A product Line of
Diodes Incorporated

PS508/PS509

Precision 8-Channels, Differential 4-Channels, 36V Analog Multiplexers

Features

- Low On-Capacitance
  - PS508: 30pF
  - PS509: 20pF
- Low Input Leakage: 30pA
- Low Charge Injection: 0.9pC
- Rail-to-Rail Operation
- Wide Supply Range: ±5V to ±18V, 10V to 36V
- Low On-Resistance: 125Ω
- Transition Time: 171ns
- Break-Before-Make Switching Action
- EN Pin Connectable to VDD
- Logic Levels: 2V to VDD
- Low Supply Current: 135µA
- ESD Protection HBM: 2000V
- 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 contact us or your local Diodes representative.
  https://www.diodes.com/quality/product-definitions/
- Packaging (Pb-free & Green):
  - 16-pin TSSOP (L)
  - 16-pin QSOP (Q)
  - 16-pin SOIC (W)

Description

The PS508 and PS509 are modern, complementary metal-oxide semiconductor (CMOS), analog multiplexers (muxes). The PS508 offers 8:1 single-ended channels, whereas the PS509 offers differential 4:1 or dual 4:1 single-ended channels. The PS508 and PS509 work equally well with either dual supplies (±5V to ±18V) or a single supply (10 V to 36 V). They also perform well with symmetric supplies (such as VDD = 12V, VSS = –12V), and unsymmetric supplies (such as VDD = 12V, VSS = –5V). All digital inputs have TTL-logic compatible thresholds, ensuring both TTL and CMOS logic compatibility when operating in the valid supply voltage range.

The PS508 and PS509 have very low on and off leakage currents, allowing these multiplexers to switch signals from high input impedance sources with minimal error. A low supply current of 135 µA allows for use in portable applications.

Applications

- Factory Automation and Industrial Process Controls
- Programmable Logic Controllers (PLC)
- Analog Input Modules
- ATE Test Equipment
- Digital Multimeters
- Battery Monitoring Systems

Truth Tables

PS509			
EN	**A1**	**A0**	**STATE**
0	X*	X*	All channels are off
1	0	0	Channels 1A and 1B on
1	0	1	Channels 2A and 2B on
1	1	0	Channels 3A and 3B on
1	1	1	Channels 4A and 4B on

* X denotes don't care.

Truth Tables

PS508				
EN	**A2**	**A1**	**A0**	**STATE**
0	X*	X*	X*	All channels are off
1	0	0	0	Channel 1 on
1	0	0	1	Channel 2 on
1	0	1	0	Channel 3 on
1	0	1	1	Channel 4 on
1	1	0	0	Channel 5 on
1	1	0	1	Channel 6 on
1	1	1	0	Channel 7 on
1	1	1	1	Channel 8 on

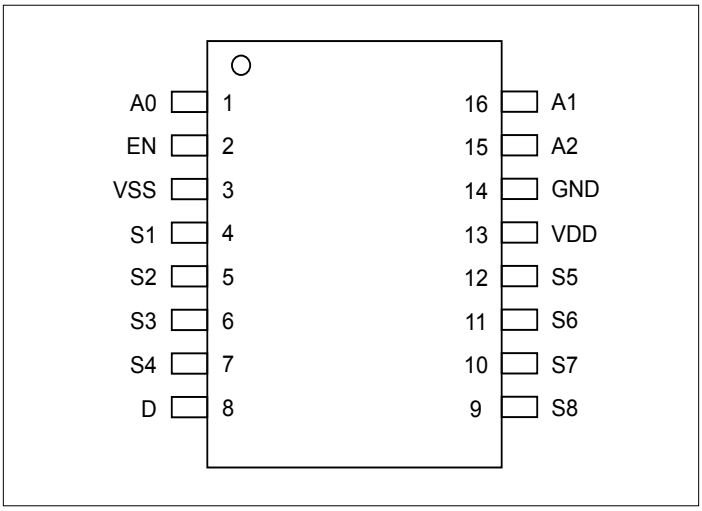
* X denotes don't care.

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.

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Pin Configuration PS508



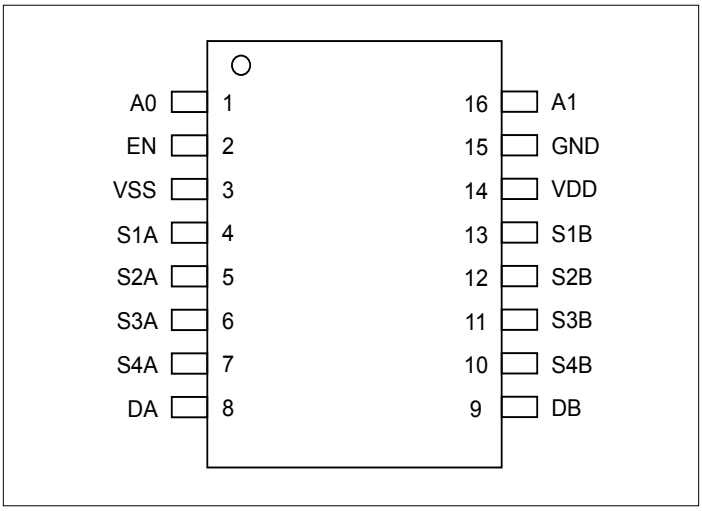
Pin Description

Pin#	Pin Name	Type	Description
1	A0	I	Address line 0.
16	A1	I	Address line 1.
15	A2	I	Address line 2.
8	D	I/O	Drain pin.
2	EN	I	Active high digital input. When this pin is low, all switches are turned off. When this pin is high, the A[2:0] logic inputs determine which switch is turned on.
14	GND	Power	Ground.
4	S1	I/O	Source pin 1.
5	S2	I/O	Source pin 2.
6	S3	I/O	Source pin 3.
7	S4	I/O	Source pin 4.
12	S5	I/O	Source pin 5.
11	S6	I/O	Source pin 6.
10	S7	I/O	Source pin 7.
9	S8	I/O	Source pin 8.
13	VDD	Power	Positive power supply. This pin is the most positive power-supply potential. For reliable operation, connect a decoupling capacitor ranging from 0.1µF to 10µF between VDD and GND.
3	VSS	Power	Negative power supply. This pin is the most negative power-supply potential. In single-supply applications, this pin can be connected to ground. For reliable operation, connect a decoupling capacitor ranging from 0.1µF to 10µF between VSS and GND.

Note: I = Input, O = Output and I/O = Input/Output

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Pin Configuration PS509



Pin Description

Pin#	Pin Name	Type	Description
1	A0	I	Address line 0.
16	A1	I	Address line 1.
8	DA	I/O	Drain pin A. Can be an input or output.
9	DB	I/O	Drain pin B. Can be an input or output.
2	EN	I	Active high digital input. When this pin is low, all switches are turned off. When this pin is high, the A[1:0] logic inputs determine which pair of switches is turned on.
15	GND	Pwr	Ground (0 V) reference
4	S1A	I/O	Source pin 1A. Can be an input or output.
5	S2A	I/O	Source pin 2A. Can be an input or output.
6	S3A	I/O	Source pin 3A. Can be an input or output.
7	S4A	I/O	Source pin 4A. Can be an input or output.
13	S1B	I/O	Source pin 1B. Can be an input or output.
12	S2B	I/O	Source pin 2B. Can be an input or output.
11	S3B	I/O	Source pin 3B. Can be an input or output.
10	S4B	I/O	Source pin 4B. Can be an input or output.
14	VDD	Pwr	Positive power supply. This pin is the most positive power supply potential. For reliable operation, connect a decoupling capacitor ranging from 0.1 µF to 10 µF between VDD and GND.
3	VSS	Pwr	Negative power supply. This pin is the most negative power supply potential. In single supply applications, this pin can be connected to ground. For reliable operation, connect a decoupling capacitor ranging from 0.1 µF to 10 µF between VSS and GND.

Note: I = Input, O = Output and I/O = Input/Output

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Maximum Ratings

(Above which useful life may be impaired. For user guidelines, not tested.)

Storage Temperature..... –65°C to +150°C
Junction Temperature ..... 150°C
Operating Temperature ..... –40°C to +125°C
Supply Voltage to Ground Potential, V_{DD} .....–0.3V to +40V
Supply Voltage to Ground Potential, V_{SS} .....–40 to +0.3V
Supply Voltage, V_{DD}—V_{SS} ..... +40V
Digital Input Voltage (EN A0, A1, A2 pins).....V_{SS} –0.3 to V_{dd} +0.3V
Digital Input Current (EN A0, A1, A2 pins).....–30 to +30 mA
Analog Input Voltage (Sx, SxA, SxB pins).....V_{SS} –2 to V_{dd} +2V
Analog Input Current (Sx, SxA, SxB pins).....–30 to +30 mA
Analog Output Voltage (D, DA, DB pins).....V_{SS} –2 to V_{dd} +2V
Analog Output Current (D, DA, DB pins).....–30 to +30 mA

Note:

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

ESD Ratings

Symbol	Parameters	Conditions	Value	Units
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1)	2000	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101(2)	500	V

Note:

1. JEDEC document JEP155 states that 500-V HBM allow safe manufacturing with a standard ESD control process.
2. JEDEC document JEP157 states that 250-V HBM allow safe manufacturing with a standard ESD control process.

Recommended Operating Conditions

Symbol	Parameters		Min.	Typ.	Max.	Units
V_{DD} (1)	Positive power-supply voltage	Dual supply	5		18	V
		Single supply	10		36	
V_{SS} (2)	Negative power-supply voltage (dual supply)		-5		-18	V
V_{DD} - V_{SS}	Supply voltage		10		36	V
VS	Source pins voltage(3)		V_{SS}		V_{DD}	V
VD	Drain pins voltage		V_{SS}		V_{DD}	V
V_{EN}	Enable pin voltage		V_{SS}		V_{DD}	V
VA	Address pins voltage		V_{SS}		V_{DD}	V
I_{CH}	Channel current (TA = 25°C)		-25		25	mA
TA	Operating temperature		-40		125	°C

Note:

1. When VSS = 0 V, VDD can range from 10 V to 36 V.
2. VDD and VSS can be any value as long as 10 V ≤(VDD – VSS) ≤36 V, and VDD ≥5 V.
3. VS is the voltage on all the S pins.

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Electrical Characteristics: Dual Supply

At T_A = 25°C, V_{DD} = 15V, and V_{SS} = –15V (unless otherwise noted)

Symbol	Parameters	Conditions		Min.	Typ.	Max.	Units
Analog Switch							
	Analog signal range	T_A = –40°C to +125°C		V_{SS}		V_{DD}	V
R_{ON}	On-resistance	V_S = 0V, I_{CH} = 1mA			125	170	Ω
		V_S = ±10V, I_{CH} = 1mA			145	200	Ω
			T_A = –40°C to +85°C			230	Ω
			T_A = –40°C to +125°C			250	Ω
ΔR_{ON}	On-resistance mismatch between channels	V_S = ±10V, I_{CH} = 1mA			2.4	6	Ω
			T_A = –40°C to +85°C			9	Ω
			T_A = –40°C to +125°C			11	Ω
R_{FLAT}	On-resistance flatness	V_S = 10V, 0V, –10V			22	45	Ω
			T_A = –40°C to +85°C			53	Ω
			T_A = –40°C to +125°C			58	Ω
	On-resistance drift	V_S = 0V			0.52		%/°C
$I_{S(OFF)}$	Input leakage current	Switch state is off, V_S = ±10V, V_D = ±10V[1]		-1	0.03	1	nA
			T_A = –40°C to +85°C	-10		10	nA
			T_A = –40°C to +125°C	-25		25	nA
$I_{D(OFF)}$	Output off leakage current	Switch state is off, V_S = ±10V, V_D = ±10V[1]		-1	0.22	1	nA
			T_A = –40°C to +85°C	-10		10	nA
			T_A = –40°C to +125°C	-50		50	nA
$I_{D(ON)}$	Output on leakage current	Switch state is on, V_D = ±10V, V_S = floating		-1	0.25	1	nA
			T_A = –40°C to +85°C	-10		10	nA
			T_A = –40°C to +125°C	-50		50	nA
Logic Input							
V_{IH}	High-level input voltage			2.0			V
V_{IL}	Low-level input voltage					0.8	V
ID	Input current					0.15	µA
Switch Dynamics[2]							
t_{ON}	Enable turn-on time	V_S = ±10V, R_L = 300Ω, C_L = 35pF			126	210	ns
			T_A = –40°C to +85°C			210	ns
			T_A = –40°C to +125°C			210	ns
t_{OFF}	Enable turn-off time	V_S = ±10V, R_L = 300Ω, C_L = 35pF			125	191	ns
			T_A = –40°C to +85°C			191	ns
			T_A = –40°C to +125°C			191	ns

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Electrical Characteristics: Dual Supply Cont.

Symbol	Parameters	Conditions		Min.	Typ.	Max.	Units
t_t	Transition time	V_S = 10V, R_L = 300Ω, C_L = 35pF,			171	310	ns
			T_A = –40°C to +85°C			310	ns
			T_A = –40°C to +125°C			310	ns
t_{BBM}	Break-before-make time delay	V_S = 10V, R_L = 300Ω, C_L = 35pF, T_A = –40°C to +125°C		30	75		ns
Q_J	Charge injection	C_L = 1nF, R_S = 0Ω	V_S = 0V		0.9		pC
			V_S = –15V to +15V		±2		pC
	Off-isolation	R_L = 50Ω, V_S = $1V_{RMS}$, f = 1MHz	Nonadjacent channel to D, DA, DB		-96		dB
			Adjacent channel to D, DA, DB		-85		dB
	Channel-to-channel crosstalk	R_L = 50Ω, V_S = $1V_{RMS}$, f = 1MHz	Nonadjacent channels		-96		dB
			Adjacent channels		-88		dB
$C_{S(OFF)}$	Input off-capacitance	f = 1MHz, V_S = 0V			5	7	pF
$C_{D(OFF)}$	Output off-capacitance	f = 1MHz, V_S = 0V	PS508		24	30	pF
			PS509		15	20	pF
$C_{D(ON)}$	Input/Output on-capacitance	f = 1MHz, V_S = 0V	PS508		30	36	pF
			PS509		20	25	pF
Power Supply							
	V_{DD} supply current	All V_A = 0V or 3.3V, V_S = 0V, V_{EN} = 3.3V			135	200	µA
			T_A = –40°C to +85°C			200	µA
			T_A = –40°C to +125°C			200	µA
	V_{SS} supply current	All V_A = 0V or 3.3V, V_S = 0V, V_{EN} = 3.3V,			135	200	µA
			T_A = –40°C to +85°C			200	µA
			T_A = –40°C to +125°C			200	µA

Note:

1. When VS is positive, VD is negative, and vice versa.
2. Specified by design, not production tested.

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Electrical Characteristics: Single Supply

at T_A = 25°C, V_{DD} = 12V, and V_{SS} = 0V (unless otherwise noted)

Symbol	Parameters	Conditions		Min.	Typ.	Max.	Units
Analog Switch							
	Analog signal range	T_A = −40°C to +125°C		V_{SS}		V_{DD}	V
R_{ON}	On-resistance	V_S = +10V, I_{CH} = 1mA			235	340	Ω
			T_A = −40°C to +85°C			390	Ω
			T_A = −40°C to +125°C			430	Ω
ΔR_{ON}	On-resistance mismatch between channels	V_S = +10V, I_{CH} = 1mA			3.1	12	Ω
			T_A = −40°C to +85°C			19	Ω
			T_A = −40°C to +125°C			23	Ω
	On-resistance drift	V_S = 10V			0.47		%/°C
$I_{S(OFF)}$	Input leakage current	Switch state is off, V_S = 1V and V_D = 10V, or V_S = 10V and V_D = 1V[1]		-1	0.03	1	nA
			T_A = −40°C to +85°C	-10		10	nA
			T_A = −40°C to +125°C	-25		25	nA
$I_{D(OFF)}$	Output off leakage current	Switch state is off, V_S = 1V and V_D = 10V, or V_S = 10V and V_D = 1V[1]		-1	0.22	1	nA
			T_A = −40°C to +85°C	-10		10	nA
			T_A = −40°C to +125°C	-50		50	nA
$I_{D(ON)}$	Output on leakage current	Switch state is on, V_D = 1V and 10V, V_S = floating		-1	0.25	1	nA
			T_A = −40°C to +85°C	-10		10	nA
			T_A = −40°C to +125°C	-50		50	nA
Logic Input							
V_{IH}	High-level input voltage			2.0			V
V_{IL}	Low-level input voltage					0.8	V
ID	Input current					0.15	µA
Switch Dynamics[2]							
t_{ON}	Enable turn-on time	V_S = 8V, R_L = 300Ω, C_L = 35pF			115	220	ns
			T_A = −40°C to +85°C			220	ns
			T_A = −40°C to +125°C			220	ns
t_{OFF}	Enable turn-off time	V_S = 8V, R_L = 300Ω, C_L = 35pF			118	200	ns
			T_A = −40°C to +85°C			200	ns
			T_A = −40°C to +125°C			200	ns

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Electrical Characteristics: Single Supply Cont.

Symbol	Parameters	Conditions		Min.	Typ.	Max.	Units
t_t	Transition time	V_S = 8V, R_L = 300Ω, C_L= 35pF			212	418	ns
		V_S = 8V, R_L = 300Ω, C_L= 35pF	T_A = –40°C to +85°C			418	ns
		V_S = 8V, R_L = 300Ω, C_L= 35pF	T_A = –40°C to +125°C			418	ns
t_{BBM}	Break-before-make time delay	V_S = 8V, R_L = 300Ω, C_L= 35pF, T_A = –40°C to +125°C		30	120		ns
Q_j	Charge injection	C_L = 1nF, R_S = 0Ω	V_S = 6 V		0.5		pC
			V_S = 0 V to 12 V,		±1.5		pC
	Off-isolation	R_L = 50Ω, V_S = $1V_{RMS}$, f = 1MHz	Nonadjacent channel to D, DA, DB		-96		dB
			Adjacent channel to D, DA, DB		-85		dB
	Channel-to-channel crosstalk	R_L = 50Ω, V_S = $1V_{RMS}$, f = 1MHz	Nonadjacent channels		-96		dB
			Adjacent channels		-88		dB
$C_{S(OFF)}$	Input off-capacitance	f = 1MHz, V_S = 6V			5	7	pF
$C_{D(OFF)}$	Output off-capacitance	f = 1MHz, V_S = 6V	PS508		24	30	pF
			PS509		15	20	pF
$C_{D(ON)}$	Input/Output on-capacitance	f = 1MHz, V_S = 6V	PS508		30	36	pF
			PS509		21	25	pF
Power Supply							
	VDD supply current	All V_A = 0V or 3.3V, V_S= 0V, V_{EN} = 3.3V			104	160	µA
			T_A = –40°C to +85°C			160	µA
			T_A = –40°C to +125°C			160	µA
	VSS supply current	All V_A = 0V or 3.3V, V_S = 0V, V_{EN} = 3.3V			104	160	µA
			T_A = –40°C to +85°C			160	µA
			T_A = –40°C to +125°C			160	µA

Note:

1. When VS is 1 V, VD is 10 V, and vice versa.
2. Specified by design, not production tested.

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Test Circuit

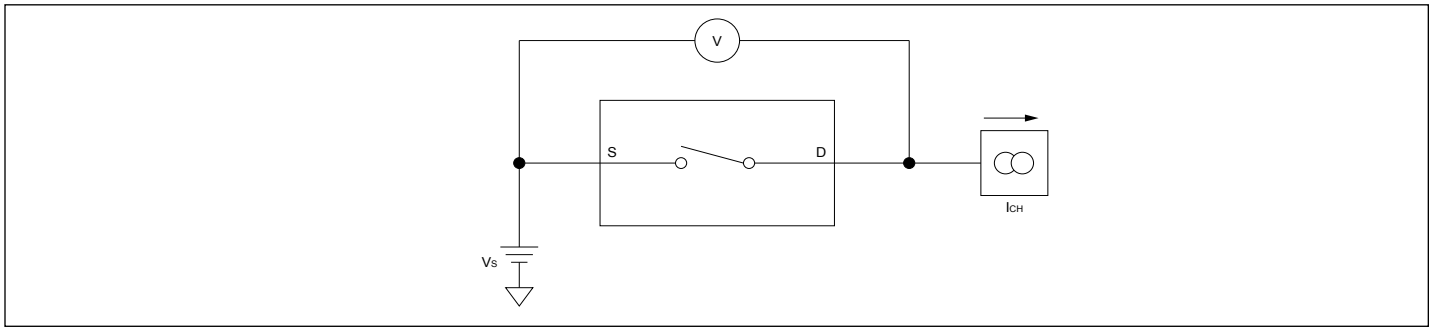


Figure 1. On-Resistance Measurement Setup

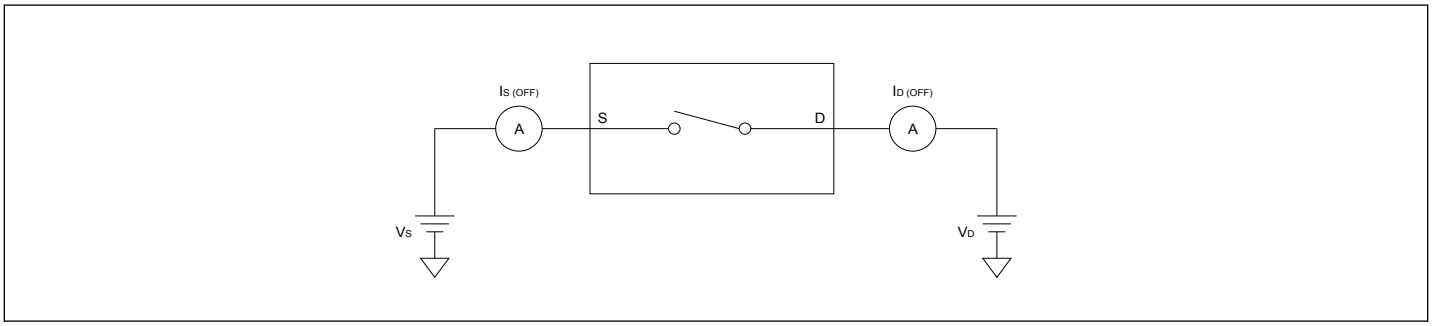


Figure 2. Off-Leakage Measurement Setup

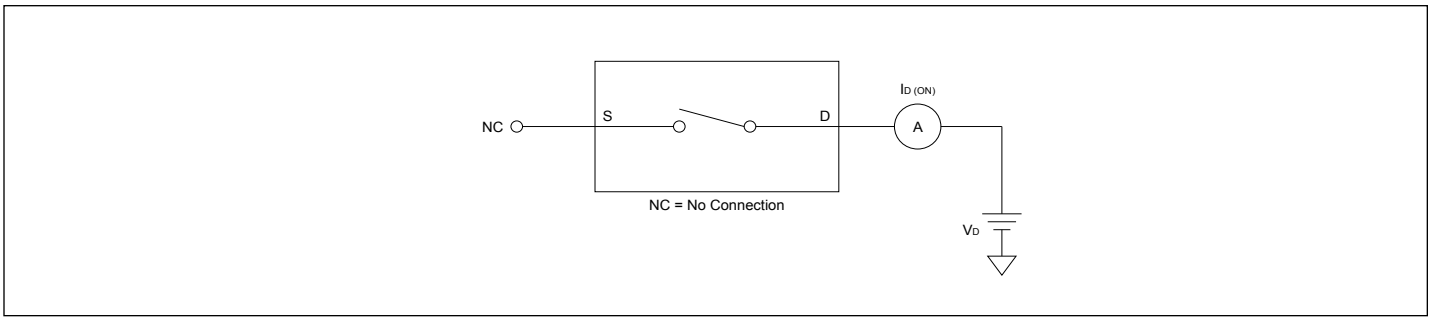


Figure 3. On-Leakage Measurement Setup

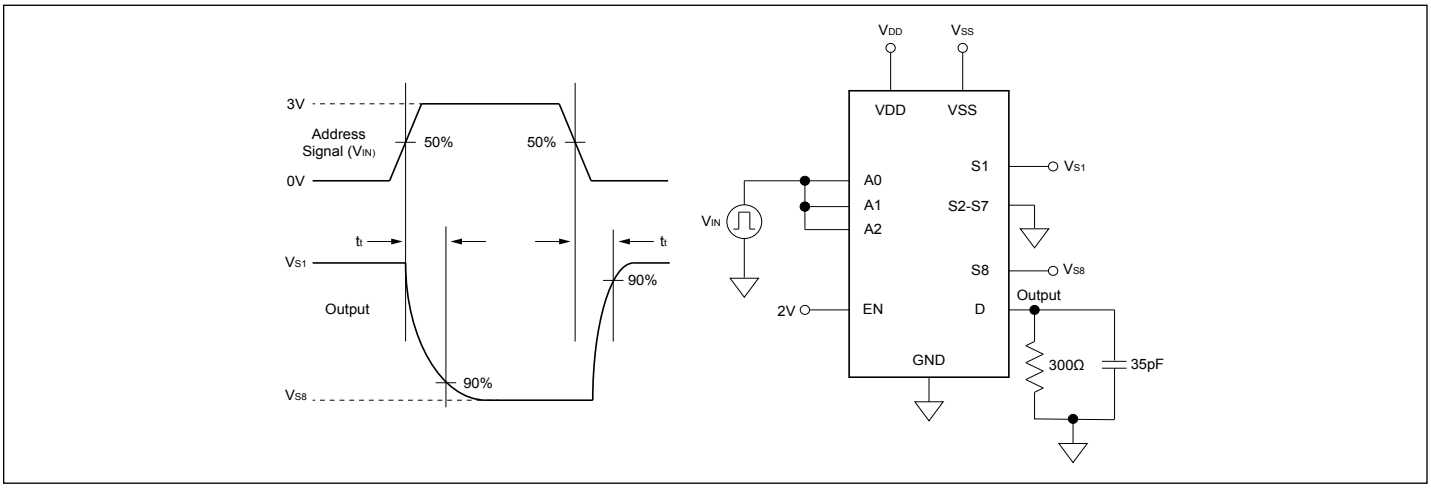


Figure 4. Transition-Time Measurement Setup

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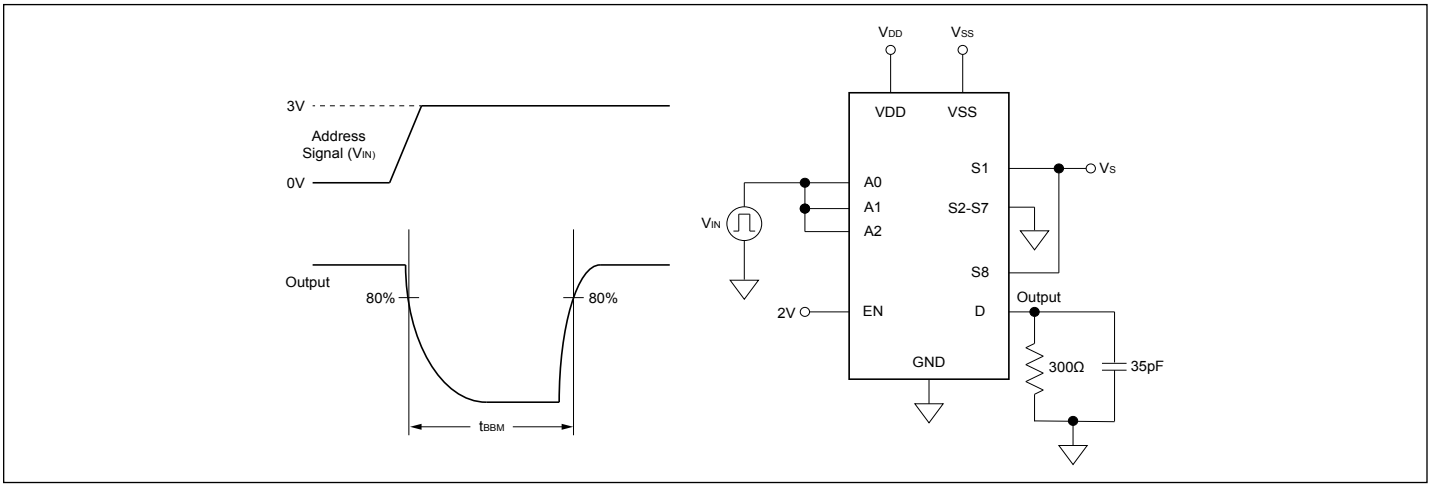


Figure 5. Break-Before-Make Delay Measurement Setup

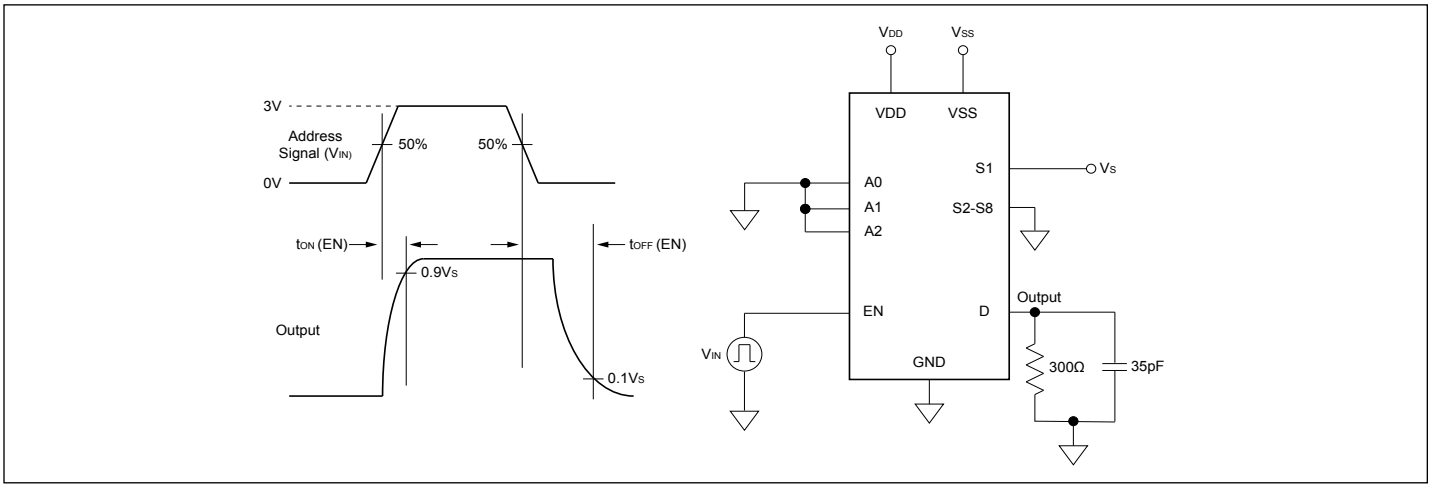


Figure 6. Turn-On and Turn-Off Time Measurement Setup

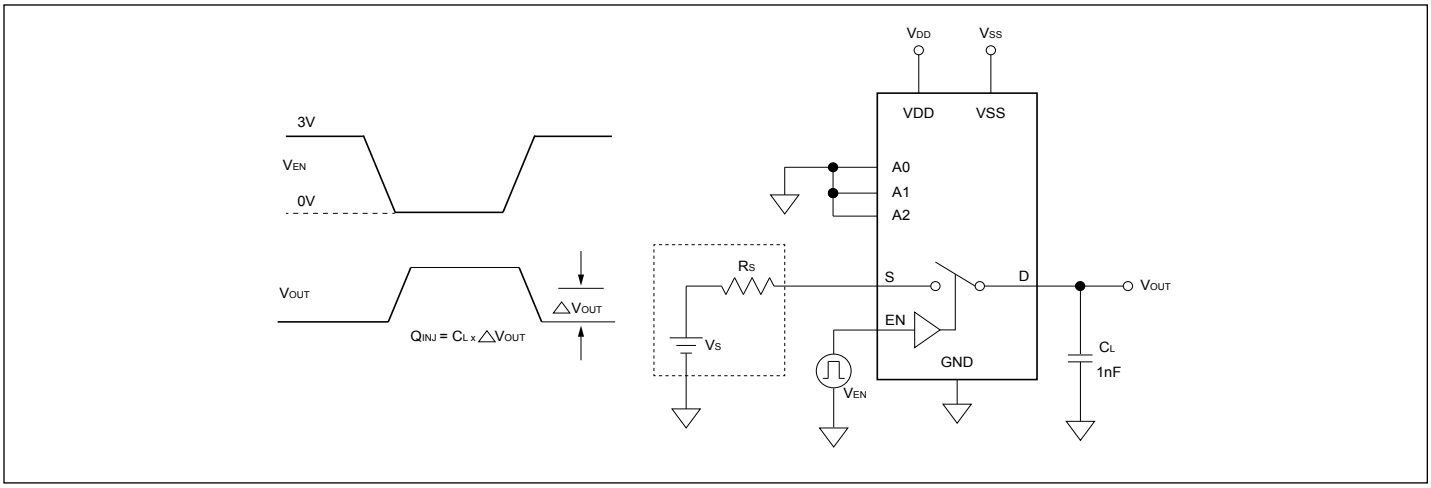


Figure 7. Charge-Injection Measurement Setup

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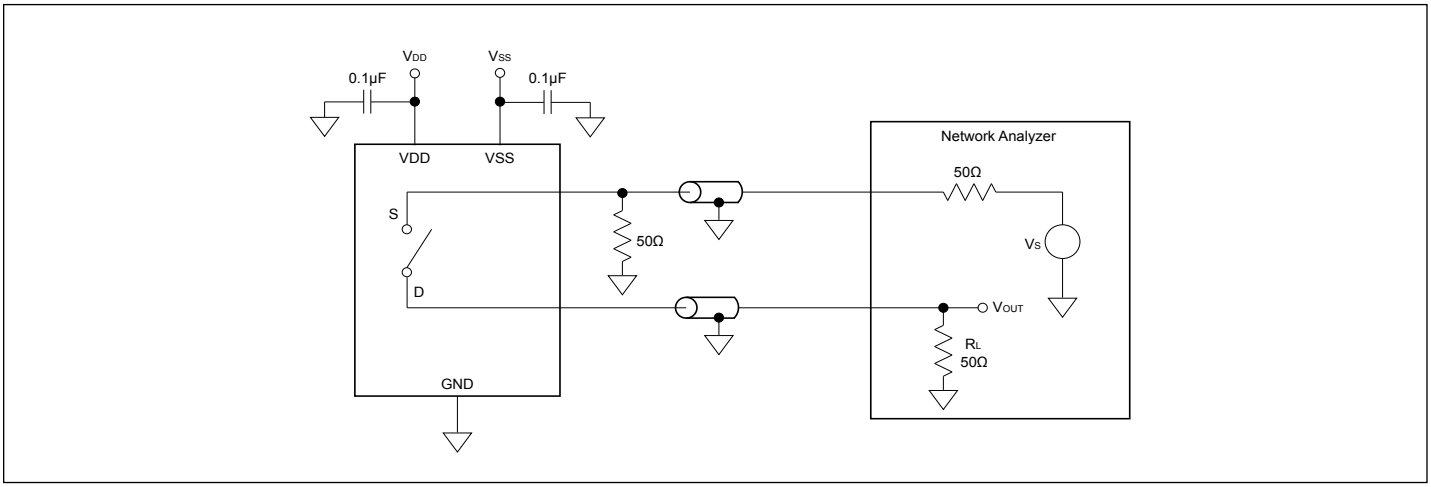


Figure 8. Off Isolation Measurement Setup

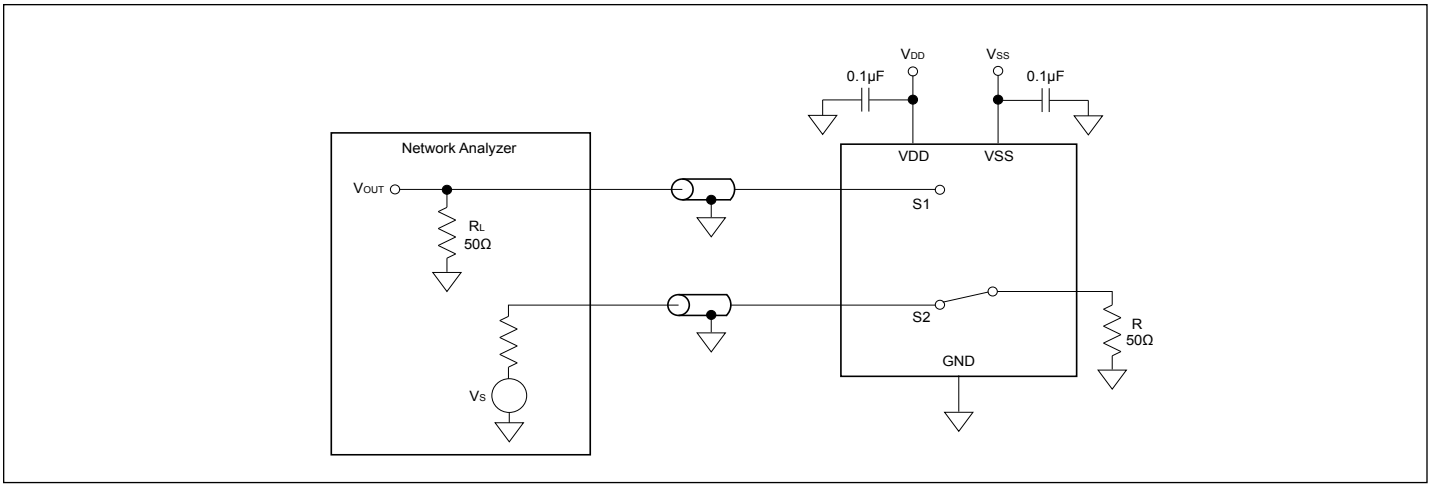


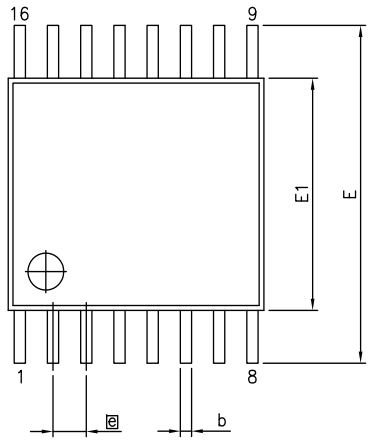
Figure 9. Channel-to-Channel Crosstalk Measurement Setup

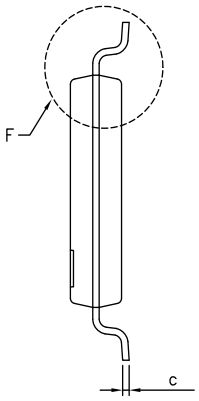
Part Marking

Top mark not available at this time. To obtain advance information regarding the top mark, please contact your local sales representative.

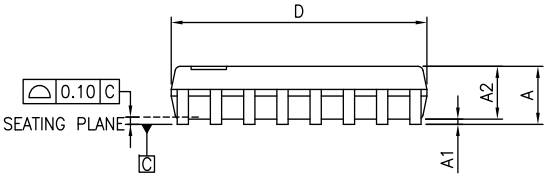
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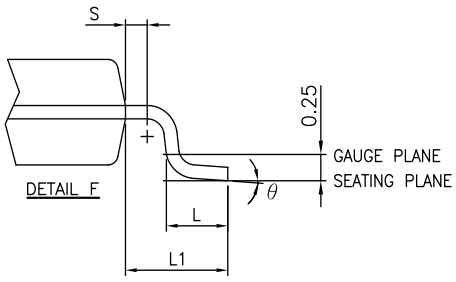
Packaging Mechanical: 16-TSSOP (L)





SYMBOLS	MIN.	NOM.	MAX.
A	–	–	1.20
A1	0.05	–	0.15
A2	0.80	1.00	1.05
b	0.19	–	0.30
c	0.09	–	0.20
D	4.90	5.00	5.10
E1	4.30	4.40	4.50
E	6.20	6.40	6.60
e	0.65 BSC		
L1	1.00 REF		
L	0.45	0.60	0.75
S	0.20	–	–
θ	0°	–	8°





NOTES:
1. ALL DIMENSIONS IN MILLIMETERS. ANGLES IN DEGREES.
2. JEDEC MO–153F
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

PERICOM Enabling Serial Connectivity

DATE: 03/24/16

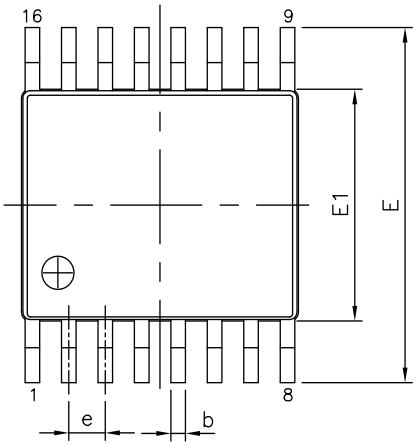
DESCRIPTION: 16-Pin, 173mil Wide TSSOP

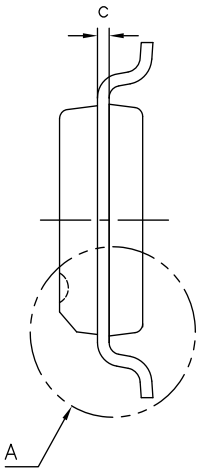
PACKAGE CODE: L (L16)

DOCUMENT CONTROL #: PD-1310 REVISION: G

16-0061

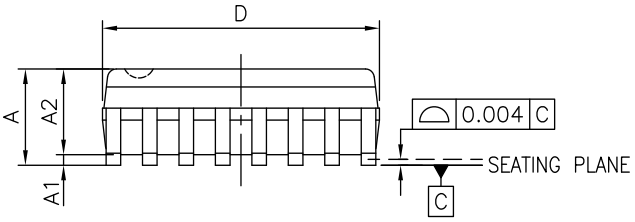
Packaging Mechanical: 16-QSOP (Q)

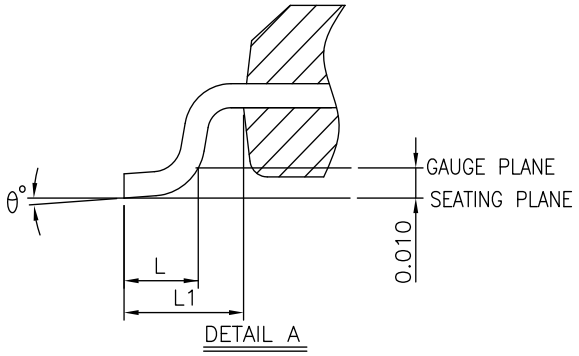




SYMBOLS	MIN.	NOM.	MAX.
A	—	—	0.069
A1	0.004	—	0.0098
A2	0.049	—	—
b	0.008	—	0.012
c	0.004	—	0.010
D	0.189	0.193	0.197
E1	0.150	0.154	0.158
E	0.228	0.236	0.244
L	0.016	—	0.050
L1	0.041 REF.		
e	0.025 BSC.		
θ°	0	—	8

UNIT : INCH





NOTES:
1. ALL DIMENSIONS IN INCH. ANGLES IN DEGREES.
2. JEDEC MO-137E
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

PERICOM Enabling Serial Connectivity

DATE: 04/08/16

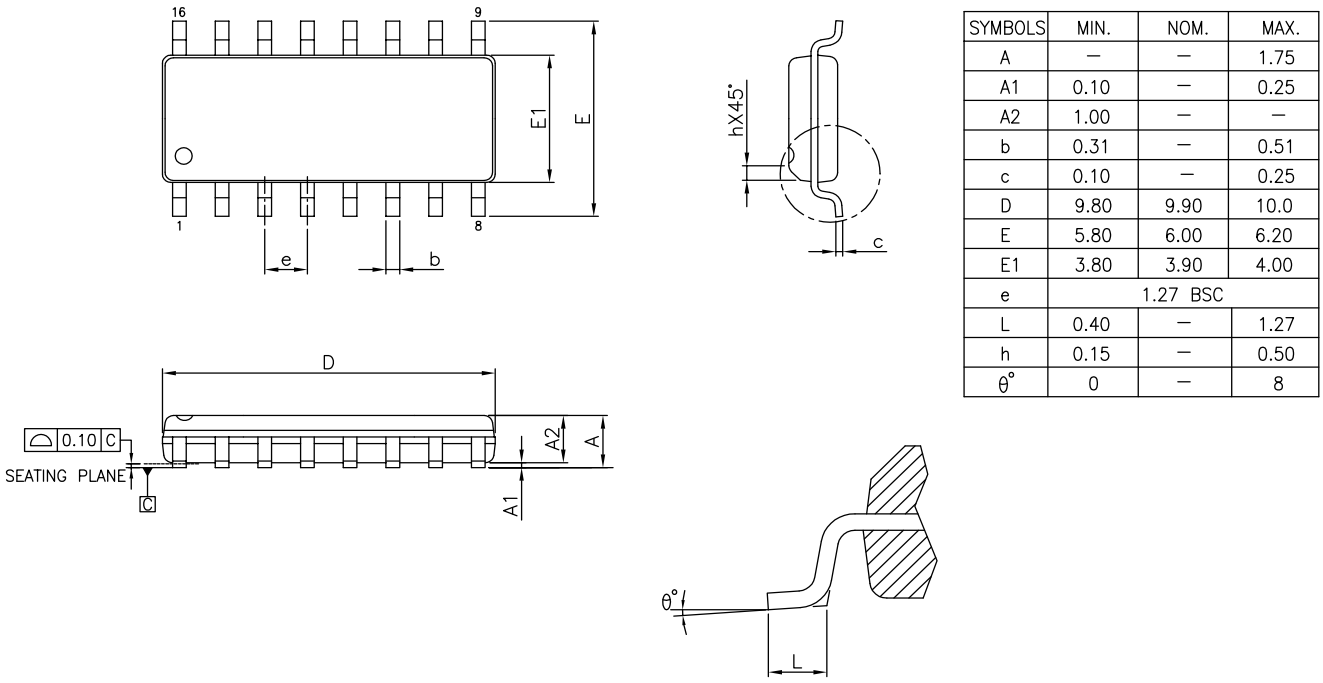
DESCRIPTION: 16-Pin, 150mil Wide QSOP

PACKAGE CODE: Q (Q16)

DOCUMENT CONTROL #: PD-1201 **REVISION: H**

16-0056

Packaging Mechanical: 16-SOIC (W)



SYMBOLS	MIN.	NOM.	MAX.
A	—	—	1.75
A1	0.10	—	0.25
A2	1.00	—	—
b	0.31	—	0.51
c	0.10	—	0.25
D	9.80	9.90	10.0
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e		1.27 BSC	
L	0.40	—	1.27
h	0.15	—	0.50
θ°	0	—	8

NOTES:
1. ALL DIMENSIONS IN MILLIMETERS. ANGLES IN DEGREES.
2. JEDEC OUTLINE : MS-012 AC
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
4. THE MIN. DIMENSION OF A2 AND h ARE OUT OF JEDEC SPEC.

DIODES INCORPORATED | PERICOM ENABLING SERIAL CONNECTIVITY | DATE: 06/30/16

DESCRIPTION: 16-Pin, 150mil Wide SOIC

PACKAGE CODE: W

DOCUMENT CONTROL #: PD-1004 | REVISION: G

16-0145

For latest package info.

please check: http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/

Ordering Information

Ordering Code	Package Code	Package Description
PS508LEX	L	16-pin, 173mil Wide (TSSOP)
PS508QEX	Q	16-pin, 150mil Wide (QSOP)
PS508WEX	W	16-pin, 150mil Wide (SOIC)
PS509LEX	L	16-pin, 173mil Wide (TSSOP)
PS509QEX	Q	16-pin, 150mil Wide (QSOP)
PS509WEX	W	16-pin, 150mil Wide (SOIC)

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. E = Pb-free and Green
5. X suffix = Tape/Reel

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1. are intended to implant into the body, or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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