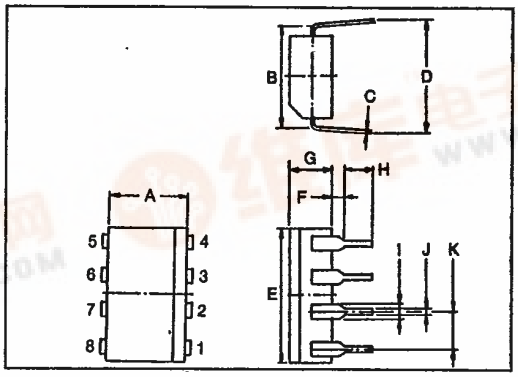
PHOTO IC COUPLER

T-41-83

MT26010
GaAlAs INFRARED+ PHOTO-IC

The MT26010 is a photocoupler which combines a GaAlAs infrared as the emitter and an integrated high gain, high speed photodetector. The output of the detector circuit is an open collector, Schottky clamped transistor. A Faraday shield integrated on the photodetector chip reduces the effects of capacitive coupling between the input LED emitter and the high gain stages of the detector. This provides an effective common mode transient immunity of 1000V/μs.



SYMBOL	INCHES	MM
A	0.252	6.4
B	0.300 ± 0.010	7.62 ± 0.25
C	0.010 $^{+0.004}_{-0.002}$	0.25 $^{+0.1}_{-0.05}$
D	0.309 ~ 0.346	7.85 8.80
E	0.380 ± 0.010	9.66 ± 0.25
F	0.031	0.8
G	0.144	3.65
H	0.100 MIN	2.5 MIN
I	0.047	1.2
J	0.020	0.5
K	0.100 ± 0.010	2.54 ± 0.25

APPLICATIONS

- ISOLATED LINE RECEIVER
- SIMPLEX/MULTIPLEX DATA TRANSMISSION
- COMPUTER-PERIPHERAL INTERFACE
- MICROPROCESSOR SYSTEM INTERFACE
- DIGITAL ISOLATION FOR A/D, D/A CONVERSION
- DIRECT REPLACEMENT FOR HCPL-2601

FEATURES

- Input current thresholds: I_F =5mA Max.
- Isolation voltage: 2500V_{rms} Min.
- Switching speed: 10MBd.
- Common mode transient immunity: 1000V/μs Min.
- Guaranteed performance over temp.: 0°C~70°C.
- UL recognized.

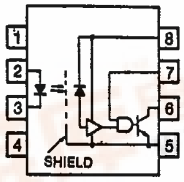
MAXIMUM RATINGS (No derating required)

	CHARACTERISTIC	SYMBOL	RATING	UNIT
A	Forward Current	I_F	20	mA
A	Reverse Voltage	V_R	5	V
B	Output Current	I_O	25	mA
B	Output Voltage	V_O	7	V
B	Supply Voltage (1 Minute Maximum)	V_{CC}	7	V
B	Enable Input Voltage (Not to exceed V_{CC} by more than 500mV)	V_E	5.5	V
B	Output Collector Power Dissipation	P_O	40	mW
	Operating Temperature Range	T_{opr}	- 0~70	°C
	Storage Temperature Range	T_{stg}	-55~125	°C
	Lead Solder Temperature (10 sec.)**	T_{sold}	260	°C
	Isolation Voltage	BV_S	2500	V_{rms}
	(R.H.≦60%, AC/1 min., Note 10)		3540	V_{dc}

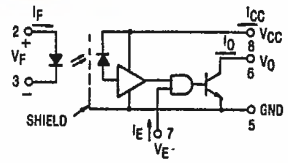
**1.6mm below seating plane.

A - LED B - DETECTOR

PIN CONFIGURATIONS (TOP VIEW)



SCHEMATIC



A 0.01 to 0.1μF bypass capacitor must be connected between pins 8 and 5 (See Note 1).

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OPTO-ELECTRICAL CHARACTERISTICS
(Ta = 0°C~70°C Unless otherwise noted)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.*	MAX.	UNIT
High Level Output Current	I_{OH}	V_{CC}=5.5V, V_O=5.5V I_F=250μA, V_E=2.0V	—	1	250	μA
Low Level Output Voltage	V_{OL}	V_{CC}=5.5V, I_F=5mA V_E=2.0V, I_{OL}(Sinking)=13mA	—	0.4	0.6	V
High Level Supply Current	I_{CCH}	V_{CC}=5.5V, I_F=0, V_E=0.5V	—	7	15	mA
Low Level Supply Current	I_{CCL}	V_{CC}=5.5V, I_F=10mA, V_E=0.5V	—	12	19	mA
Low Level Enable Current	I_{EL}	V_{CC}=5.5V, V_E=0.5V	—	-1.6	-2.0	mA
High Level Enable Current	I_{EH}	V_{CC}=5.5V, V_E=2.0V	—	-1	—	mA
High Level Enable Voltage	V_{EH}	Note 11	2.0	—	—	V
Low Level Enable Voltage	V_{EL}		—	—	0.8	
Input Forward Voltage	V_F	I_F=10mA, Ta=25°C	—	1.65	1.75	V
Input Reverse Breakdown Voltage	BV_R	I_R=10μA, Ta=25°C	5	—	—	V
Input Capacitance	C_{IN}	V_F=0, f=1MHz	—	45	—	pF
Input Diode Temperature Coefficient	$\frac{\Delta V_F}{\Delta T_A}$	I_F=10mA	—	-2.0	—	mV/°C
Input-Output Insulation Leakage Current	I_{I-O}	Relative Humidity=45% Ta=25°C, t=5second V_{I-O}=3000Vdc, Note 10	—	—	1	μA
Resistance (Input-Output)	R_{I-O}	V_{I-O}=500V, Note 10	—	10^{12}	—	Ω
Capacitance (Input-Output)	C_{I-O}	f=1MHz, Note 10	—	0.6	—	pF

*All typical values are V_{CC}=5V, Ta=25°C.

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Current, Low Level	I_{FL}	0	—	250	μA
Input Current, High Level	I_{FH}	6.3*	—	20	mA
Supply Voltage, Output	V_{CC}	4.5	—	5.5	V
High Level Enable Voltage	V_{EH}	2.0	—	V_{CC}	V
Low Level Enable Voltage	V_{EL}	0	—	0.8	V
Fan Out (TTL Load)	N	—	—	8	
Operating Temperature	T_{opr}	0	—	70	°C

*6.3mA is a guard banded value which allows for at least 20% CTR degradation.
Initial input current threshold value is 5.0mA or less.

TRUTH TABLE
(Postive Logic)

INPUT	ENABLE	OUTPUT
H	H	L
L	H	H
H	L	H
L	L	H

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SWITCHING CHARACTERISTICS (Ta = 25°C, V_{CC} = 5V)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time to High Output Level	t_{pLH}	1	R_L=350Ω, C_L=15pF I_F=7.5mA Note 2, 3, 4 & 5	—	60	75	ns
Propagation Delay Time to Low Output Level	t_{pHL}			—	60	75	ns
Output Rise Time (10-90%)	t_r			—	30	—	ns
Output Fall Time (90-10%)	t_f			—	30	—	ns
Propagation Delay Time of Enable from V_{EH} to V_{EL}	t_{ELH}	2	R_L=350Ω, C_L=15pF I_F=7.5mA, V_{EH}=3.0V V_{EL}=0.5V Note 6 & 7	—	25	—	ns
Propagation Delay Time of Enable from V_{EL} to V_{EH}	t_{EHL}			—	25	—	ns
Common Mode Transient Immunity at High Output Level	CM_H	3	V_{CM}=400V, R_L=350Ω V_O(min.)=2V, I_F=0mA Note 9	1000	10000	—	V/μs
Common Mode Transient Immunity at Low Output Level	CM_L		V_{CM}=400V, R_L=350Ω V_O(max.)=0.8V I_F=7.5mA Note 8	-1000	-10000	—	V/μs

NOTES

1. The V_{CC} supply voltage to each isolator must be bypassed by a 0.01μF capacitor or larger. This can be either a ceramic or solid tantalum capacitor with good high frequency characteristic and should be connected as close as possible to the package V_{CC} and GND pins of each device.
2. t_{pHL} • Propagation delay is measured from the 3.75 mA level on the LOW to HIGH transition of the input current pulse to the 1.5V level on the HIGH to LOW transition of the output voltage pulse.
3. t_{pLH} • Propagation delay is measured from the 3.75mA level on the HIGH to LOW transition of the input current pulse to the 1.5V level on the LOW to HIGH transition of the output voltage pulse.
4. t_f • Fall time is measured from the 10% to the 90% levels of the HIGH to LOW transition on the output pulse.
5. t_r • Rise time is measured from the 90% to the 10% levels of the LOW to HIGH transition on the output pulse.
6. t_{EHL} • Enable input propagation delay is measured from the 1.5V level on the LOW to HIGH transition of the input voltage pulse to the 1.5V level on the HIGH to LOW transition of the output voltage pulse.
7. t_{ELH} • Enable input propagation delay is measured from the 1.5V level on the HIGH to LOW transition of the input voltage pulse to the 1.5V level on the LOW to HIGH transition of the output voltage pulse.
8. CM_L • The maximum tolerable rate of fall of the common mode voltage to ensure the output will remain in the low output state (i.e., V_{OUT}<0.8V). Measured in volts per microsecond (V/μs).
9. CM_H • The maximum tolerable rate of rise in the common mode voltage to ensure the output will remain in the high state (i.e., V_{OUT}>2.0V). Measured in volts per microsecond (V/μs). Volts/microsecond can be translated to sinusoidal voltages:

$$V/\mu s = \frac{(dV_{CM})}{dt}\Big|_{Max.} = f_{CM}\, V_{CM}\ (p.p.)$$

Example:
V_{CM}=318Vpp when f_{CM}=1MHz using CM_L and CM_H=1000V/μs data sheet specified minimum.

10. • Device considered a two-terminal device: Pins 1, 2, 3 and 4 shorted together, and Pins 5, 6, 7 and 8 shorted together.
11. Enable Input • No pull up resistor required as the device has an internal pull up resistor.

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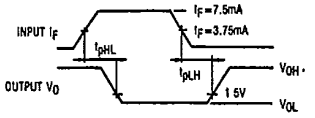
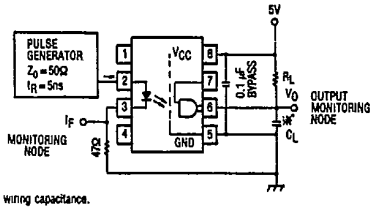
TEST CIRCUIT 1

t_{pHL} and t_{pLH}

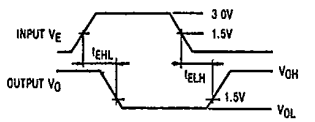


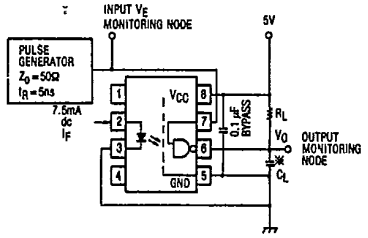


* C_L is approximately 15pF which includes probe and stray wiring capacitance.

TEST CIRCUIT 2

t_{ELH} and t_{EHL}

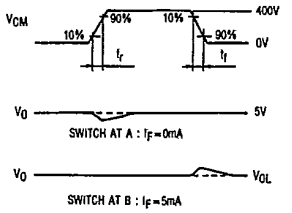


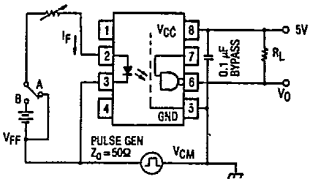


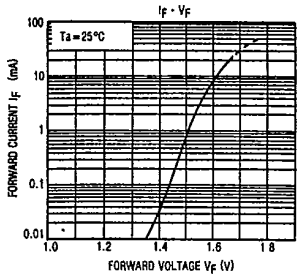
* C_L is approximately 15pF which includes probe and stray wiring capacitance.

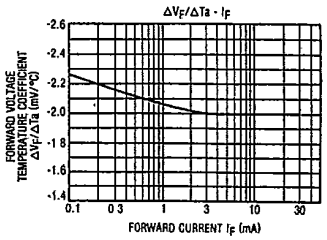
TEST CIRCUIT 3.

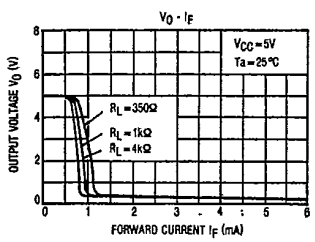
Transient Immunity and Typical Waveforms.











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