

# PHOTO IC COUPLER

T-41-83

## MT26010

### GaAlAs INFRARED+ PHOTO-IC

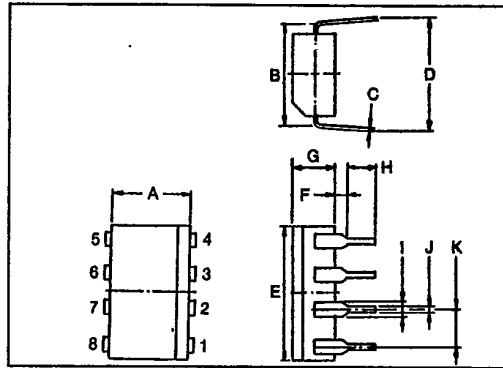
The MT26010 is a photocoupler which combines a GaAlAs infrared as the emitter and an integrated high gain, high speed photodetector. The output of the detector circuit is an open collector, Schottky clamped transistor. A Faraday shield integrated on the photodetector chip reduces the effects of capacitive 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.

#### 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:  $I_F = 5\text{mA}$  Max.
- Isolation voltage: 2500V<sub>rms</sub> Min.
- Switching speed: 10MBd.
- Common mode transient immunity: 1000V/μs Min.
- Guaranteed performance over temp.: 0°C ~ 70°C.
- UL recognized.



SYMBOL	INCHES	MM
A	0.252	6.4
B	0.300 ± 0.010	7.62 ± 0.25
C	0.010 ± 0.004	0.25 ± 0.10
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

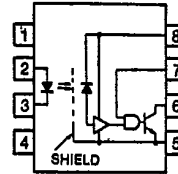
#### MAXIMUM RATINGS (No derating required)

CHARACTERISTIC	SYMBOL	RATING	UNIT
A Forward Current	$I_F$	20	mA
	Reverse Voltage	$V_R$	5 V
Output Current	$I_O$	25	mA
Output Voltage	$V_O$	7	V
B Supply Voltage (1 Minute Maximum)	$V_{CC}$	7	V
Enable Input Voltage (Not to exceed $V_{CC}$ by more than 500mV)	$V_E$	5.5	V
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 (R.H. ≤ 60%, AC/1 min., Note 10)	$BV_S$	2500	V <sub>rms</sub>
		3540	V <sub>dc</sub>

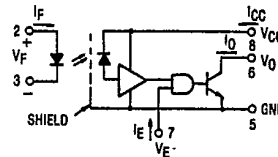
\*\*1.6mm below sealing plane.

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 <sub>OH</sub>	V <sub>CC</sub> =5.5V, V <sub>O</sub> =5.5V I <sub>F</sub> =250μA, V <sub>E</sub> =2.0V	—	1	250	μA
Low Level Output Voltage	V <sub>OL</sub>	V <sub>CC</sub> =5.5V, I <sub>F</sub> =5mA V <sub>E</sub> =2.0V, I <sub>OL</sub> (Sinking)=13mA	—	0.4	0.6	V
High Level Supply Current	I <sub>CCH</sub>	V <sub>CC</sub> =5.5V, I <sub>F</sub> =0, V <sub>E</sub> =0.5V	—	7	15	mA
Low Level Supply Current	I <sub>CCL</sub>	V <sub>CC</sub> =5.5V, I <sub>F</sub> =10mA, V <sub>E</sub> =0.5V	—	12	19	mA
Low Level Enable Current	I <sub>EL</sub>	V <sub>CC</sub> =5.5V, V <sub>E</sub> =0.5V	—	-1.6	-2.0	mA
High Level Enable Current	I <sub>EH</sub>	V <sub>CC</sub> =5.5V, V <sub>E</sub> =2.0V	—	-1	—	mA
High Level Enable Voltage	V <sub>EH</sub>	Note 11	2.0	—	—	V
Low Level Enable Voltage	V <sub>EL</sub>		—	—	0.8	V
Input Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =10mA, Ta=25°C	—	1.65	1.75	V
Input Reverse Breakdown Voltage	B <sub>VR</sub>	I <sub>R</sub> =10μA, Ta=25°C	5	—	—	V
Input Capacitance	C <sub>IN</sub>	V <sub>F</sub> =0, f=1MHz	—	45	—	pF
Input Diode Temperature Coefficient	$\frac{\Delta V_F}{\Delta T_A}$	I <sub>F</sub> =10mA	—	-2.0	—	mV/°C
Input-Output Insulation Leakage Current	I <sub>I-O</sub>	Relative Humidity=45% Ta=25°C, t=5second V <sub>I-O</sub> =3000Vdc, Note 10	—	—	1	μA
Resistance (Input-Output)	R <sub>I-O</sub>	V <sub>I-O</sub> =500V, Note 10	—	10 <sup>12</sup>	—	Ω
Capacitance (Input-Output)	C <sub>I-O</sub>	f=1MHz, Note 10	—	0.6	—	pF

\*All typical values are V<sub>CC</sub>=5V, Ta=25°C.

## RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Current, Low Level	I <sub>FL</sub>	0	—	250	μA
Input Current, High Level	I <sub>FH</sub>	6.3*	—	20	mA
Supply Voltage, Output	V <sub>CC</sub>	4.5	—	5.5	V
High Level Enable Voltage	V <sub>EH</sub>	2.0	—	V <sub>CC</sub>	V
Low Level Enable Voltage	V <sub>EL</sub>	0	—	0.8	V
Fan Out (TTL Load)	N	—	—	8	
Operating Temperature	T <sub>opr</sub>	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 (Positive 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, VCC = 5V)**

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time to High Output Level	t <sub>pLH</sub>	1	R <sub>L</sub> = 350Ω, C <sub>L</sub> = 15pF I <sub>F</sub> = 7.5mA Note 2, 3, 4 & 5	—	60	75	ns
Propagation Delay Time to Low Output Level	t <sub>pHL</sub>			—	60	75	ns
Output Rise Time (10-90%)	t <sub>r</sub>			—	30	—	ns
Output Fall Time (90-10%)	t <sub>f</sub>			—	30	—	ns
Propagation Delay Time of Enable from V <sub>EH</sub> to V <sub>EL</sub>	t <sub>ELH</sub>	2	R <sub>L</sub> = 350Ω, C <sub>L</sub> = 15pF I <sub>F</sub> = 7.5mA, V <sub>EH</sub> = 3.0V V <sub>EL</sub> = 0.5V Note 6 & 7	—	25	—	ns
Propagation Delay Time of Enable from V <sub>EL</sub> to V <sub>EH</sub>	t <sub>EHL</sub>			—	25	—	ns
Common Mode Transient Immunity at High Output Level	CM <sub>H</sub>	3	V <sub>CM</sub> = 400V, R <sub>L</sub> = 350Ω V <sub>O(min.)</sub> = 2V, I <sub>F</sub> = 0mA Note 9	1000	10000	—	V/μs
Common Mode Transient Immunity at Low Output Level	CM <sub>L</sub>			-1000	-10000	—	V/μs

## NOTES

- The V<sub>CC</sub> 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<sub>CC</sub> and GND pins of each device.
- t<sub>pHL</sub> • 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.
- t<sub>pLH</sub> • 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.
- t<sub>f</sub> • Fall time is measured from the 10% to the 90% levels of the HIGH to LOW transition on the output pulse.
- t<sub>r</sub> • Rise time is measured from the 90% to the 10% levels of the LOW to HIGH transition on the output pulse.
- t<sub>EHL</sub> • 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.
- t<sub>ELH</sub> • 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.
- CM<sub>L</sub> • 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<sub>OUT</sub> < 0.8V). Measured in volts per microsecond (V/μs).
- CM<sub>H</sub> • The maximum tolerable rate of rise in the common mode voltage to ensure the output will remain in the high state (i.e., V<sub>OUT</sub> > 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:

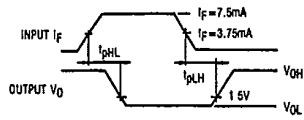
V<sub>CM</sub> = 318V<sub>pp</sub> when f<sub>CM</sub> = 1MHz using CM<sub>L</sub> and CM<sub>H</sub> = 1000V/μs data sheet specified minimum.

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

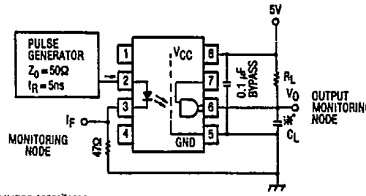
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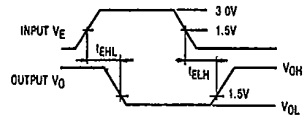
TEST CIRCUIT 1  
 $T_{pHL}$  and  $t_{pLH}$



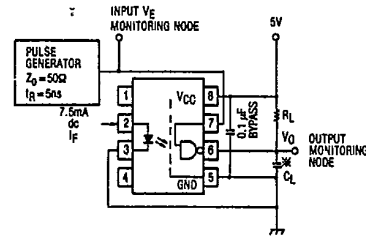
\*  $C_L$  is approximately 15pF which includes probe and stray wiring capacitance.



TEST CIRCUIT 2  
 $t_{ELH}$  and  $t_{EHL}$

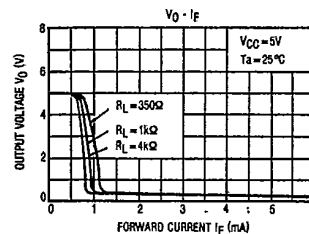
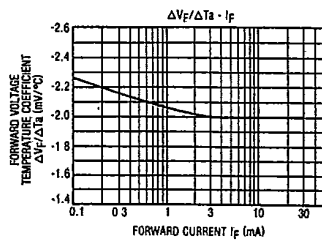
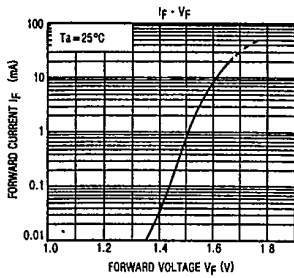
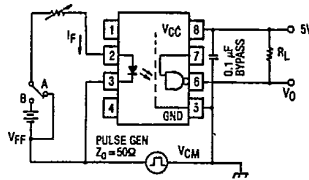
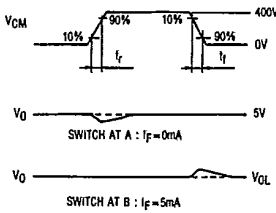


\*  $C_L$  is approximately 15pF which includes probe and stray wiring capacitance.



TEST CIRCUIT 3.

Transient Immunity and Typical Waveforms.



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