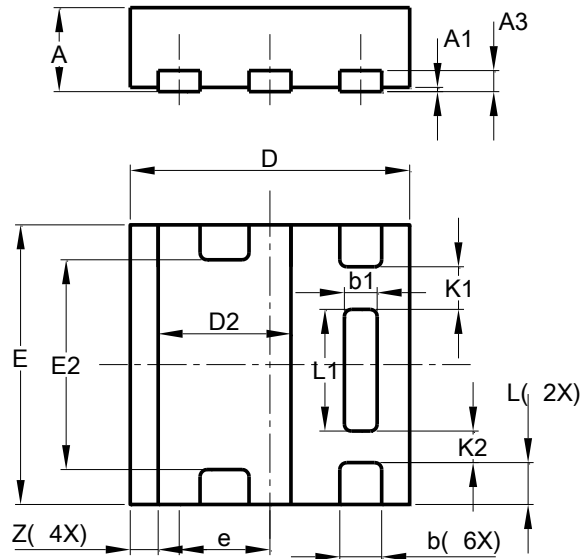


Fig. 14 Gate-Charge Characteristics

**Package Outline Dimensions**

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

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

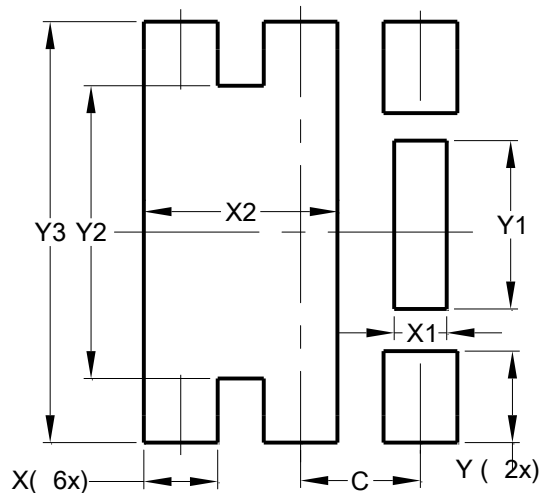


U-DFN2020-6 (Type E)			
Dim	Min	Max	Typ
A	0.57	0.63	0.60
A1	0	0.05	0.03
A3	-	-	0.15
b	0.25	0.35	0.30
b1	0.185	0.285	0.235
D	1.95	2.05	2.00
D2	0.85	1.05	0.95
E	1.95	2.05	2.00
E2	1.40	1.60	1.50
e	-	-	0.65
L	0.25	0.35	0.30
L1	0.82	0.92	0.87
K1	-	-	0.305
K2	-	-	0.225
Z	-	-	0.20
All Dimensions in mm			

**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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