

## Summary

$V_{(BR)DSS}$	$R_{DS(on) \max}$	$I_D \max$
-12V	29mΩ @ $V_{GS} = -4.5V$	-6.6 A
	45mΩ @ $V_{GS} = -2.5V$	-5.3 A
	60mΩ @ $V_{GS} = -1.8V$	-4.6 A
	100mΩ @ $V_{GS} = -1.5V$	-3.5 A

## Applications

This device provides high performance, low  $R_{DS(ON)}$  P Channel MOSFETs in the thermally and space efficient X1-DFN1616-6 package. The low  $R_{DS(ON)}$  of this MOSFET ensures conduction losses are kept making it ideal for use as a:

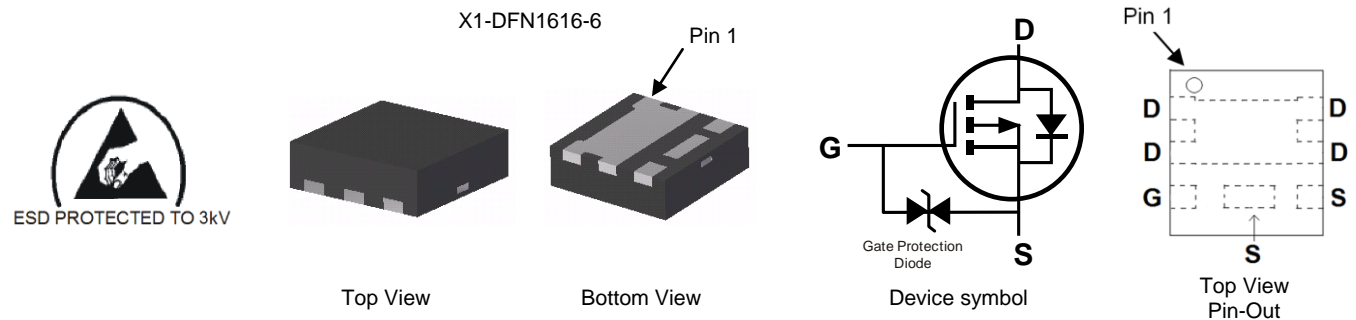
- Battery Disconnect Switch
- Load Switch for Power Management Functions

## Features and Benefits

- Typical off board profile of 0.5mm ideally suited for thin applications
- Low  $R_{DS(ON)}$  minimizes conduction losses
- PCB footprint of 2.56mm<sup>2</sup>
- 3kV ESD Protected Gate – protection against human borne ESD**
- 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**

## Mechanical Data

- Case: X1-DFN1616-6
- Case Material: Molded Plastic, “Green” Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Lead Free Plating (NiPdAu Finish over Copper Leadframe)
- Terminals: Solderable per MIL-STD-202, Method 208 Ⓔ4
- Weight: 0.04 grams (Approximate)



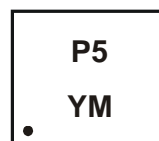
## Ordering Information (Note 4)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DMP1245UFCL-7	P5	7	8	3,000

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  - 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.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information

X1-DFN1616-6



P5 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: Y = 2011)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2011	...	2014	2015	2016	2017	2018	2019	2020	2021		
Code	Y	...	B	C	D	E	F	G	H	I		
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<sub>A</sub> = +25°C unless otherwise specified.)

Characteristic	Symbol	Value	Units
Drain-Source Voltage	V <sub>DS</sub>	-12	V
Gate-Source Voltage	V <sub>GS</sub>	±8	V
Continuous Drain Current (Note 6)	I <sub>D</sub>	-6.6 -5.25	A
		@ T <sub>A</sub> = +25°C @ T <sub>A</sub> = +70°C	
Pulsed Drain Current	I <sub>DM</sub>	-16.67	A
		T <sub>P</sub> = 10μs	

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

Characteristic	Symbol	Value	Units
Total Power Dissipation	P <sub>D</sub>	613	mW
		1.7	W
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	204	°C/W
		74	
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

Notes: 5. For a device surface mounted on minimum recommended pad layout, in still air conditions; the device is measured when operating in a steady state condition.  
6. For a device surface mounted on 25mm by 25mm by 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions; the device is measured when operating in a steady state condition.

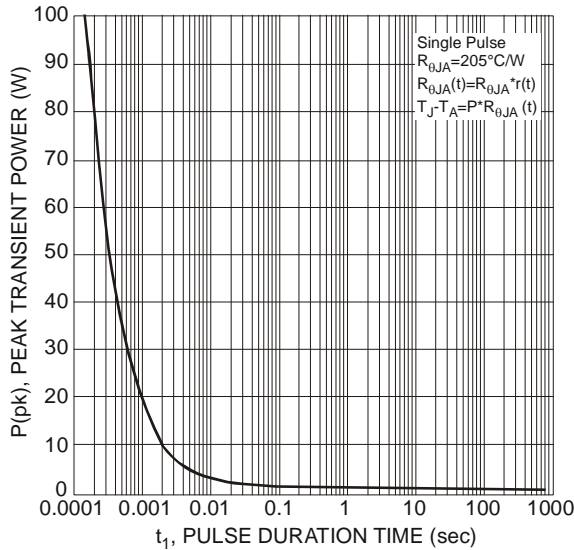


Fig. 1 Single Pulse Maximum Power Dissipation

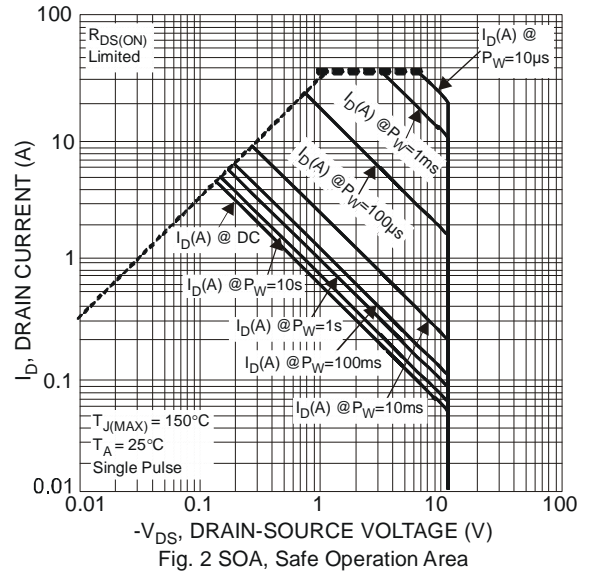


Fig. 2 SOA, Safe Operation Area

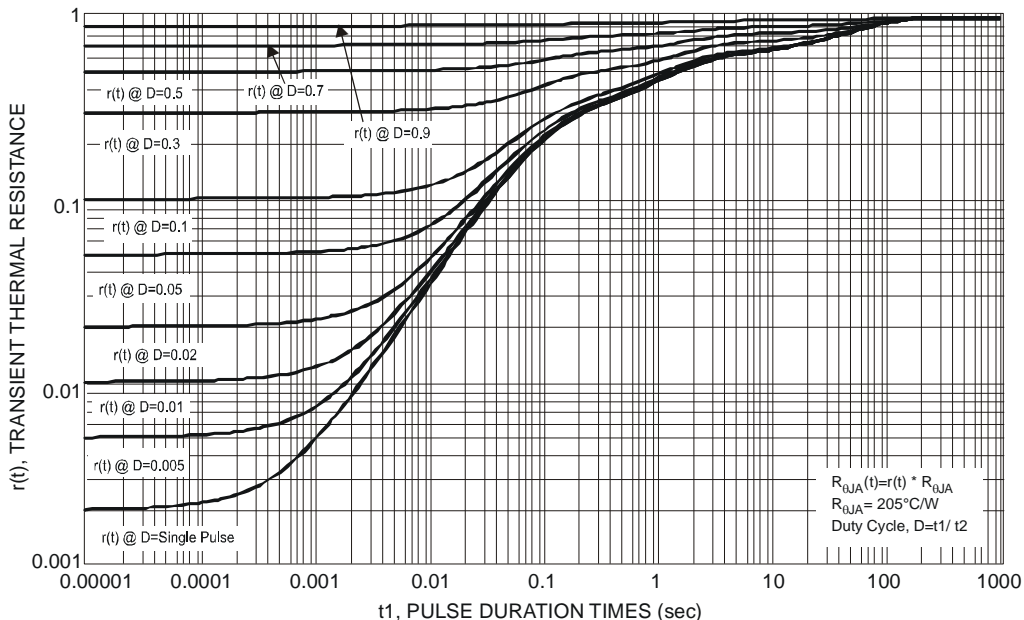


Fig. 03 Transient Thermal Resistance

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</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>	—	—	-1	μA	V <sub>DS</sub> = -12.0V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10	μA	V <sub>GS</sub> = ±8.0V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.3	-0.6	-0.95	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	—	25	29	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A
		—	31	45		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -3.5A
		—	40	60		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -1A
		—	60	100		V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -0.5A
Forward Transfer Admittance	Y <sub>fs</sub>	0.4	3	-	S	V <sub>DS</sub> = -5V, I <sub>D</sub> = -2A
Diode Forward Voltage	V <sub>SD</sub>	-	-	-1.0	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -2A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	-	1357.4	-	pF	V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	-	499	-	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	-	273.6	-	pF	
Gate Resistance	R <sub>g</sub>	-	14.26	-	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge	Q <sub>g</sub>	-	16.1	-	nC	V <sub>GS</sub> = -4.5V I <sub>D</sub> = -1A, V <sub>DS</sub> = -10V
		-	26.1	-	nC	
Gate-Source Charge	Q <sub>gs</sub>	-	1.71	-	nC	
Gate-Drain Charge	Q <sub>gd</sub>	-	20.48	-	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	-	15.2	-	ns	V <sub>GS</sub> = -2.5V, V <sub>DS</sub> = -10V I <sub>D</sub> = -180mA, R <sub>G</sub> = 2.0Ω,
Turn-On Rise Time	t <sub>r</sub>	-	33.11	-	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	-	219.4	-	ns	
Turn-Off Fall Time	t <sub>f</sub>	-	217.64	-	ns	

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

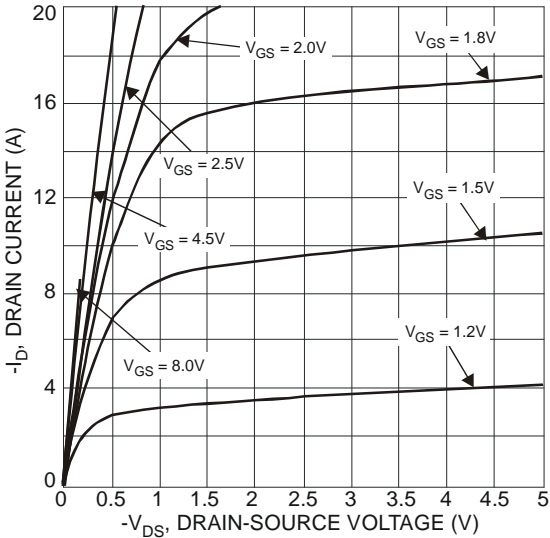


Fig. 4 Typical Output Characteristics

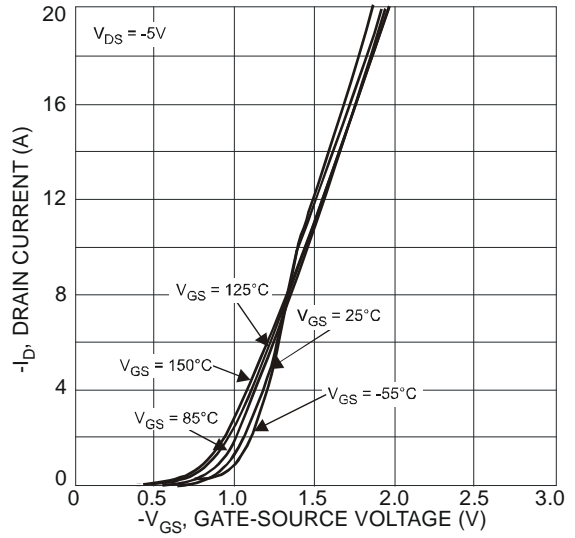


Fig. 5 Typical Transfer Characteristic

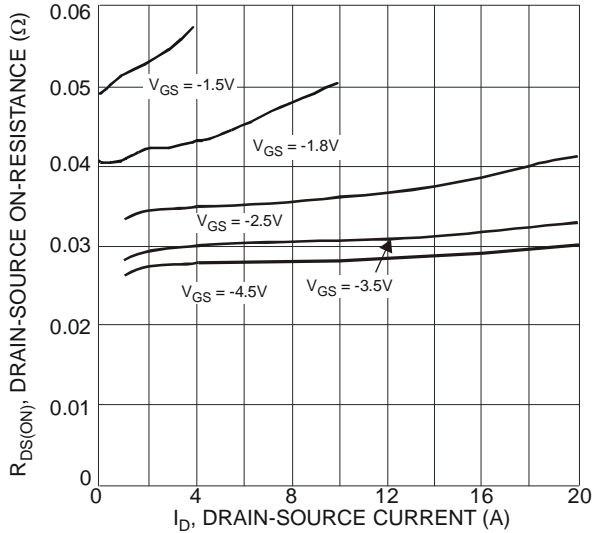


Fig. 6 Typical On-Resistance vs. Drain Current and Gate Voltage

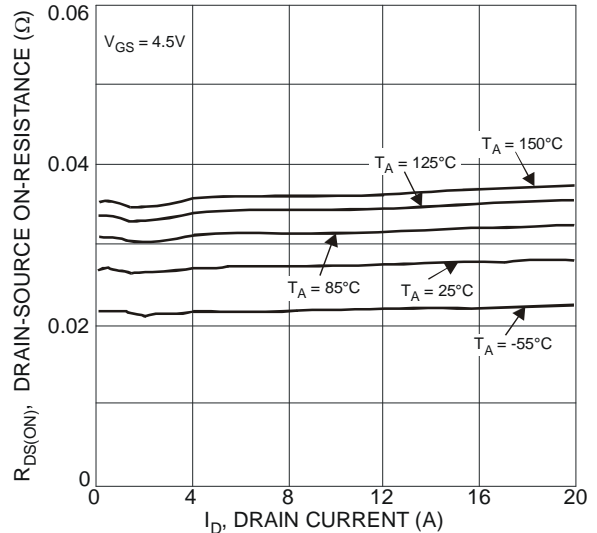


Fig. 7 Typical On-Resistance vs. Drain Current and Temperature

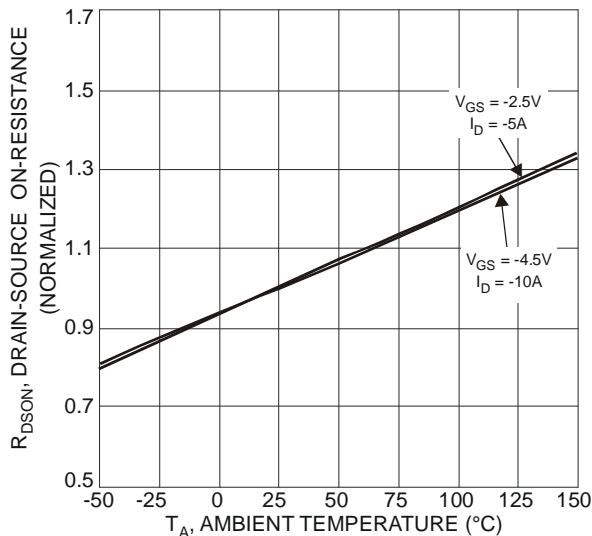


Fig. 8 On-Resistance Variation with Temperature

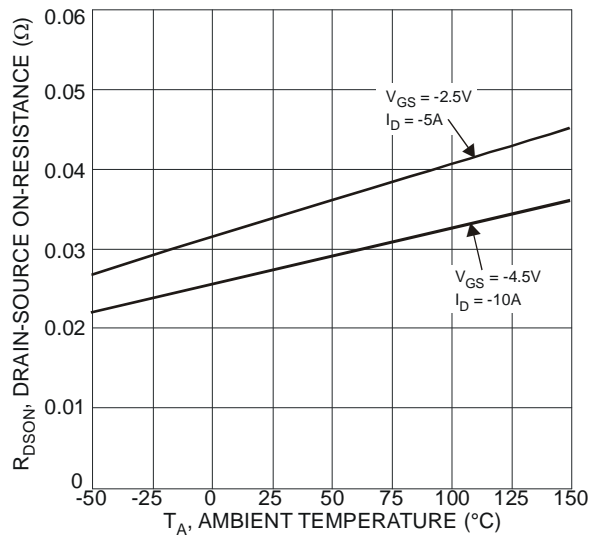


Fig. 9 On-Resistance Variation with Temperature

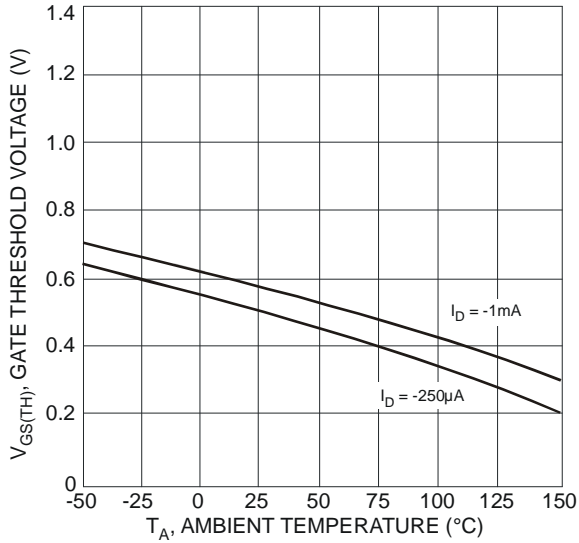


Fig. 10 Gate Threshold Variation vs. Ambient Temperature

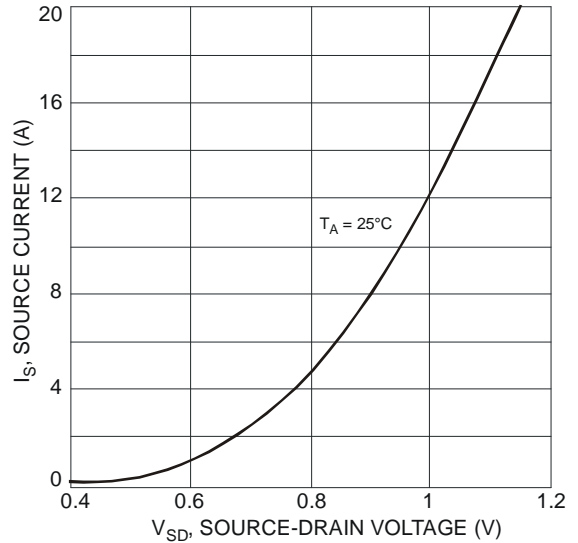


Fig. 11 Diode Forward Voltage vs. Current

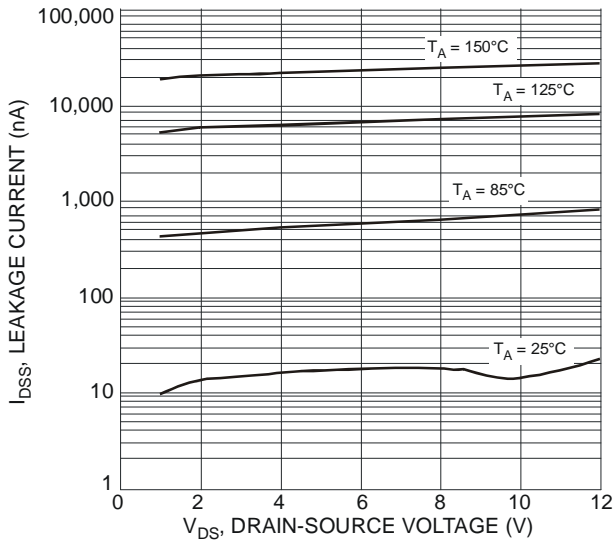


Fig. 12 Typical Drain-Source Leakage Current vs. Voltage

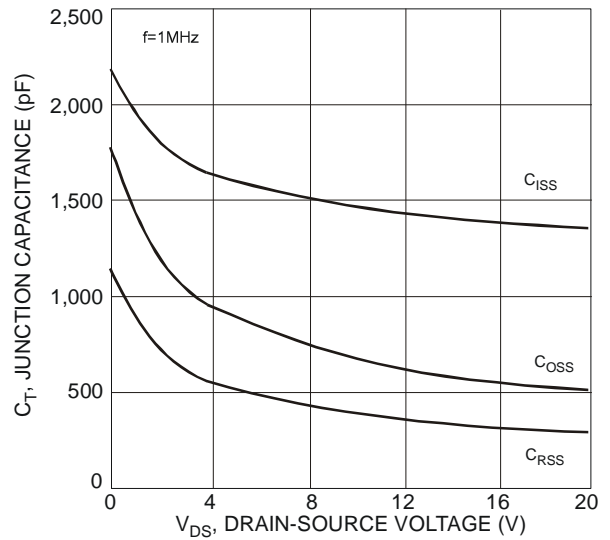


Fig. 13 Typical Junction Capacitance

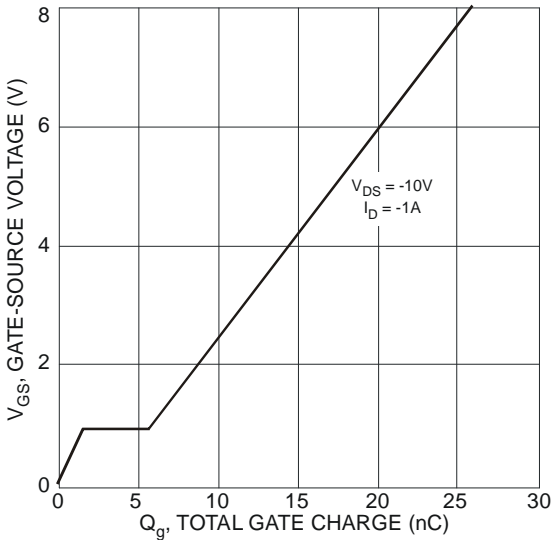
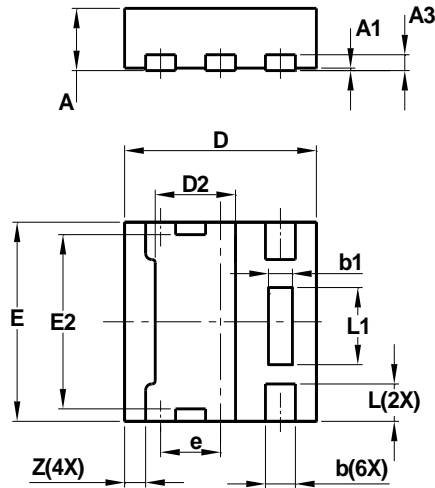


Fig. 14 Gate-Charge Characteristics

## Package Outline Dimensions

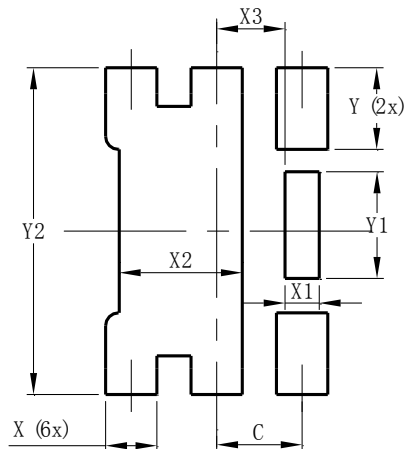
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



X1-DFN1616-6 Type E			
Dim	Min	Max	Typ
A	0.47	0.53	0.50
A1	0	0.05	0.02
A3	—	—	0.13
b	0.20	0.30	0.25
b1	0.10	0.30	0.20
D	1.55	1.65	1.60
D2	0.57	0.77	0.67
E	1.55	1.65	1.60
E2	1.30	1.50	1.40
e	—	—	0.50
L	0.25	0.35	0.30
L1	0.52	0.72	0.62
Z	—	—	0.175
All Dimensions in mm			

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for latest version.



Dimensions	Value (in mm)
C	0.500
X	0.300
X1	0.200
X2	0.720
X3	0.400
Y	0.475
Y1	0.620
Y2	1.900

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