

HIGH SPEED COUPLER

6N135, 6N136 INFRARED LED + PHOTO IC

The 6N135 and 6N136 consist of a high emitting diode and a one chip photo diode-transistor. Each unit is an 8-lead DIP package.

APPLICATIONS

- DIGITAL LOGIC ISOLATION
- LINE RECEIVER
- POWER SUPPLY CONTROL
- SWITCHING POWER SUPPLY
- TRANSISTOR INVERTER

FEATURES

- High isolation voltage.
- High speed: t_{pHL} , $t_{pLH} = 0.5\mu s$ (Typ.) ($R_L = 1.9k\Omega$).
- TTL compatible.
- If base pin is open, output signal will be noisy by environmental condition for this case, MT5500 is suitable.
- UL recognized.

MAXIMUM RATINGS ($T_a = 25^\circ C$)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Forward Current (Note 1)	I_F	25	mA
Pulse Forward Current (Note 2)	I_{FP}	50	mA
Total Pulse Forward Current (Note 3)	I_{FPT}	1	A
Reverse Voltage	V_R	5	V
Diode Power Dissipation (Note 4)	P_D	45	mW
Output Current	I_O	8	mA
Peak Output Current	I_{OP}	16	mA
Emitter-Base Reverse Voltage (Pin 5-7)	V_{EB}	5	V
Supply Voltage	V_{CC}	-0.5 ~ 15	V
Output Voltage	V_O	-0.5 ~ 15	V
Base Current (Pin 7)	I_B	5	mA
Output Power Dissipation (Note 5)	P_O	100	mW
Operating Temperature Range	T_{opr}	-55 ~ 100	$^\circ C$
Storage Temperature Range	T_{stg}	-55 ~ 125	$^\circ C$
Isolation Voltage (Note 6)	BV_S	2500	V_{rms}

Note 1: Derate 0.8mA above $70^\circ C$.

Note 2: 50% duty cycle, 1ms pulse width. Derate 1.6mA/ $^\circ C$ above $70^\circ C$.

Note 3: Pulse width 1 μs , 300pps.

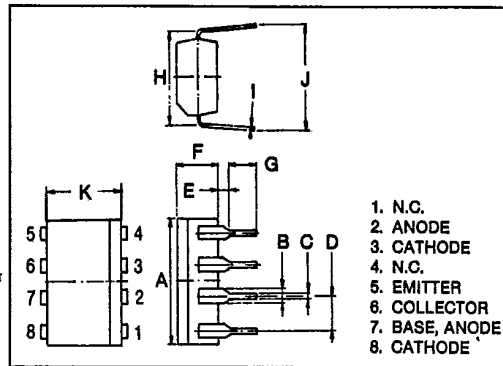
Note 4: Derate 0.9mW/ $^\circ C$ above $70^\circ C$.

Note 5: Derate 2mW/ $^\circ C$ above $70^\circ C$.

Note 6: R.H.=40~60%, AC/1 min.

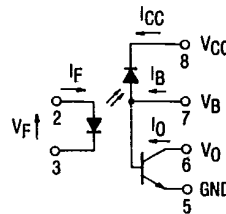
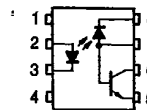
A - LED B - DETECTOR

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SYMBOL	INCHES	MM
A	0.380 ± 0.010	9.66 ± 0.25
B	0.047	1.2
C	0.020	0.5
D	0.100 ± 0.010	2.54 ± 0.25
E	0.031	0.8
F	0.144	3.65
G	0.098	2.5
H	0.300 ± 0.010	7.62 ± 0.25
I	$0.010 \begin{smallmatrix} +0.004 \\ -0.002 \end{smallmatrix}$	$0.25 \begin{smallmatrix} +0.1 \\ -0.06 \end{smallmatrix}$
J	$0.309 \sim 0.346$	$7.85 \sim 8.80$
K	0.252	6.4

PIN CONFIGURATIONS
(TOP VIEW)



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OPTO-ELECTRICAL CHARACTERISTICS OVER RECOMMENDED TEMPERATURE ($T_a = 0^\circ\text{C} \sim 70^\circ\text{C}$ Unless otherwise noted)

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CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP**	MAX.	UNIT
Current Transfer Ratio	6N135	$I_F = 16\text{mA}$, $V_O = 0.4\text{V}$	7	18	—	%
	6N136	$V_{CC} = 4.5\text{V}$, $T_a = 25^\circ\text{C}$ (Note 1)	19	24	—	%
	6N135	$I_F = 16\text{mA}$, $V_O = 0.5\text{V}$	5	13	—	%
	6N136	$V_{CC} = 4.5\text{V}$ (Note 1)	15	21	—	%
Logic Low Output Voltage	6N135	$I_F = 16\text{mA}$, $I_O = 1.1\text{mA}$, $V_{CC} = 4.5\text{V}$	—	0.1	0.4	V
	6N136	$I_F = 16\text{mA}$, $I_O = 2.4\text{mA}$, $V_{CC} = 4.5\text{V}$	—	0.1	0.4	V
Logic High Output Current	I_{OH}	$I_F = 0\text{mA}$, $V_O = V_{CC} = 5.5\text{V}$ $T_a = 25^\circ\text{C}$	—	3	500	nA
		$I_F = 0\text{mA}$, $V_O = V_{CC} = 15\text{V}$ $T_a = 25^\circ\text{C}$	—	0.1	100	μA
	I_{OH}	$I_F = 0\text{mA}$, $V_O = V_{CC} = 15\text{V}$	—	—	250	μA
Logic Low Supply Current	I_{CCL}	$I_F = 16\text{mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{V}$	—	40	—	μA
Logic High Supply Current	I_{CCH}	$I_F = 0\text{mA}$, $V_O = \text{Open}$ $V_{CC} = 15\text{V}$, $T_a = 25^\circ\text{C}$	—	0.01	1	μA
	I_{CCH}	$I_F = 0\text{mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{V}$	—	—	2	μA
Input Forward Voltage	V_F	$I_F = 16\text{mA}$, $T_a = 25^\circ\text{C}$	—	1.65	1.7	V
Temperature Coefficient of Forward Voltage	$\frac{\Delta V_F}{\Delta T_a}$	$I_F = 16\text{mA}$	—	-1.9	—	mV/ $^\circ\text{C}$
Input Reverse Breakdown Voltage	BV_R	$I_R = 10\mu\text{A}$, $T_a = 25^\circ\text{C}$	5	—	—	V
Input Capacitance	C_{IN}	$f = 1\text{MHz}$, $V_F = 0$	—	60	—	pF
Input-Output Insulation Leakage Current	I_{I-O}	45% Relative Humidity, $t = 5\text{s}$, $V_{I-O} = 3000\text{Vdc}$, $T_a = 25^\circ\text{C}$ (Note 2)	—	—	1.0	μA
Resistance (Input-Output)	R_{I-O}	$V_{I-O} = 500\text{Vdc}$ (Note 2)	—	10^{12}	—	Ω
Capacitance (Input-Output)	C_{I-O}	$f = 1\text{MHz}$ (Note 2)	—	0.6	—	pF
Transistor DC Current Gain	h_{FE}	$V_O = 5\text{V}$, $I_O = 3\text{mA}$	—	80	—	—

**All typicals at $T_a = 25^\circ\text{C}$.

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SWITCHING CHARACTERISTICS ($T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$, $I_F = 16\text{mA}$ Unless otherwise noted)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time to Logic Low at Output	6N135	t_{pHL}	1	$R_L = 4.1k\Omega$	—	0.2	1.5	μs
	6N136			$R_L = 1.9k\Omega$	—	0.2	0.8	μs
Propagation Delay Time to Logic High at Output	6N135	t_{pLH}	1	$R_L = 4.1k\Omega$	—	1.0	1.5	μs
	6N136			$R_L = 1.9k\Omega$	—	0.5	0.8	μs
Common Mode Transient Immunity at Logic High Level Output (Note 3)	6N135	CM_H	2	$I_F = 0mA, V_{CM} = 10V_{p-p}$ $R_L = 4.1k\Omega$	—	1000	—	$V/\mu s$
	6N136			$I_F = 0mA, V_{CM} = 10V_{p-p}$ $R_L = 1.9k\Omega$	—	1000	—	$V/\mu s$
Common Mode Transient Immunity at Logic Low Level Output (Note 3)	6N135	CM_L	2	$I_F = 16mA, V_{CM} = 10V_{p-p}$ $R_L = 4.1k\Omega$	—	-1000	—	$V/\mu s$
	6N136			$I_F = 16mA, V_{CM} = 10V_{p-p}$ $R_L = 1.9k\Omega$	—	-1000	—	$V/\mu s$
Bandwidth (Note 4)	BW	—	—	$R_L = 100\Omega$	—	2	—	MHz

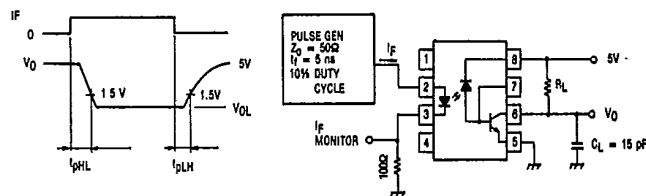
Note 1: DC CURRENT TRANSFER RATIO is defined as the ratio of output collector current, I_O , to the forward LED Input current, I_F , times 100%.

Note 2: Device considered a two-terminal device: Pins 1, 2, 3, and 4 shorted together and Pins 5, 6, 7 and 8 shorted together.

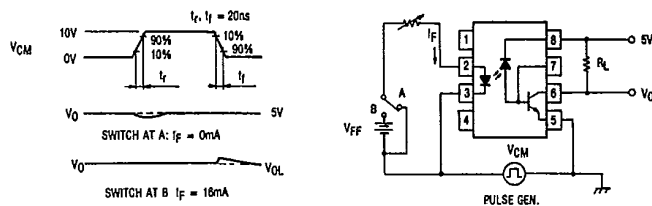
Note 3: Common mode transient immunity in Logic High level is the maximum tolerable (Positive) dV_{CM}/dt on the leading edge of the common mode pulse, V_{CM} , to assure that the output will remain in a Logic High state (i.e., $V_O > 2.0\text{V}$). Common mode transient immunity in Logic Low level is the maximum tolerable (negative) dV_{CM}/dt on the trailing edge of the common mode pulse signal, V_{CM} , to assure that the output will remain in a Logic Low state (i.e., $V_O < 0.8\text{V}$).

Note 4: The frequency at which the ac output voltage is 3dB below the low frequency asymptote.

TEST CIRCUIT 1.

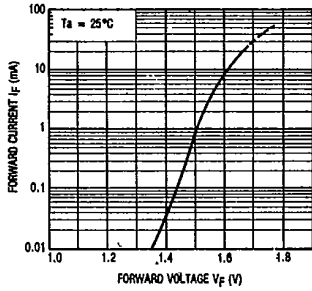
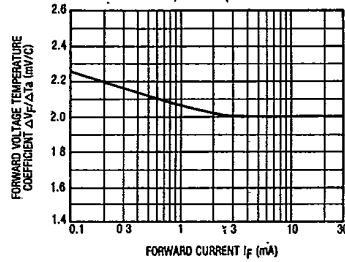
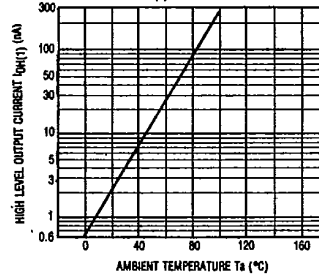
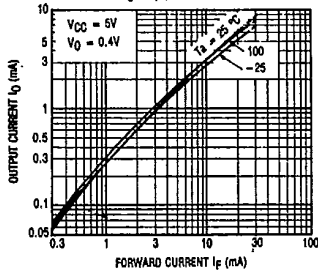
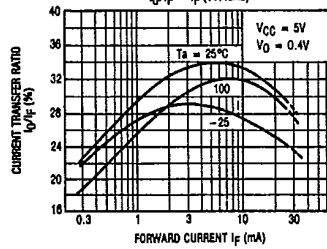
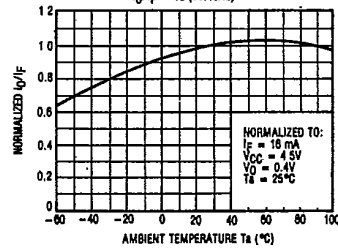
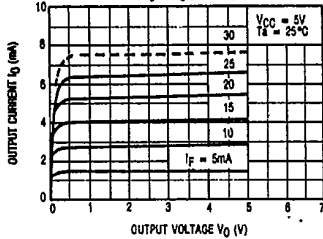
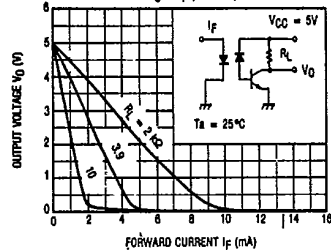


TEST CIRCUIT 2



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 $I_F - V_F$ (TYPICAL) $\Delta V_F / \Delta T_a - I_F$ (TYPICAL) $I_{OH(1)} - T_a$ (TYPICAL) $I_O - I_F$ (TYPICAL) $I_O / I_F - I_F$ (TYPICAL) $I_O / I_F - T_a$ (TYPICAL) $I_O - V_O$ (TYPICAL) $V_O - I_F$ (TYPICAL) $t_{PHL}, t_{PLH} - R_L$ (TYPICAL)