To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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RENESAS

MOS INTEGRATED CIRCUIT

Phase-out/Discontinued

μPD22100, 22148

CROSSPOINT SWITCH WITH CONTROL MEMORY CMOS IC

The μPD22100 consists of 16 crosspoint switches organized in 4 rows and 4 columns, and the μPD22148 consists of 32 crosspoint switches organized in 4 row and 8 columns. Any of the 16 or 32 switches can be selected by applying appropriate address. The selected crosspoint turns on if during strobe and data In are high and turns off if during strobe and data In are low.

FEATURES

μPD22100

- 4 × 4 CROSSPOINT SWITCHES
- INTERNAL POWER ON RESET FUNCTION
- Low ON-RESISTANCE
  60 Ω Typ. (V_{DD} = 15 V)
- Wide operating temperature Range
  –40 °C to +85 °C

μPD22148

- 4 × 8 CROSSPOINT SWITCHES
- Including the Level Shifter Circuit
- Low ON-RESISTANCE
  60 Ω Typ. (V_{DD} = 15 V)
- Wide operating temperature Range
  –40 °C to +85 °C

ORDERING INFORMATION

Part Number	Package
μPD22100C	16 pin plastic DIP (300 mil)
μPD22100GS	16 pin plastic SOP (300 mil)
μPD22148CA	22 pin plastic shrink DIP (300 mil)

TRUTH TABLE

■ **μPD22100**

INPUT						SELECTED CHANNELS
S	D	C	B	A	DATA	Y_0X_0 Y_0X_1 Y_0X_2 Y_0X_3 Y_1X_0 Y_1X_1 Y_1X_2 Y_1X_3 Y_2X_0 Y_2X_1 Y_2X_2 Y_2X_3 Y_3X_0 Y_3X_1 Y_3X_2 Y_3X_3
L	X	X	X	X	X	NC →
H	L	L	L	L	L	OFF NC →
H	L	L	L	L	H	ON NC →
H	L	L	L	H	L	NC OFF NC →
H	L	L	L	H	H	NC ON NC →
H	L	L	H	L	L	NC → OFF NC →
H	L	L	H	L	H	NC → ON NC →
H	L	L	H	H	L	NC → OFF NC →
H	L	L	H	H	H	NC → ON NC →
⋮	⋮	⋮	⋮	⋮	⋮	⋮
H	H	H	H	H	L	NC → OFF
H	H	H	H	H	H	NC → ON

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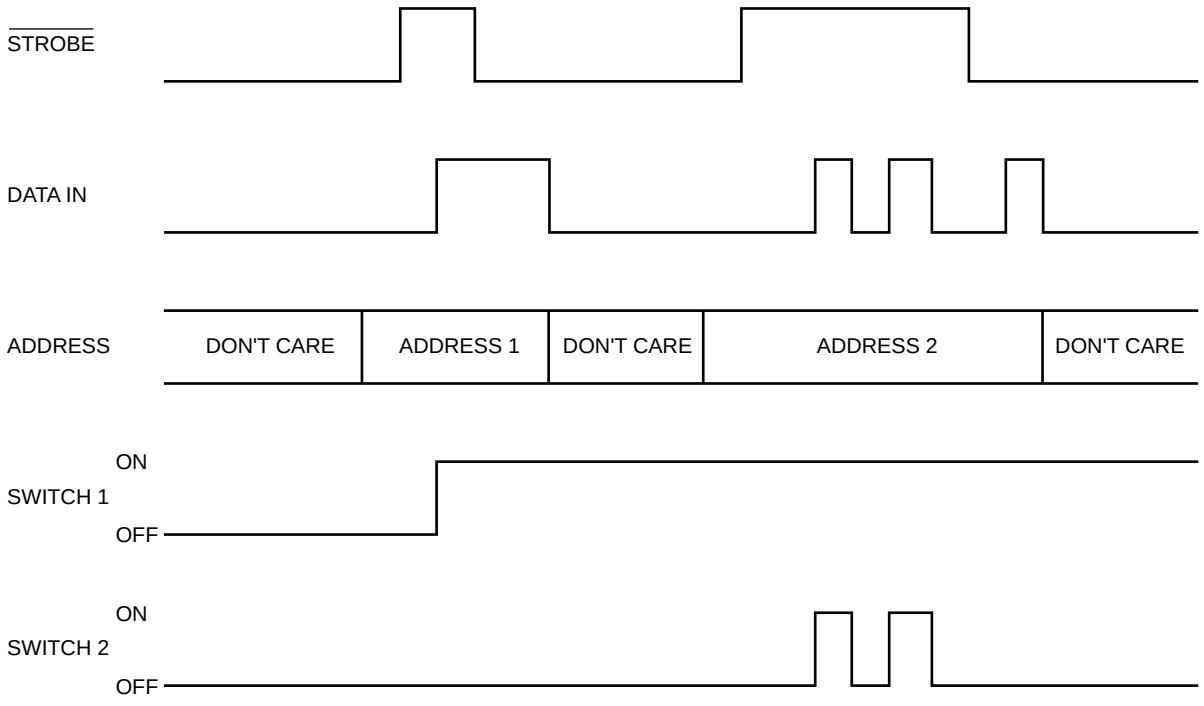
■ **μPD22148**

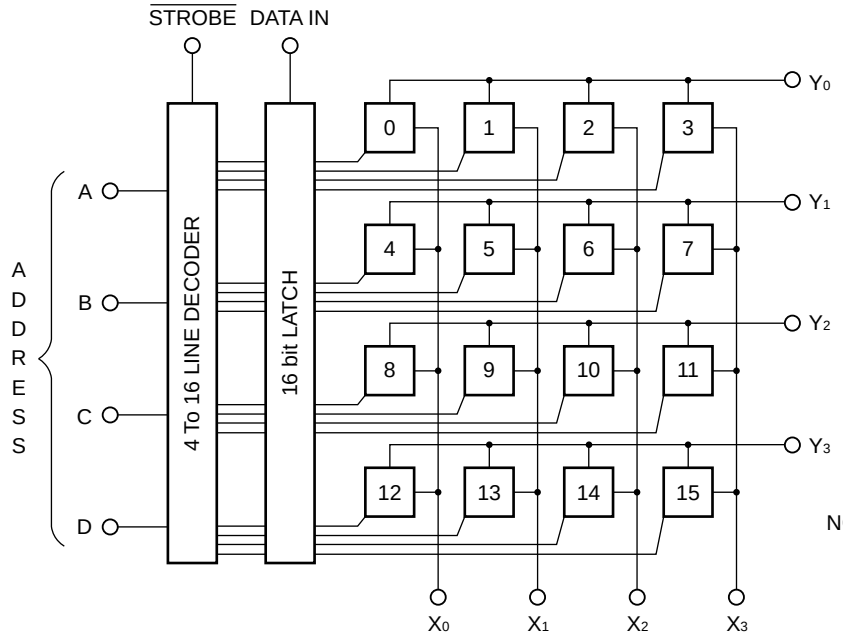
INPUTS							SELECTED CHANNELS
S	E	D	C	B	A	DATA	Y_0X_0 Y_0X_1 Y_0X_2 Y_0X_3 Y_1X_0 Y_1X_1 Y_1X_2 Y_1X_3 Y_2X_0 Y_2X_1 Y_2X_2 Y_2X_3 Y_3X_0 Y_3X_1 Y_3X_2 Y_3X_3 Y_4X_0 Y_4X_1 Y_4X_2 Y_4X_3 Y_5X_0 Y_5X_1 Y_5X_2 Y_5X_3 Y_6X_0 Y_6X_1 Y_6X_2 Y_6X_3 Y_7X_0 Y_7X_1 Y_7X_2 Y_7X_3
L	X	X	X	X	X	X	NC →
H	L	L	L	L	L	L	OFF NC →
H	L	L	L	L	L	H	ON NC →
H	L	L	L	L	H	L	NC OFF NC →
H	L	L	L	L	H	H	NC ON NC →
H	L	L	L	H	L	L	NC → OFF →
H	L	L	L	H	L	H	NC → ON NC →
H	L	L	L	H	H	L	NC → OFF NC →
H	L	L	L	H	H	H	NC → ON NC →
H	L	L	H	L	L	L	NC → OFF NC →
H	L	L	H	L	L	H	NC → ON NC →
H	L	L	H	L	H	L	NC → OFF NC →
H	L	L	H	L	H	H	NC → ON NC →
H	L	L	H	H	L	L	NC → OFF NC →
H	L	L	H	H	L	H	NC → ON NC →
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
H	H	H	H	H	H	L	NC → OFF
H	H	H	H	H	H	H	NC → ON

TIMING DIAGRAM



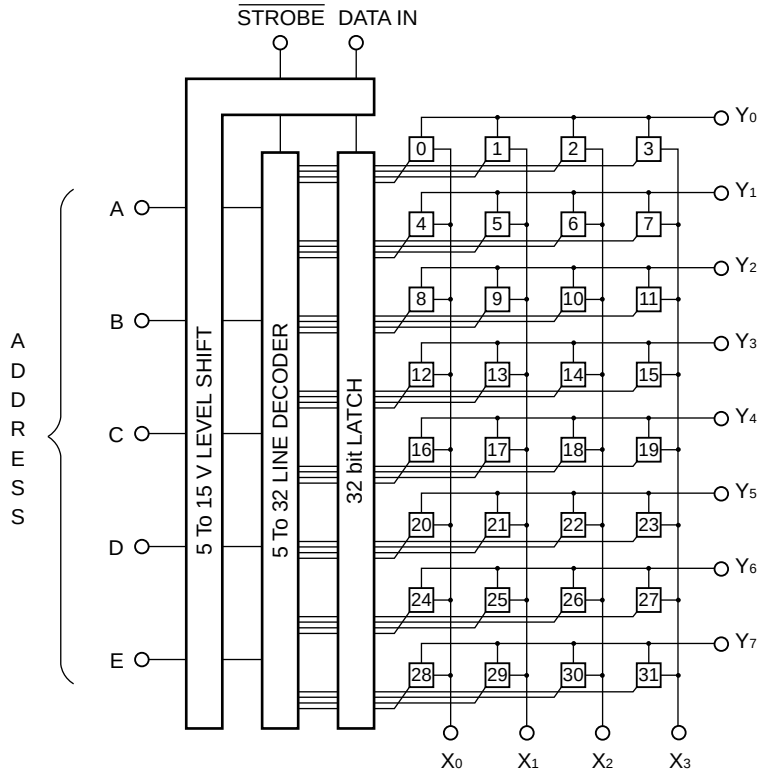
BLOCK DIAGRAM

■ μPD22100



NOTE) n : Analog switch

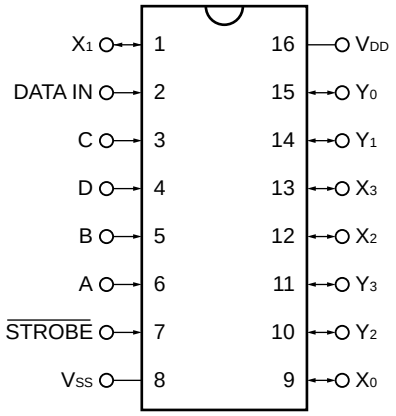
■ μPD22148



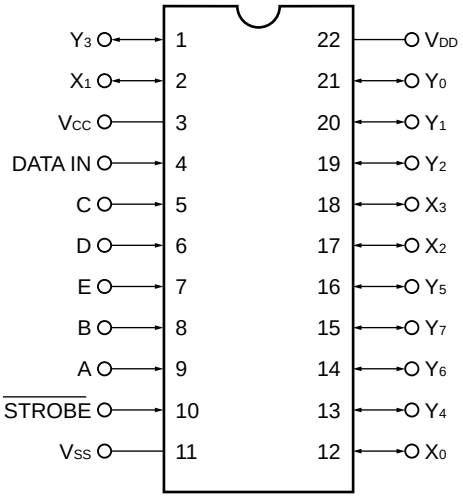
NOTE) n : Analog switch

CONNECTION DIAGRAM (TOP VIEW)

■ **μPD22100**



■ **μPD22148**



■ **μPD22100**

ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C, V_{SS} = 0 V)

DC Supply Voltage	V_{DD}	–0.5 to +20	V
Input Voltage	V_I	–0.5 to V_{DD} + 0.5	V
Input Current	I_I	10	mA
Power Dissipation	P_D	200	mW
Operating Temperature	T_{opt}	–40 to +85	°C
Storage Temperature	T_{stg}	–65 to +125	°C

RECOMMENDED OPERATING CONDITIONS (T_a = –40 to +85 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
Operating Voltage	V_{DD}	3		18	V	
Input Voltage (Control)	V_{IH}	0.7 V_{DD}		V_{DD}	V	
Input Voltage (Control)	V_{IL}	0		0.3 V_{DD}	V	
Analog Input Voltage	V_{IA}	V_{SS}		V_{DD}	V	$V_{xn} - V_{yn} \leq 0.5$ V

ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	T_a = –40 °C		T_a = 25 °C			T_a = +85 °C		UNIT		CONDITIONS
		MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		V_{DD} (V)	
On-State Resistance	R_{ON}		530		160	650		820	Ω	5	$V_{IS} = \frac{V_{DD} - V_{SS}}{2}$
			100		80	120		150		10	
			75		70	90		120		12	
			70		60	85		110		15	
On-State Resistance Difference Between Any Two Switches	ΔR_{ON}				35				Ω	5	$V_{IS} = \frac{V_{DD} - V_{SS}}{2}$
					20					10	
					18					12	
					15					15	
Input Leakage Current	I_L		±300		±1	±300		±10000	nA	18	All Switches OFF
Input Voltage	V_{IH}	3.5		3.5			3.5		V	5	Switch ON $R_{ON} < R_{ON}$ MAX.
		7		7			7			10	
		11		11			11			15	
Input Voltage	V_{IL}		1.5			1.5		1.5	V	5	Switch OFF IL < 0.2 μA
			3			3		3		10	
			4			4		4		15	
Input Current	I_I		±0.3		$\pm 10^{-5}$	±0.3		±1	μA	18	$V_I = V_{SS}, V_{DD}$
Quiescent Current	I_{DD}		5		0.04	5		150	μA	5	$V_I = V_{SS}, V_{DD}$
			10		0.04	10		300		10	
			20		0.04	20		600		15	
			100		0.08	100		3000		20	

SWITCHING TIME CHARACTERISTICS (T_a = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	V_{DD}(V)	CONDITIONS
Propagation Delay Time	t_{PLH} t_{PHL}		30	60	ns	5	Signal INPUT → Signal OUTPUT
			15	30		10	R_L = 10 kΩ, C_L = 50 pF. t_r = t_f = 20 ns
			10	20		15	
	t_{PZH}		300	600	ns	5	Strobe INPUT → OUTPUT; R_L = 1 kΩ, C_L = 50 pF, t_r, t_f = 20 ns
			125	250		10	
			80	160		15	
	t_{PZH}		210	420	ns	5	Data INPUT → OUTPUT
			110	220		10	
			100	150		15	
	t_{PZL}		350	700	ns	5	Address INPUT → OUTPUT
			135	270		10	
			90	180		15	
	t_{PHZ}		165	330	ns	5	Strobe INPUT → OUTPUT
			85	170		10	
			70	140		15	
	t_{PZL}		210	420	ns	5	Data INPUT → OUTPUT
			110	220		10	
			100	150		15	
	t_{PHZ}		435	870	ns	5	Address INPUT → OUTPUT
			210	420		10	
			160	320		15	
Set Up Time	$t_{set\ up}$		95	190	ns	5	Data INPUT → Strobe Address
			25	50		10	
			15	30		15	
Hold Time	t_{hold}		180	360	ns	5	Data INPUT → Strobe INPUT Address INPUT
			110	220		10	
			60	120		15	
Frequency	fϕmax.	0.6	1.2		MHz	5	R_L = 1 kΩ, C_L = 50 pF
		1.6	3.2			10	t_r, t_f = 20 ns
		2.5	5			15	
Strobe Pulse Width	PW (STROBE)		300	600	ns	5	
			120	240		10	
			90	190		15	
Crosstalk Voltage			75		mV (peak)	10	R_L = 10 kΩ t_r = t_f = 20 ns Rectronglar
INPUT Capacitance	C_{IN}		5	7.5	pF		Data, $\overline{\text{Strobe}}$, Address INPUT
			30		pF		Signal INPUT: Xn, Yn
			30				
Feedthrough Capacitance	$C_{IN/OUT}$		0.4		pF		
Frequency Response (Switch ON)	—		40		MHz	10	R_L = 1 kΩ, V_{IS} = 5 $V_{(p-p)}$ $20 \log \frac{V_{OS}}{V_{IS}} = -3$ dB
Feedthrough Attenuation (Switch Off)	—		–80		dB	10	R_L = 1 kΩ, f = 1.6 kHz, V_{IS} = 5 $V_{(p-p)}$ Sine Wave Input
Sine Wave Distortion	—		0.5		%	10	R_L = 1 kΩ, V_{IS} = 5 $V_{(p-p)}$ f = 1 kHz
Crosstalk Between Any Two Switches	—		1.5		MHz	10	R_L = 1 kΩ SW(A) = ON SW(B) = OFF $20 \log \frac{V_O(B)}{V_I(A)} = -40$ dB

■ **μPD22148**

ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C, V_{SS} = 0 V)

DC Supply Voltage 1	V_{DD}	V_{CC} to +20	V
DC Supply Voltage 2	V_{CC}	–0.5 to +6	V
Input Voltage	V_I	–0.5 to V_{CC} + 0.5	V
Input Voltage (Analog)	V_{IA}	–0.5 to V_{DD} + 0.5	V
Input Current	I_I	±10	mA
Power Dissipation	P_D	200	mW
Operating Temperature	T_{opt}	–40 to +85	°C
Storage Temperature	T_{stg}	–65 to +125	°C

RECOMMENDED OPERATING CONDITIONS (T_a = –40 to +85 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
Operating Voltage 1	V_{DD}	V_{CC}		18	V	
Operating Voltage 2	V_{CC}	4.5	5	5.5	V	
Input Voltage (Control)	V_{IH}	0.7 V_{CC}		V_{CC}	V	
Input Voltage (Control)	V_{IL}	0		0.3 V_{CC}	V	
Analog Input Voltage	V_{IA}	V_{SS}		V_{DD}	V	$V_{xn} - V_{yn} \leq 0.5$ V

ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	T_a = –40 °C		T_a = 25 °C			T_a = +85 °C		UNIT	CONDITIONS	
		MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		V_{DD} (V)	
On-State Resistance	R_{ON}		530		160	650		820	Ω	5	$V_{IS} = \frac{V_{DD} - V_{SS}}{2}$
			100		80	120		150		10	
			75		70	90		120		12	
			70		60	85		110		15	
On-State Resistance Difference Between Any Two Switches	ΔR_{ON}				35				Ω	5	$V_{IS} = \frac{V_{DD} - V_{SS}}{2}$
					20					10	
					18					12	
					15					15	
Input Leakage Current	I_L		±300		±1	±300		±10000	nA	18	All Switches OFF
Input Voltage	V_{IH}	3.5		3.5			3.5		V	—	V_{CC} = 5 V V_{DD} > 10 V
Input Voltage	V_{IL}		1.5			1.5		1.5	V	—	V_{CC} = 5 V V_{DD} > 10 V
Input Current	I_I		±0.3		$\pm 10^{-5}$	±0.3		±1	μA	—	V_{CC} = 6 V V_I = V_{SS}, V_{CC}
Quiescent Current	I_{DD}		10		0.08	10		300	μA	5	V_I = V_{SS}, V_{DD}
			20		0.08	20		600		10	
			40		0.16	40		1200		15	

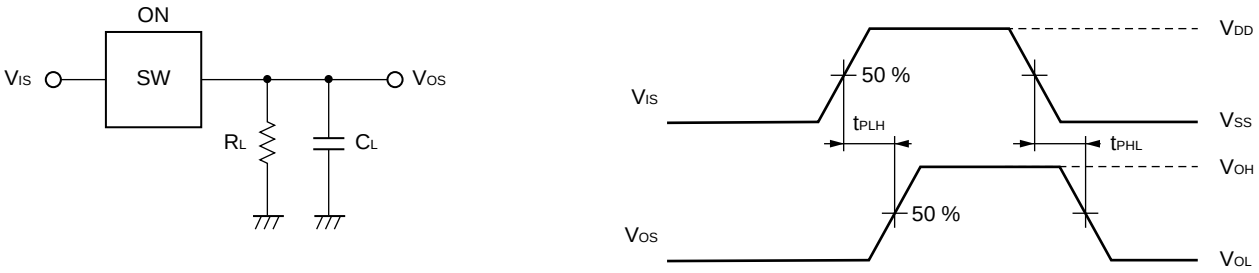
SWITCHING TIME CHARACTERISTICS (T_a = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	V_{DD}(V)	CONDITIONS	
Propagation Delay Time	t_{PLH} t_{PHL}		30	60	ns	5	Signal INPUT → Signal OUTPUT	
			15	30		10	R_L = 10 kΩ, C_L = 50 pF. t_r = t_f = 20 ns	
			10	20		15		
	t_{PZH}		400	800	ns	5	$\overline{\text{Strobe}}$ INPUT → OUTPUT	R_L = 1 kΩ C_L = 50 pF t_r, t_f = 20 ns
			225	450		10		
			180	360		15		
	t_{PZH}		310	620	ns	5	Data INPUT → OUTPUT	
			220	440		10		
			200	400		15		
	t_{PZH}		450	900	ns	5	Address INPUT → OUTPUT	
			235	470		10		
			190	380		15		
	t_{PHZ}		265	530	ns	5	$\overline{\text{Strobe}}$ INPUT → OUTPUT	
			185	370		10		
			170	340		15		
	t_P		310	620	ns	5	Data INPUT → OUTPUT	
			210	420		10		
			200	400		15		
	t_{PHZ}		535	1070	ns	5	Address INPUT → OUTPUT	
			310	720		10		
			260	520		15		
Set Up Time	$t_{set\ up}$		140	280	ns	5	Data INPUT → $\overline{\text{Strobe}}$ Address	
			70	140		10		
			60	120		15		
Hold Time	t_{hold}		270	540	ns	5	Data INPUT → $\overline{\text{Strobe}}$ INPUT Address INPUT	
			180	360		10		
			110	220		15		
Frequency	$f_\phi$max.	0.6	1.2		MHz	5	R_L = 1 kΩ, C_L = 50 pF t_r, t_f = 20 ns	
		1.6	3.2			10		
		2.5	5			15		
Strobe Pulse Width	PW (STROBE)		300	600	ns	5		
			120	240		10		
			90	190		15		
Crosstalk Voltage			75		mV (peak)	10	R_L = 10 kΩ t_r = t_f = 20 ns Rectronglar	
INPUT Capacitance	C_{IN}		5	7.5	pF		Data, Strobe, Address INPUT	
			105		pF		Signal INPUT	Xn
			75					Yn
Feedthrough Capacitance	$C_{IN/OUT}$		1.1		pF			
Frequency Response (Switch ON)	—		15		MHz	10	R_L = 1 kΩ, V_{IS} = 5 $V_{(p-p)}$ $20 \log \frac{V_{OS}}{V_{IS}}$ = –3 dB	
Feedthrough Attenuation (Switch Off)	—		–60		dB	10	R_L = 1 kΩ, f = 1.6 kHz, V_{IS} = 5 $V_{(p-p)}$ Sine Wave Input	
Sine Wave Distortion	—		0.5		%	10	R_L = 1 kΩ, V_{IS} = 5 $V_{(p-p)}$ f = 1 kHz	
Crosstalk Between Any Two Switches	—		1.5		MHz	10	R_L = 1 kΩ SW(A) = ON SW(B) = OFF	$20 \log \frac{V_O(B)}{V_I(A)}$ = –40 dB V_{CC} = 5 V

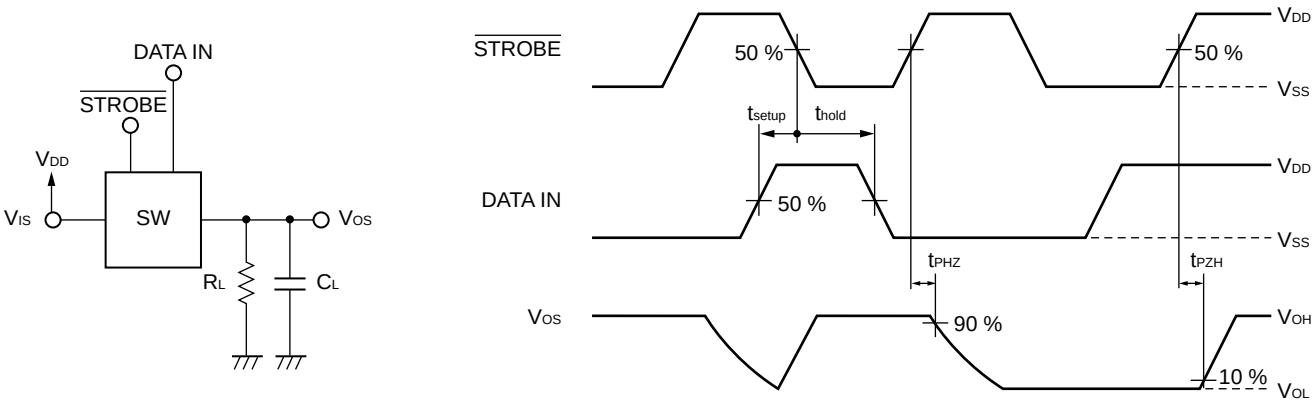
TEST CIRCUITS

■ PROPAGATION DELAY TIMES

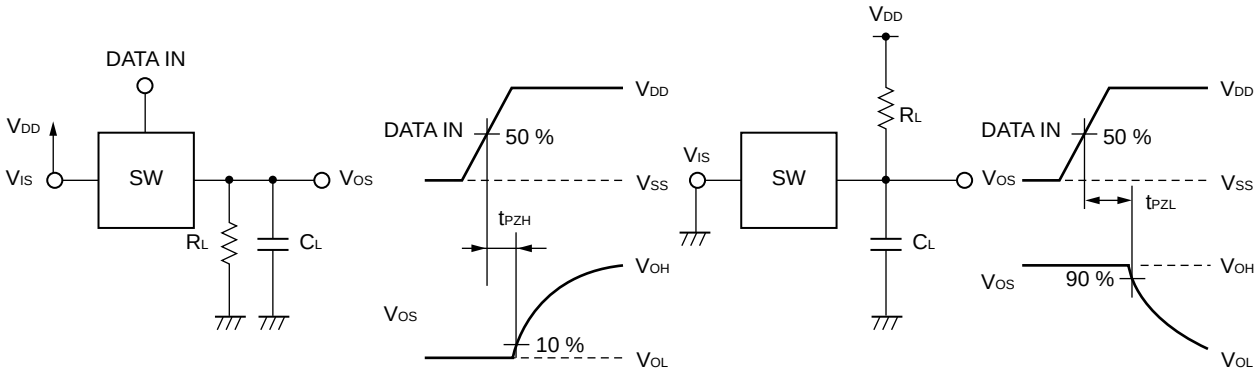
(1) SIGNAL INPUT → SIGNAL OUTPUT



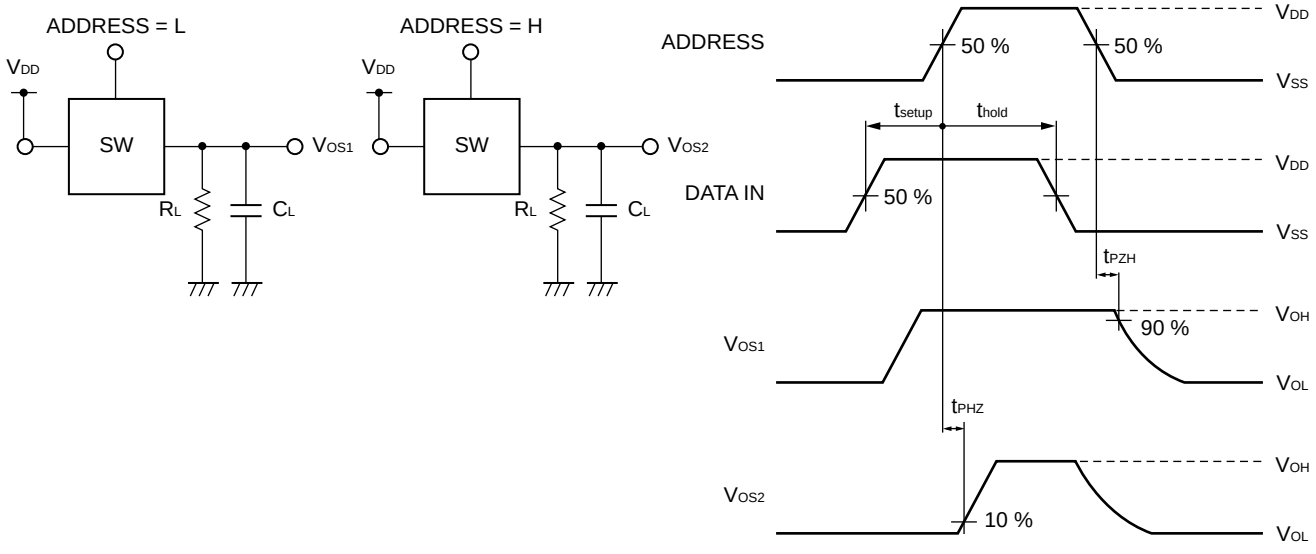
(2) $\overline{\text{STROBE}}$ INPUT → OUTPUT



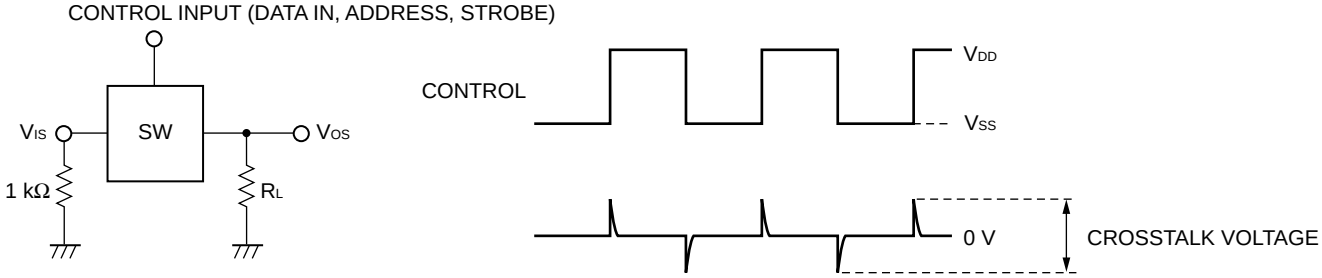
(3) DATA INPUT → OUTPUT ($\overline{\text{STROBE}}$ = V_{DD})



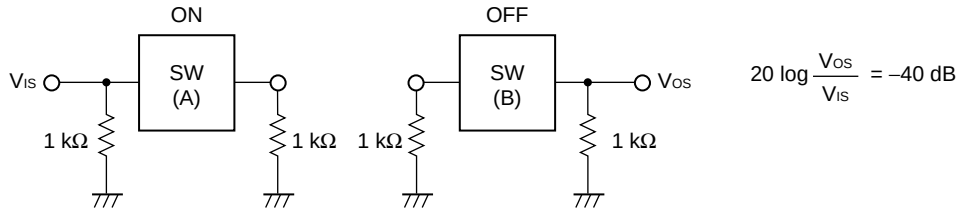
(4) ADDRESS INPUT → OUTPUT ($\overline{\text{STROBE}}$ = V_{DD})



■ CROSSTALK VOLTAGE



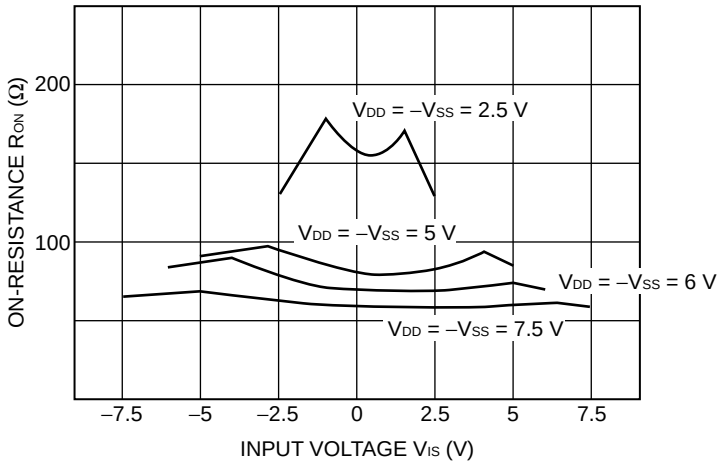
■ CROSSTALK FREQUENCY



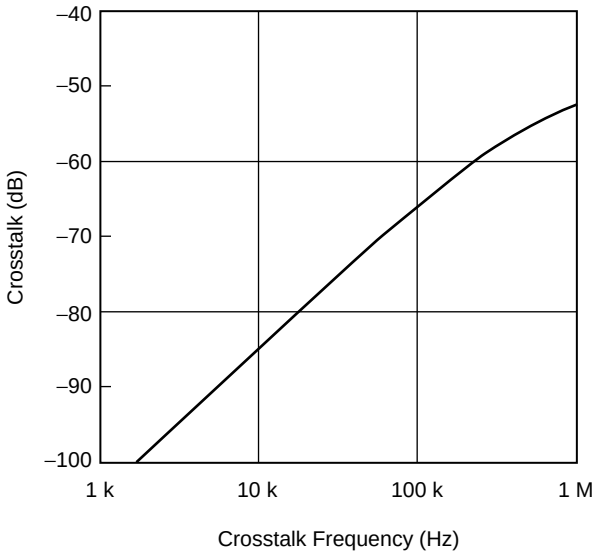
$$20 \log \frac{V_{OS}}{V_{IS}} = -40 \text{ dB}$$

TYPICAL CHARACTERISTICS (T_a = 25 °C)

(A) R_{ON} – V_{IS} Characteristics

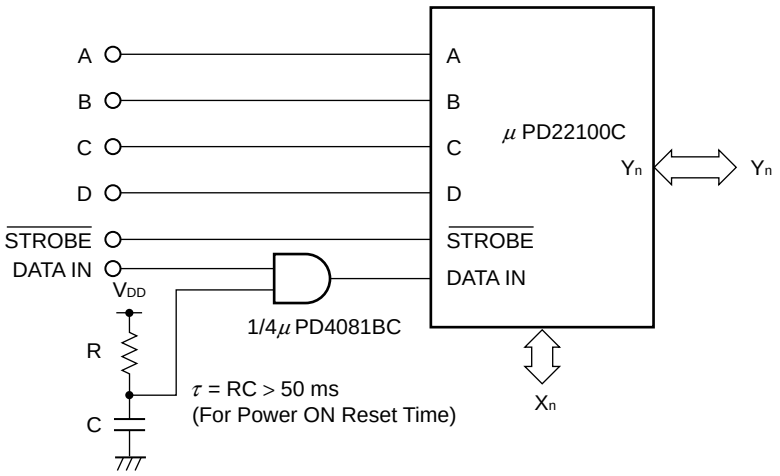


(B) Crosstalk Frequency Characteristics

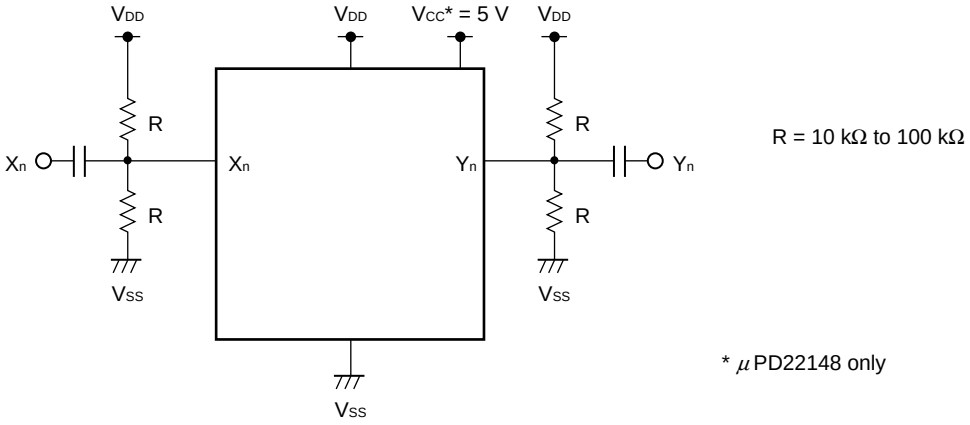


APPLICATION CIRCUITS

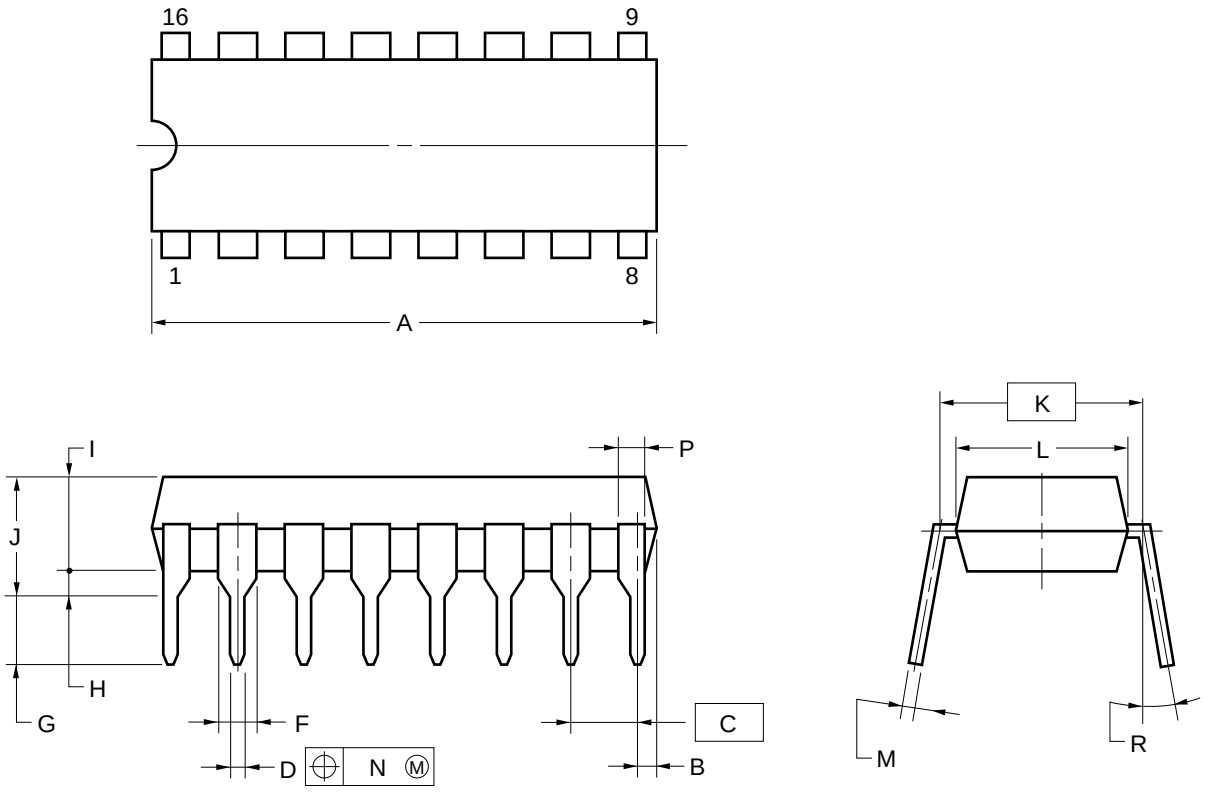
■ μPD22100



■ μPD22100/22148 BIAS CIRCUIT



16PIN PLASTIC DIP (300 mil)



NOTES

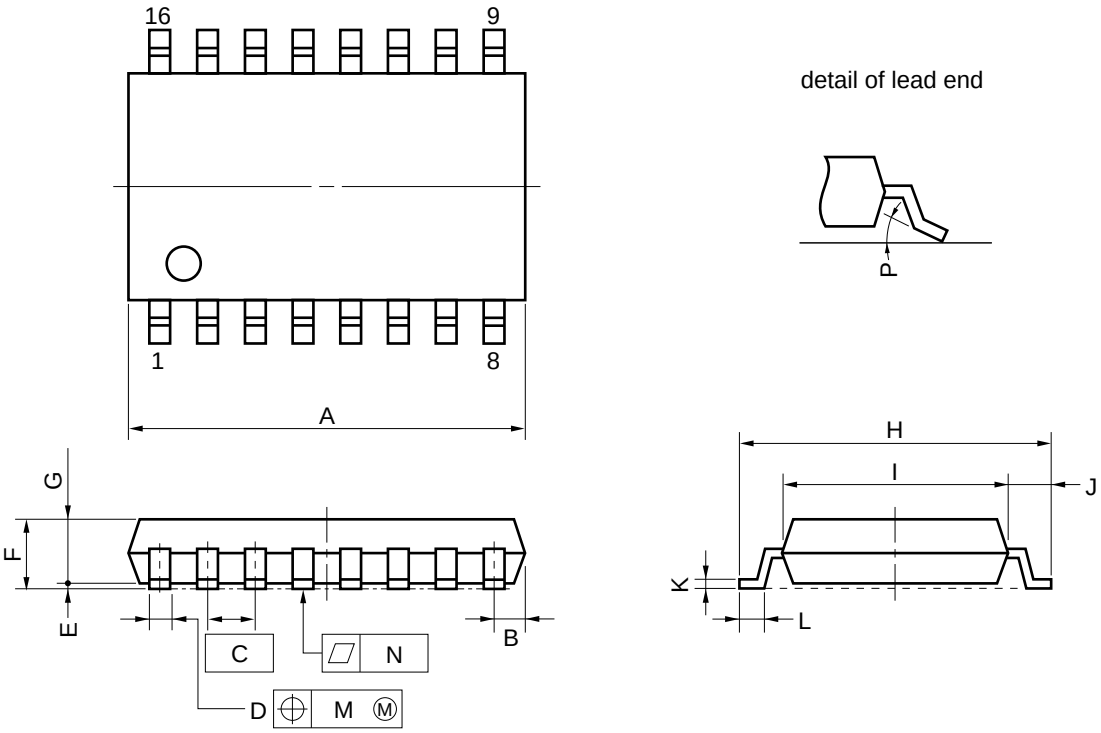
1) Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.

2) Item "K" to center of leads when formed parallel.

ITEM	MILLIMETERS	INCHES
A	20.32 MAX.	0.800 MAX.
B	1.27 MAX.	0.050 MAX.
C	2.54 (T.P.)	0.100 (T.P.)
D	0.50 ± 0.10	$0.020^{+0.004}_{-0.005}$
F	1.2 MIN.	0.047 MIN.
G	3.5 ± 0.3	0.138 ± 0.012
H	0.51 MIN.	0.020 MIN.
I	4.31 MAX.	0.170 MAX.
J	5.08 MAX.	0.200 MAX.
K	7.62 (T.P.)	0.300 (T.P.)
L	6.4	0.252
M	$0.25^{+0.10}_{-0.05}$	$0.010^{+0.004}_{-0.003}$
N	0.25	0.01
P	1.0 MIN.	0.039 MIN.
R	0~15°	0~15°

P16C-100-300A,C-1

16 PIN PLASTIC SOP (300 mil)



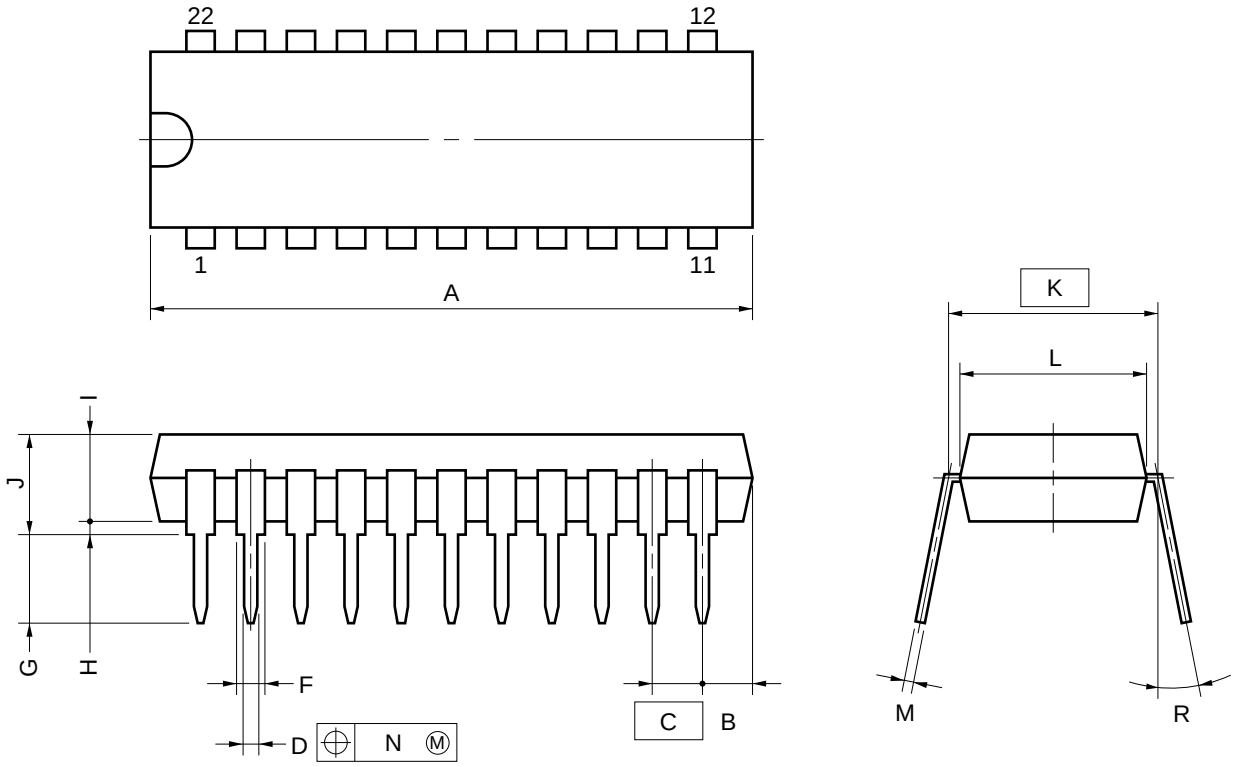
NOTE

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	10.46 MAX.	0.412 MAX.
B	0.78 MAX.	0.031 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	$0.40^{+0.10}_{-0.05}$	$0.016^{+0.004}_{-0.003}$
E	0.1±0.1	0.004±0.004
F	1.8 MAX.	0.071 MAX.
G	1.55	0.061
H	7.7±0.3	0.303±0.012
I	5.6	0.220
J	1.1	0.043
K	$0.20^{+0.10}_{-0.05}$	$0.008^{+0.004}_{-0.002}$
L	0.6±0.2	$0.024^{+0.008}_{-0.009}$
M	0.12	0.005
N	0.10	0.004
P	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$

P16GM-50-300B-4

22 PIN PLASTIC SHRINK DIP (300 mil)



NOTES

1) Each lead centerline is located within 0.17 mm (0.007 inch) of its true position (T.P.) at maximum material condition.

2) Item "K" to center of leads when formed parallel.

ITEM	MILLIMETERS	INCHES
A	23.12 MAX.	0.911 MAX.
B	2.67 MAX.	0.106 MAX.
C	1.778 (T.P.)	0.070 (T.P.)
D	0.50 ± 0.10	$0.020^{+0.004}_{-0.005}$
F	0.85 MIN.	0.033 MIN.
G	3.2±0.3	0.126±0.012
H	0.51 MIN.	0.020 MIN.
I	4.31 MAX.	0.170 MAX.
J	5.08 MAX.	0.200 MAX.
K	7.62 (T.P.)	0.300 (T.P.)
L	6.5	0.256
M	$0.25^{+0.10}_{-0.05}$	$0.010^{+0.004}_{-0.003}$
N	0.17	0.007
R	0~15°	0~15°

S22C-70-300B-1

M4 96.5