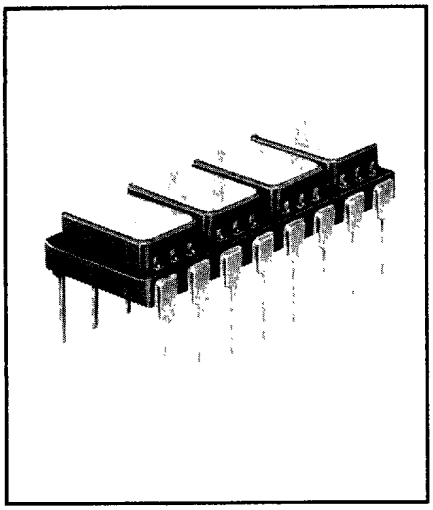
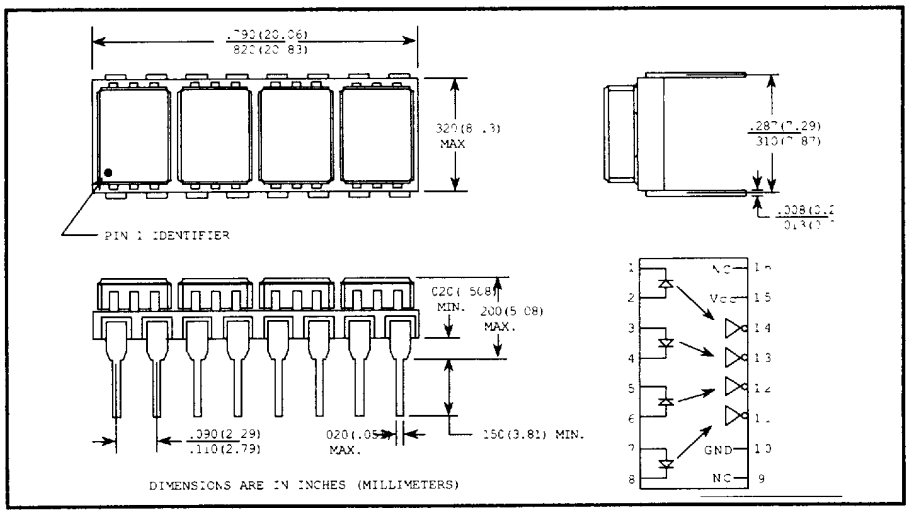
OPTEK

T-41-81

Product Bulletin HDA140A
June 1990 Replaces May 1989

Four Channel Low Input Current Optocoupler
Type HDA140A





Functions

- Key parameters guarantee from -55°C to +15°C unless otherwise noted
- Hermetically sealed
- High density packaging
- Low power consumption
- High current transfer ratio
- Low input current requirement

Description

The HDA140A consists of four ceramic surface mount optocouplers attached to a dual in-line leaded mother board. This package is superior to single cavity construction because it eliminates any possibility of crosstalk between channels, while still meeting the 6N140A JEDEC physical and electrical requirements. The photodiode and the first stage transistor of each channel is connected in common, this permits lower output saturation voltage and higher speed operation than is possible with conventional photodarlington optocouplers.

Custom tested HDA140A devices for programs requiring special military processing can be supplied in accordance with Optek's own special environmental, electrical screening and quality conformance testing.

Absolute Maximum Ratings (T_A = 25°C unless otherwise noted)

Operating Temperature ..... -55°C to +150°C
Storage Temperature ..... -65°C to +150°C
Lead Solder Temperature (1.6mm below seating plane for 10 sec.) ..... 260°C

Input Diode

Peak Input Current (each channel, ≤ 1ms duration, 500 pps) 20mA
Average Input Current, I_F (each channel) ..... 10.0mA(1)
Reverse Input Voltage, V_R (each channel) 5.0V

Output Photodetector

Output Current, I_O (each channel) 40mA
Output Voltage, V_O (each channel) ..... -0.5 to 20V(2)
Supply Voltage, V_{CC} ..... -0.5 to 20V(2)
Output Power Dissipation (each channel) ..... 50mW(3)

Notes:

(1) Derate I_F at 0.33mA/°C above 110°C.
(2) Pin 10 (Ground) should be most negative voltage at the detector side. Keeping V_{CC} as low as possible, greater than 2.0 volts, will provide the lowest total I_{OH} over temperature.
(3) Output power is collector output power plus one fourth of the total supply power. Derate at 1.66mW/°C above 110°C.
(4) I_{OHX} is leakage current resulting from channel to channel optical crosstalk. I_F = 2.0μA for channel under test. For all other channels I_F = 10.0mA.

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Type HDA140A

Electrical Characteristics (T_A = -55°C to 125°C, unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
Input Diode						
V_F*	Forward Voltage			1.70	V	I_F = 1.60mA, T_A = 25°C
BV_R*	Reverse Breakdown Voltage	5.0			V	I_R = 10.0µA, T_A = 25°C
$\frac{\Delta V_F}{\Delta T_A}$	Temperature Coefficient of Forward Voltage		-1.80		mV/°C	I_F = 1.60mA
Coupled						
CTR*	Current Transfer Ratio	300	1500		%	I_F = 0.50mA, V_O = 0.4V, V_{CC} = 4.5V
		300	1000		%	I_F = 1.60mA, V_O = 0.4V, V_{CC} = 4.5V
		200	500		%	I_F = 5.0mA, V_O = 0.4V, V_{CC} = 4.5V
V_{OL}	Logic Low Output Voltage		0.10	0.4	V	I_F = 0.50mA, I_{OL} = 1.50mA, V_{CC} = 4.5V
V_{OL}	Logic Low Output Voltage		0.20	0.4	V	I_F = 5.0mA, I_{OL} = 10.0mA, V_{CC} = 4.5V
I_{OHX}	Logic High Output Current		.001	250	µA	I_F = 2.0mA (channel under test)
I_{OH}*	Logic High Output Current		.001	250	µA	V_O = V_{CC} = 18V (see note 4)
I_{CCL}*	Logic Low Supply Current		1.70	4.0	mA	I_{F1} = I_{F2} = I_{F3} = I_{F4} =1.60mA, V_{CC} = 18V
I_{CCH}*	Logic High Supply Current		.001	40	µA	I_{F1} = I_{F2} = I_{F3} = I_{F4} = 0mA, V_{CC} = 18V
I_{I-O}*	Input-Output Insulation Leakage Current			1.0	µA	45% Relative Humidity, T_A = 25°C, t = 5sec, V_{I-O} = 1500VDC
R_{I-O}	Resistance (input-output)		10^{12}		Ω	V_{I-O} = 500VDC
C_{I-O}	Capacitance (input-output)		1.50		pF	f = 1.00MHz, T_A = 25°C
C_{I-I}	Capacitance (input-input)		1.00		pF	f = 1.00MHz, T_A = 25°C
C_{IN}	Input Capacitance		60		pF	f = 1.00MHz, VF = 0, T_A = 25°C
I_{I-I}	Input-Input Insulation Leakage Current		0.50		nA	45% Relative Hunidity, V_H = 500V, T_A = 25°C, t = 5 sec
R_{I-I}	Resistance (input-input)		10^{12}		Ω	V_{I-I} = 500V, T_A = 25°C
Switching Specification (T_A = 25°C)						
t_{PLH}*	Propagation Delay Time to Logic High at Output		6.0	60	µs	I_F = 0.50mA, R_L = 4.7kΩ, V_{CC} = 5.0V
			4.0	20	µs	I_F = 5.0mA, R_L = 680kΩ, V_{CC} = 5.0V
t_{PHL}*	Propagation Delay Time to Logic Low at Output		30	100	µs	I_F = 0.50mA, R_L = 4.7kΩ, V_{CC} = 5.0V
			2.0	5.0	µs	I_F = 5.0mA, R_L = 680kΩ, V_{CC} = 5.0V
CM_H	Common Mode Transient Immunity at Logic High Level Level Output	500	1000		V/µs	I_F = 0, R_L = 1.5kΩ, $\|V_{CM}\|$ = 50V_{p-p}, V_{CC} = 5.0V
CM_L	Common Mode Transient Immunity at Logic Low Level Level Output	-500	-1000		V/µs	I_F = 1.60mA, R_L = 1.5kΩ, $\|V_{CM}\|$ = 50V_{p-p}, V_{CC} = 5.0V

*JEDEC Registered Data

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Product Bulletin
June 1990 Replaces May 1989

Product Screening & Quality Conformance Test Program
Types HCC640TXV, HDA140ATXV, 6N140ATXV

100% Screening

Test Screen	MIL-STD-883 Method	Condition	HCC640TXV	HDA140ATXV 6N140ATXV
1. Pre Cap Internal Visual	2017		100%	100%
2. Stabilization Bake	1008	Condition C, T_A = +150°C, t = 24hrs	100%	100%
3. Temperature Cycle	1010	Condition C, -65°C to +150°C, 10 cycles	100%	100%
4. Constant Acceleration	2001	Condition A, 5KG's, Y_1 only	100%	100%
5. Interim Electrical Test		Group A, Subgroup 1	100%	100%
6. Power Burn-in	1015	Condition B, V_{CC} = 18.0VDC, I_O = 10.0mADC, I_F = 5.0mADC, t = 160hrs, T_A = +125°C	100%	100%
7. Final Electrical Test		Group A, Subgroup 1 Group A, Subgroup 2 Group A, Subgroup 3	100%	100%
8. Fine Leak	1014	Condition A	100%	100%
9. Gross Leak	1014	Condition C	100%	100%
10. External Visual	2009		100%	100%

Quality Conformance Inspection (Groups A, B, C, & D)

Group A Electrical Inspection

Test	LTPD
Subgroup 1 (Static Tests @ T_A = 25°c) V_F, B_{VR}, CTR, V_{OL}, I_{OHX}, I_{OH}, I_{CCL}, I_{I-O}	2
Subgroup 2 (Static Tests @ T_A = +125°C) V_F, B_{VR}, CTR, V_{OL}, I_{OHX}, I_{OH}, I_{CCL}	3
Subgroup 3 (Static Tests @ T_A = -55°C) V_F, B_{VR}, CTR, V_{OL}, I_{OHX}, I_{OH}, I_{CCL}	5
Subgroup 4 (Dynamic Tests @ T_A = 25°C) C_{I-O}	2
Subgroup 9 (Switching Tests @ T_A = 25°C) t_{PLH}, t_{PHL}, CM_H, CM_L	2
Subgroup 10 (Switching Tests @ T_A = +125°C) t_{PLH}, t_{PHL}, CM_H, CM_L	3
Subgroup 11 (Switching Tests @ T_A = -55°C) t_{PLH}, t_{PHL}, CM_H, CM_L	5

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Types HCC640TXV, HDA140TXV, 6N140ATXV

Group B Testing

Test	MIL-STD-883 Method	Condition	LTPD
Subgroup 1 Physical Dimentions	2016		2 Devices (0 Failures)
Subgroup 2 Not Required			
Subgroup 3 Resistance to Solvents	2015		4 Devices (0 Failures)
Subgroup 4 Internal Visual and Mechanical	2014		1 Device (0 Failures)
Subgroup 5 Bond Strength (Performed at precap, prior to seal. LTPD applies to number of bond pulls from a minimum of 4 devices.)	2011	Condition D	15 (4 Devices)
Subgroup 6 Die Shear Strength (Performed at precap, prior to seal.)	2019		2 Devices (0 Failures)
Subgroup 7 Solderability (LTPD applies to number of leads inspected. 3 device minimum.)	2003	Soldering temperature of 245°C ± 5°C for 10 seconds.	15 (3 Devices)
Subgroup 8 Fine Leak Gross Leak	1014 1014	Condition A Condition C	15
Subgroup 9* Electrical Test Electrostatic Discharge Sensitivity Electrical Test	-- 3015 --	Group A, Subgroup 1 Group A, Subgroup 1	15

* (To be performed at initial qualification only.)

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Group C Testing

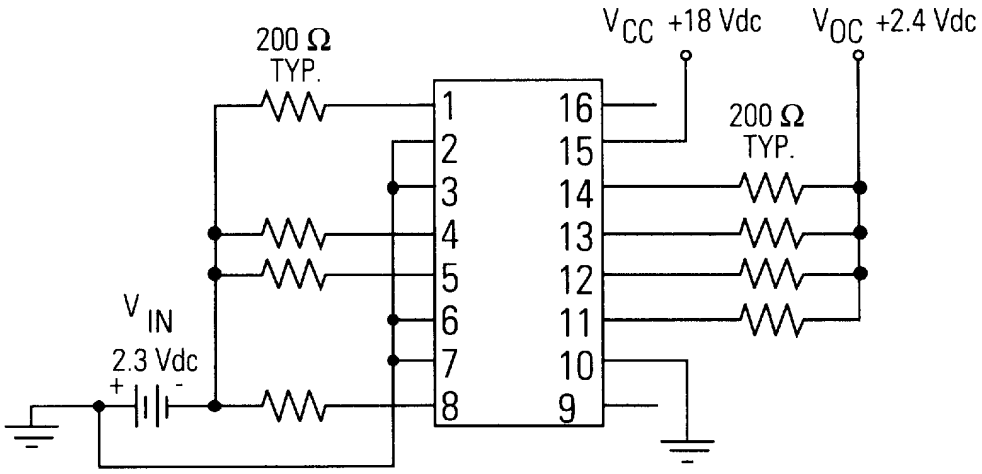
Test	MIL-STD-883 Method	Condition	LTPD
Subgroup 1			15
External Visual	2009		
Temperature Cycling	1010	Condition C, -65°C to +150°C, 10 cycles	
Constant Acceleration	2001	Condition A, 5KG's, Y_1 only	
Fine Leak	1014	Condition A	
Gross Leak	1014	Condition C	
Visual Inspection	1010	Per Visual Criteria of Method 1010	
Electrical Test		Group A, Subgroups 1, 2, 3	
Subgroup 2			10
Steady State Life Test	1005	Condition B, V_{CC} = 18.0VDC, I_O = 10.0mADC, I_F = 5.0mADC, t = 1,000hrs, T_A = +125°C,	
Electrical Test		Group A, Subgroups 1, 2, 3	
Subgroup 3	1018	100°C ≤ 5,000ppm	3(0) or 5(1)
Internal Water Vapor Content			

Group C testing is performed on a periodic basis from current manufacturing every three months.

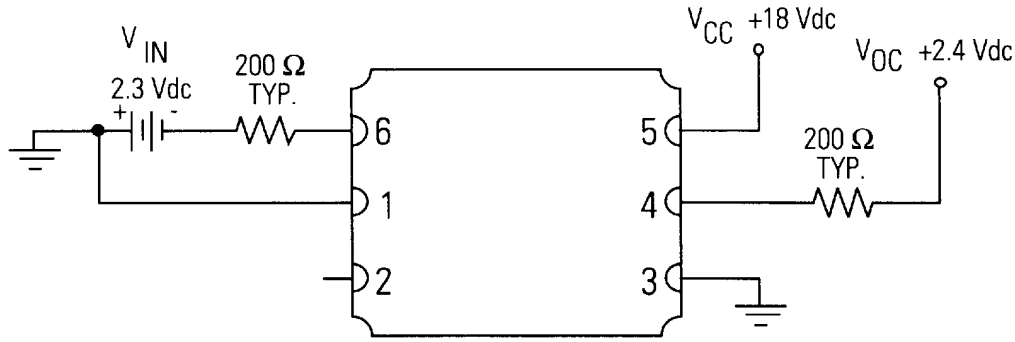
Group D Testing

Test	MIL-STD-883 Method	Condition	LTPD
Thermal Shock	1011	Condition C	5 Devices (0 Failures)
Stabilization Bake	1008	T_A = 150°C, t = 1hr	5 Devices (0 Failures)
Lead Integrity	2004	Condition B2 (HDA140A & 6N140ATXV) Condition D (HCC640TXV)	1 Device (0 Failures)
Fine Leak Gross Leak	1014 1014	Condition A Condition C	5 Devices (0 Failures)

Group D testing is performed on a periodic basis from current manufacturing every six months.



HDA140ATXV & 6N140ATXV
Power Burn-In Circuit



HCC640TXV
Power Burn-In Circuit

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