

Description

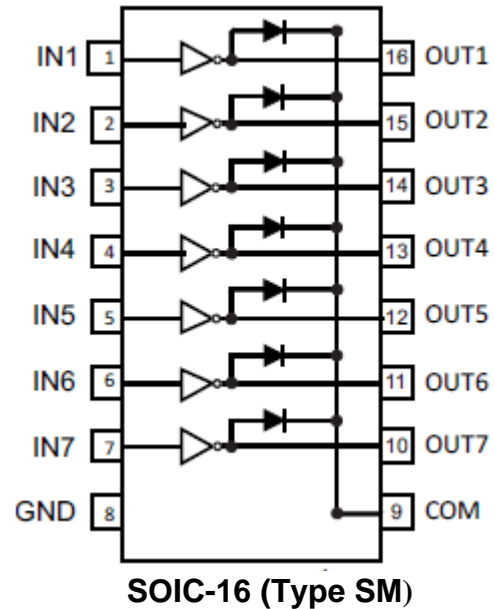
The DIODES™ ULN62003A is a high-voltage, high-current transistor array containing seven open drain devices, with all of their sources connected to a common ground. The transistors are rated at 500mA with each having a clamp diode for protection needed for driving inductive loads.

The DMOS output construction has a lower on-resistance than the common bipolar devices reducing power dissipation, allowing the designer additional flexibility to control more devices and maintain the desired die temperature.

These devices are capable of driving multiple load types such as solenoids, relays, DC motors, LED displays, filament lamps, thermal print-heads, and high-power buffers.

The device is pinned in opposition to simplify board layout and is a direct replacement for many common peripheral drivers. The ULN62003A is available in an industry-standard, small outline, 16-pin package (SO-16).

Pin Assignments



Features

- 500mA Rated Drain Current (Single Output)
- High Voltage Outputs: 50V
- Output Clamp Diodes
- Inputs Compatible with Popular Logic Types
- Relay Driver Applications
- **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-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

Applications

- Appliances
 - Window A/Cs
 - Washers/Dryers
 - Microwaves/Ranges/Ovens
- Industrial and agricultural automation
- Residential and industrial HVAC systems
- Stepper motor drivers
- Thermal print heads

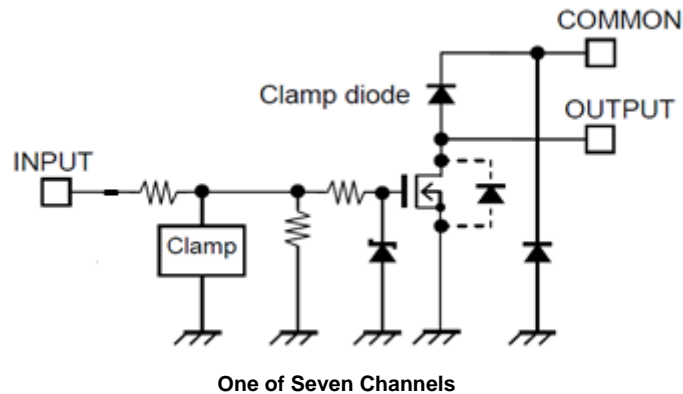
Notes:

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.

Pin Descriptions

Pin Number	Pin Name	Function
SO-16		
1	IN1	Input Pair 1
2	IN2	Input Pair 2
3	IN3	Input Pair 3
4	IN4	Input Pair 4
5	IN5	Input Pair 5
6	IN6	Input Pair 6
7	IN7	Input Pair 7
8	GND	Common Source (Ground)
9	COM	Common Clamp Diodes
10	OUT7	Output Pair 7
11	OUT6	Output Pair 6
12	OUT5	Output Pair 5
13	OUT4	Output Pair 4
14	OUT3	Output Pair 3
15	OUT2	Output Pair 2
16	OUT1	Output Pair 1

Functional Block Diagram



Absolute Maximum Ratings (Note 4) (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter		Rating	Unit
V _{out}	Output Voltage		50	V
V _R	Clamp Diode Reverse Voltage (Note 5)		50	V
V _I	Input Voltage (Note 5)		-1 to 30	V
I _F	Clamp Diode forward current		500	mA
I _{Out}	Output Current		500	mA
θ _{JA}	Thermal Resistance Junction-to-Ambient (Note 6)	SO-16	120	°C/W
θ _{JC}	Thermal Resistance Junction-to-Case (Note 7)	SO-16	28	°C/W
T _J	Junction Temperature		+150	°C
T _{STG}	Storage Temperature		-65 to +150	°C

- Notes:
- Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
 - All voltage values are with respect to the GND (Pin8), unless otherwise noted.
 - Maximum power dissipation is a function of T_{J(max)}, θ_{JA} and T_A. The maximum allowable power dissipation at any allowable ambient temperature is P_D = (T_{J(max)} - T_A)/θ_{JA}. Operating at the absolute maximum T_J of +150°C can affect reliability.
 - Maximum power dissipation is a function of T_{J(max)}, θ_{JC} and T_A. The maximum allowable power dissipation at any allowable ambient temperature is P_D = (T_{J(max)} - T_C)/θ_{JC}. Operating at the absolute maximum T_J of +150°C can affect reliability.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V _{CC}	Drain to Source Voltage	—	50	V
T _A	Operating Ambient Temperature	-40	+125	°C

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

ULN62003A								
	Parameter	Test Figure	Test Conditions		Min	Typ	Max	Unit
V _{out}	Output Voltage	-	-	-	-	-	50	V
V _{com}	COMMON Pin Voltage	-	-	-	0	-	50	V
I _{out}	Output Current	-	1 circuit on	-	0	-	400	mA
		Duty=10%	7 circuit on	T _{pw} =25ms T _A =+85°C T _J =+125°C	-	-	270	mA
		Duty=50%	7 circuits on	T _{pw} =25ms T _A =+85°C T _J =+125°C	-	-	120	mA
V _{in(on)}	Input Voltage	-	I _{out} =100mA or upper	V _{out} =2V	2.5	-	25	V
V _{in(off)}	Input Voltage	-	I _{out} =100uA or less	V _{out} =2V	0	-	0.6	V
I _F	Clamp Diodes Forward Current	-	-	-	-	-	400	mA
I _{leak}	Output Leakage Current	1	V _{out} =50V T _A =85°C	V _{in} =0V	-	-	1	μA
V _{ds}	Output Voltage (Output On-Resistance)	2	I _{out} =350mA	V _{in} =5.0V	-	0.7	1.14	V
			-	-	-	2.0	3.25	Ω
			I _{out} =200mA	V _{in} =5V	-	0.4	0.65	V
			-	-	-	2	3.25	Ω
			I _{out} =100mA	V _{in} =5V	-	0.2	0.325	V
			-	-	-	2.0	3.25	Ω
I _{in(On)}	Input Current (Output On)	3	V _{in} =2.5V	-	-	-	0.1	mA
I _{in(Off)}	Input Current (Output Off)	4	V _{in} =0 T _A =85°C	-	-	-	1	μA
I _{in(Off)_N}	Input Current (Output Off)	3	V _{in} = -1.0V, T _A =0~85°C	-	-	0.1	4	mA
V _{in(On)}	Input Voltage (Output On)	5	I _{out} =100mA	V _{out} =2V	-	-	2.5	V
I _R	Clamp Diodes Reverse Current	6	V _R =50V	T _A =85°C	-	-	1.0	μA
V _F	Clamp Diodes Forward Voltage	7	I _F =350mA	-	-	-	2.0	V
t _{on}	Turn-On Delay	8	V _{out} =50V	R _L =125Ω/CL=15Pf	-	0.4	-	uS
t _{off}	Turn-Off Delay	8	-	-	-	0.8	-	uS

Parameter Measurement Circuits

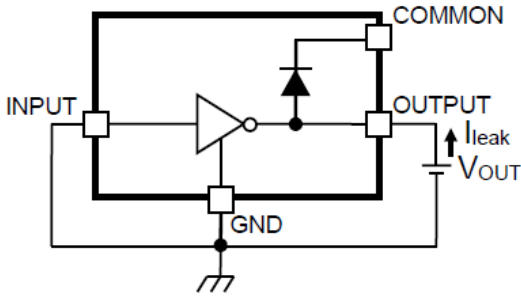


Fig.1 Ileak

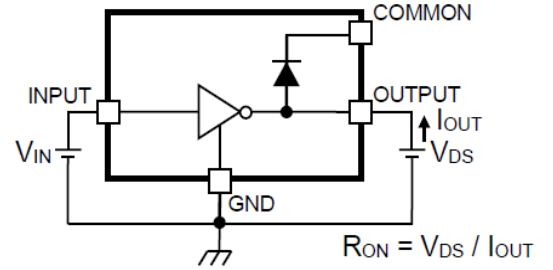


Fig.2 VDS

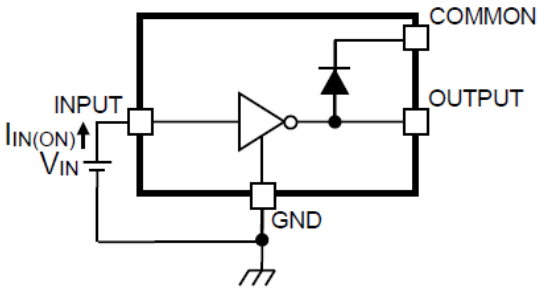


Fig.3 IIN(ON)

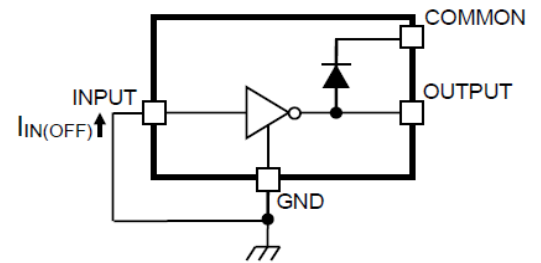


Fig.4 IIN(OFF)

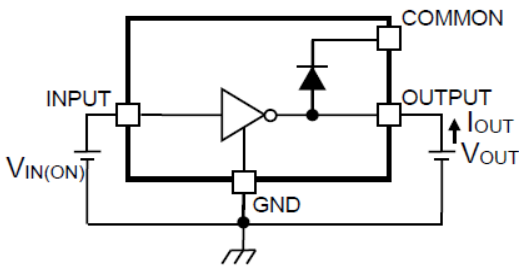


Fig.5 VIN(ON)

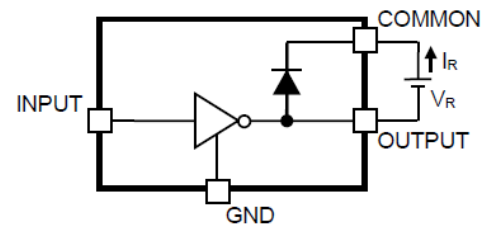


Fig.6 IR

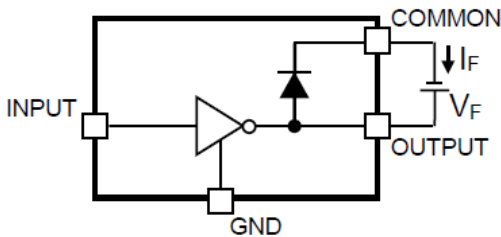


Fig.7 VF

Parameter Measurement Circuits (continued)

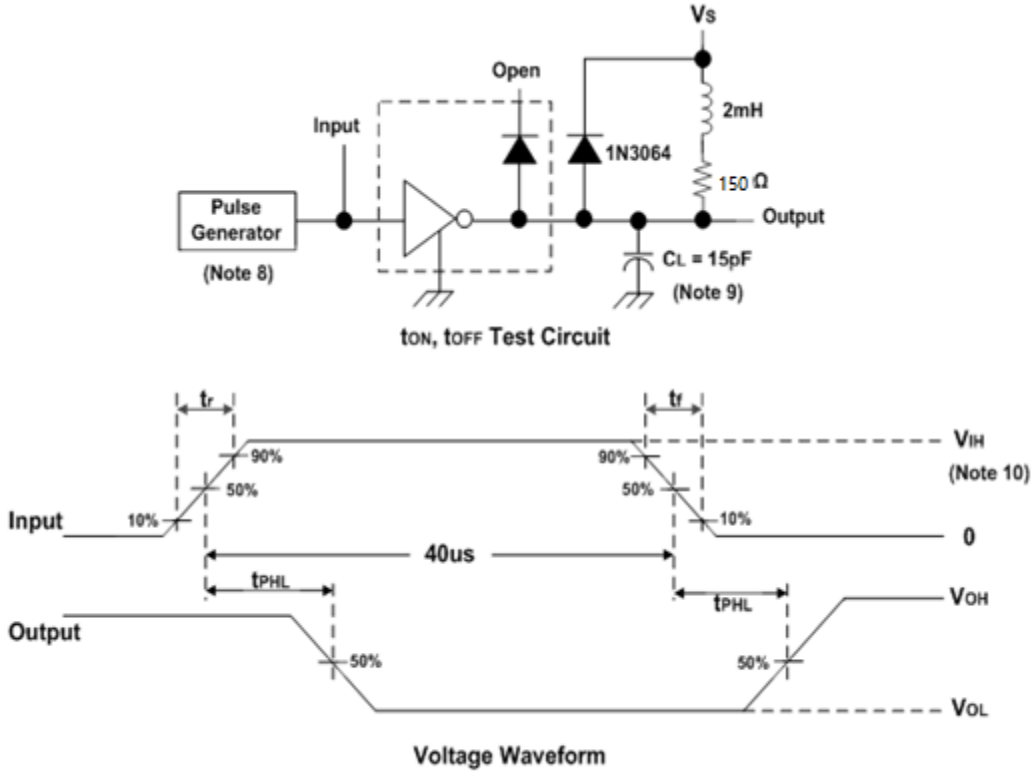
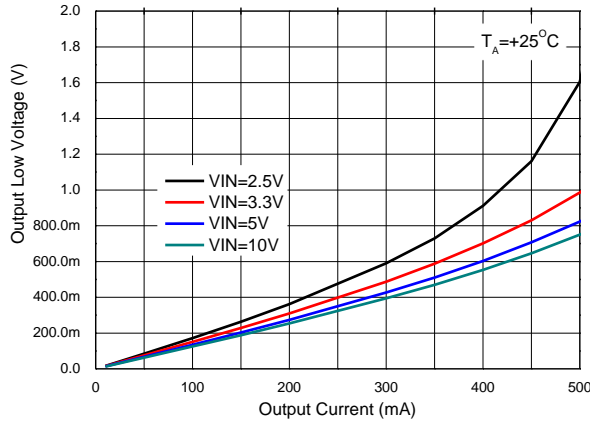


Fig. 9 Latch-Up Test Circuit and Voltage Waveform

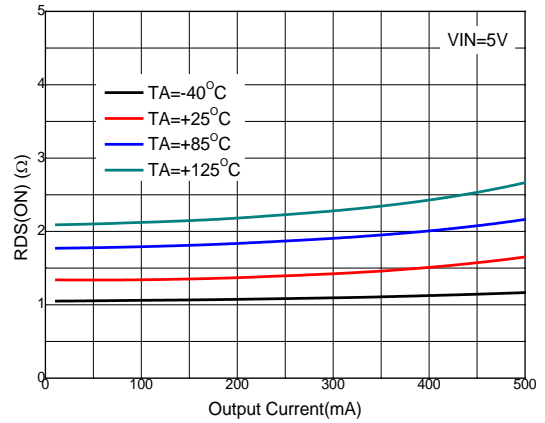
- Notes:
- 8. The pulse generator has the following characteristics: Pulse Width = 12.5Hz, output impedance 50Ω, $t_r \leq 5\text{ns}$, $t_f \leq 10\text{ns}$.
 - 9. C_L includes probe and jig capacitance.
 - 10. For testing for the ULN62003A, $V_{IH} = 5\text{V}$

Typical Performance Characteristics

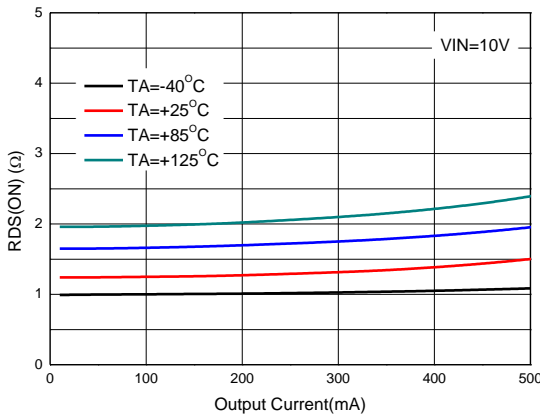
Output Low Voltage vs. Output Sink Current (One Darlington)



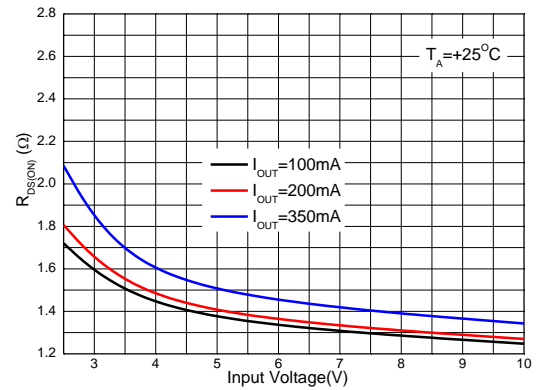
MOSFET ON Resistor VS. Output Current



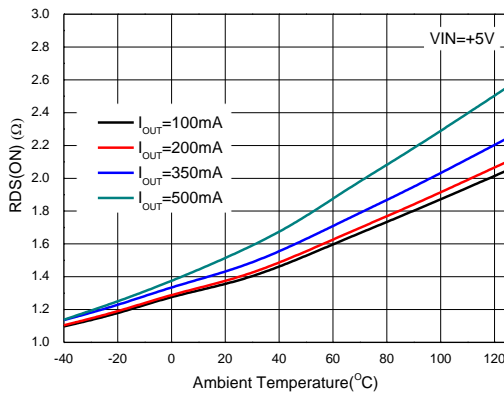
MOSFET ON Resistor VS. Output Current



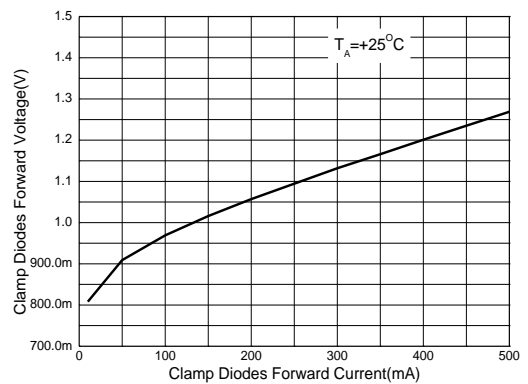
MOSFET ON Resistor VS. Input Voltage



MOSFET ON Resistor VS. Temperature

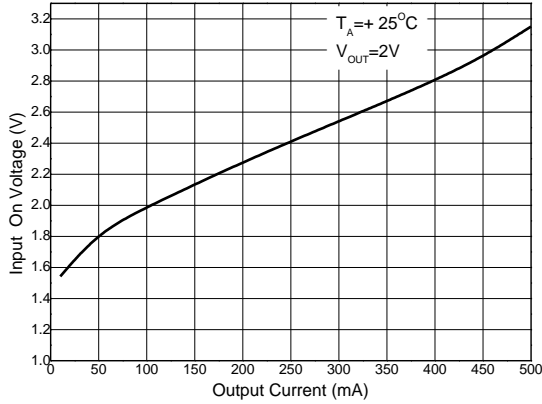


Clamp Diode Forward Voltage VS. Forward Current

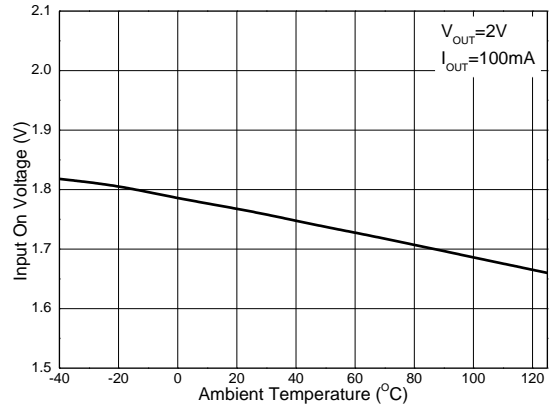


Typical Performance Characteristics (continued)

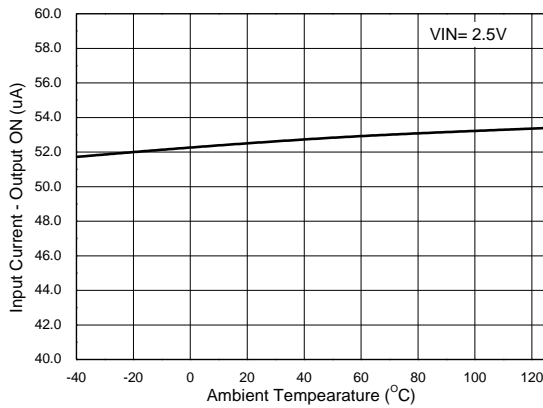
Input On Voltage



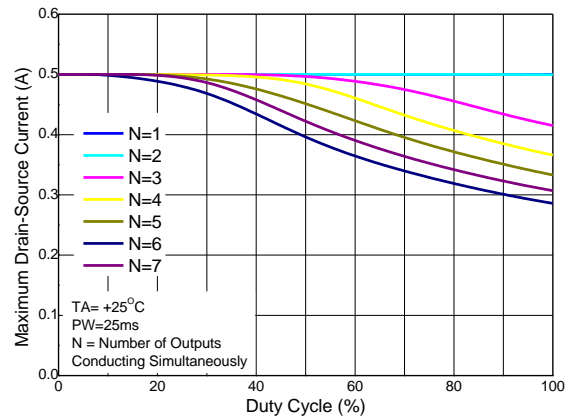
Input On Voltage VS. Temperature



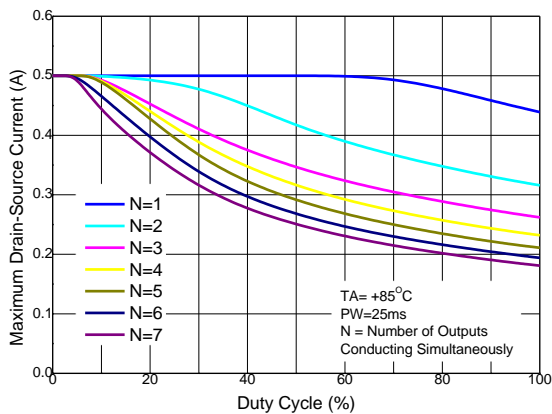
Input On Current VS. Temperature



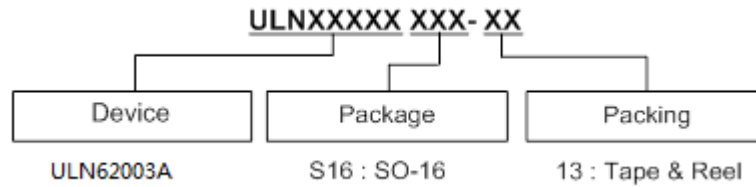
Max. Drain-Source Current VS. Duty Cycle



Max. Drain-Source Current VS. Duty Cycle



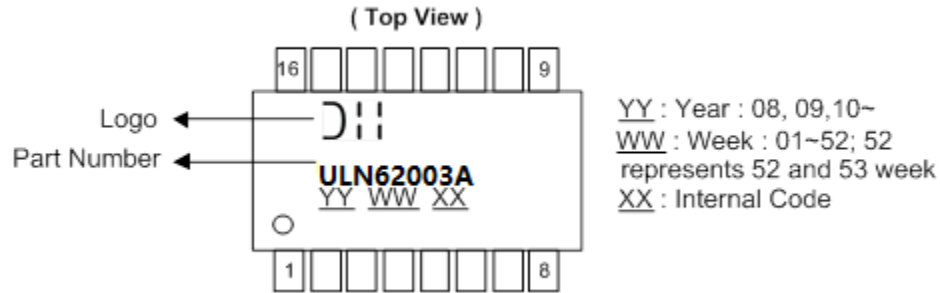
Ordering Information



Part Number	Package Code	Package	13" Tape and Reel		Tube	
			Quantity	Part Number Suffix	Quantity	Part Number Suffix
ULN62003AS16-13	S16	SO-16	4,000/Tape & Reel	-13	NA	NA

Marking Information

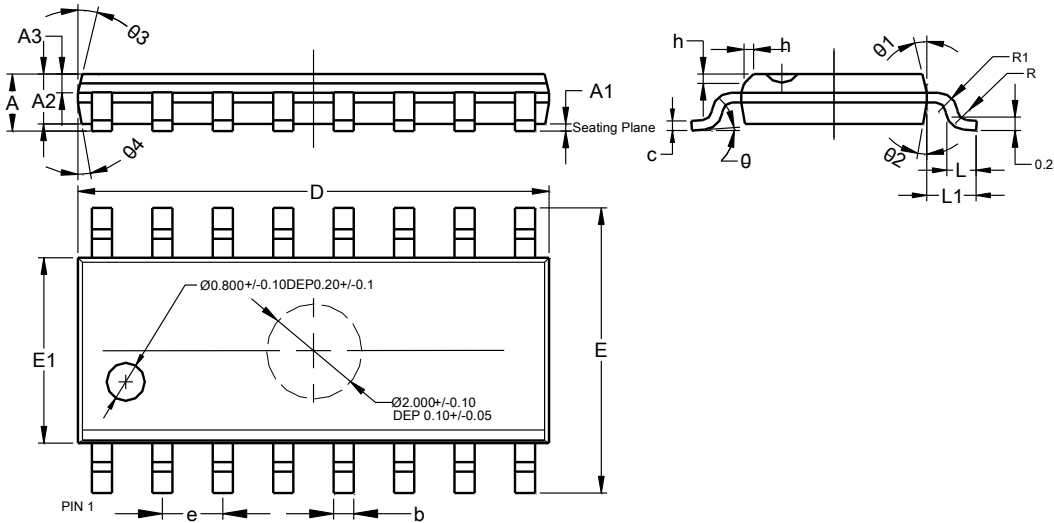
(1) SO-16



Package Outline Dimensions

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

SO-16 (Type SM)

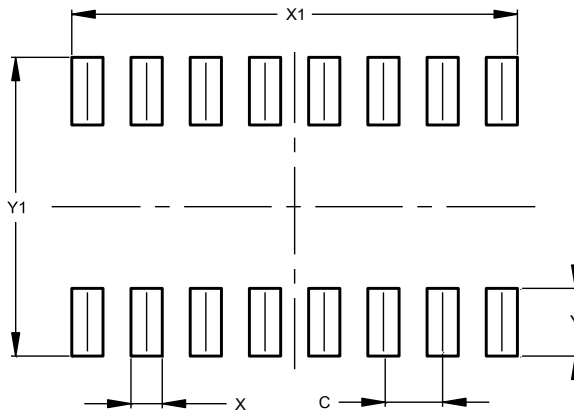


SO-16 (Type SM)			
Dim	Min	Max	Typ
A	1.35	1.75	1.60
A1	0.10	0.25	0.15
A2	1.25	1.65	1.45
A3	0.55	0.75	0.65
b	0.36	0.51	--
c	0.17	0.25	--
D	9.80	10.00	9.90
E	5.80	6.20	6.00
E1	3.80	4.00	3.90
e	1.27BSC		
h	0.30	0.50	0.40
L	0.45	0.80	0.60
L1	1.04REF		
R	0.07	--	--
R1	0.07	--	--
θ	0°	8°	--
θ_1	10°	14°	12°
θ_2	8°	12°	10°
θ_3	10°	14°	12°
θ_4	8°	12°	10°
All Dimensions in mm			

Suggested Pad Layout

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

SO-16 (Type SM)



Dimensions	Value (in mm)
C	1.270
X	0.670
X1	9.560
Y	1.450
Y1	6.400

Mechanical Data

- Moisture Sensitivity: Level 3 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.16 grams (Approximate)

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