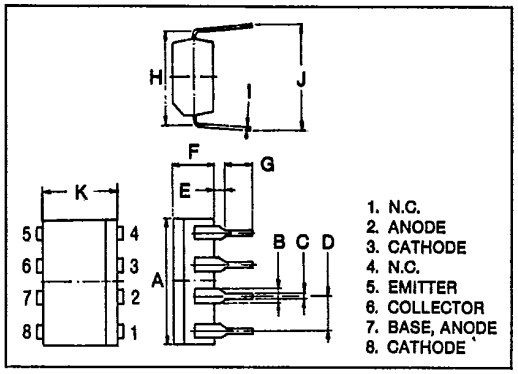
HIGH SPEED COUPLER

T-41-83

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} =0.5μs(Typ.) (R_L =1.9kΩ).
- TTL compatible.
- If base pin is open, output signal will be noisy by environmental condition for this case, MT5500 is suitable.
- UL recognized.

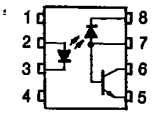
SYMBOL	INCHES	MM
A	0.380±0.010	9.66±0.25
B	0.047	1.2
C	0.020	0.5
D	0.100±0.010	2.54±0.25
E	0.031	0.8
F	0.144	3.65
G	0.098	2.5
H	0.300±0.010	7.62±0.25
I	0.010 $^{+0.004}_{-0.002}$	0.25 $^{+0.1}_{-0.05}$
J	0.309~0.346	7.85~8.80
K	0.252	6.4

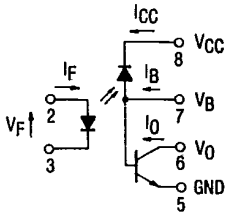
MAXIMUM RATINGS (Ta=25°C)

	CHARACTERISTIC		SYMBOL	RATING	UNIT
A	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
B	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	°C
	Storage Temperature Range		T_{stg}	-55~125	°C
	Isolation Voltage	(Note 6)	BV_S	2500	V_{rms}

Note 1: Derate 0.8mA above 70°C.
Note 2: 50% duty cycle, 1ms pulse width. Derate 1.6mA/°C above 70°C.
Note 3: Pulse width 1μs, 300pps.
Note 4: Derate 0.9mW/°C above 70°C.
Note 5: Derate 2mW/°C above 70°C.
Note 6: R.H.=40~60%, AC/1 min.
A - LED B - DETECTOR

PIN CONFIGURATIONS (TOP VIEW)





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

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

**All typicals at Ta=25°C.

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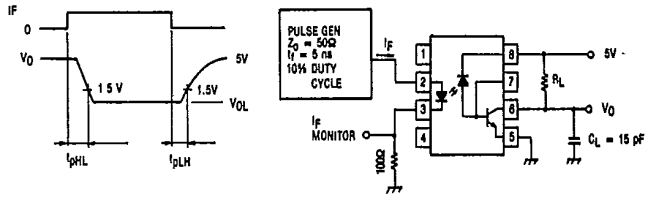
SWITCHING CHARACTERISTICS (T_a = 25°C, V_{CC} = 5V, I_F = 16mA Unless otherwise noted)

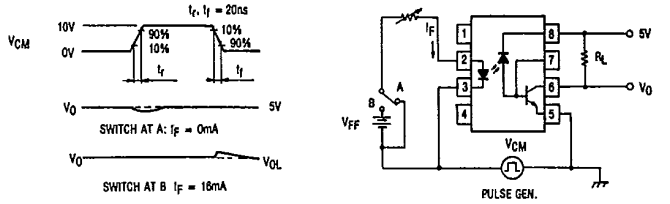
CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time to Logic Low at Output	6N135	t_{pHL}	1	R_L=4.1kΩ	—	0.2	1.5	μs
	6N136			R_L=1.9kΩ	—	0.2	0.8	μs
Propagation Delay Time to Logic High at Output	6N135	t_{pLH}	1	R_L=4.1kΩ	—	1.0	1.5	μs
	6N136			R_L=1.9kΩ	—	0.5	0.8	μs
Common Mode Transient Immunity at Logic High Level Output (Note 3)	6N135	CM_H	2	I_F=0mA, V_{CM}=10Vp-p R_L=4.1kΩ	—	1000	—	V/μs
	6N136			I_F=0mA, V_{CM}=10Vp-p R_L=1.9kΩ	—	1000	—	V/μs
Common Mode Transient Immunity at Logic Low Level Output (Note 3)	6N135	CM_L	2	I_F=16mA, V_{CM}=10Vp-p R_L=4.1kΩ	—	-1000	—	V/μs
	6N136			I_F=16mA, V_{CM}=10Vp-p R_L=1.9kΩ	—	-1000	—	V/μs
Bandwidth	(Note 4)	BW	—	R_L=100Ω	—	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) dVcm/dt on the leading edge of the common mode pulse, Vcm, to assure that the output will remain in a Logic High state (i.e., V_O>2.0V). Common mode transient immunity in Logic Low level is the maximum tolerable (negative) dVcm/dt on the trailing edge of the common mode pulse signal, Vcm, to assure that the output will remain in a Logic Low state (i.e., V_O<0.8V).
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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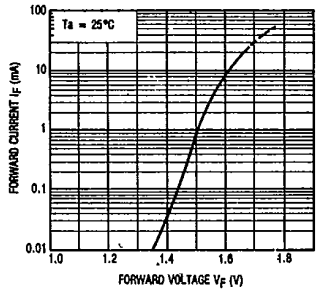
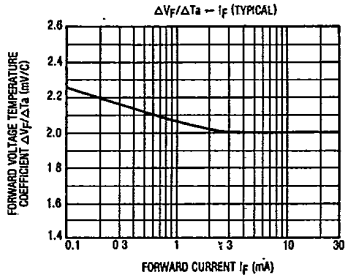
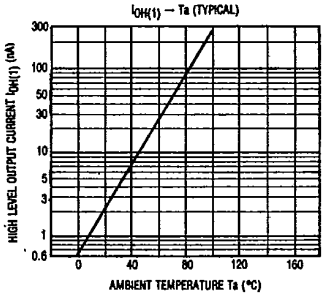
$I_F - V_F$ (TYPICAL)



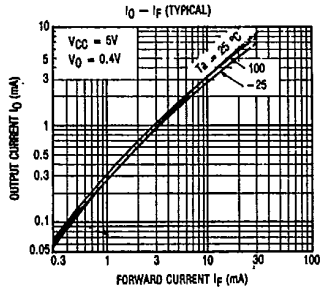
$\Delta V_F/\Delta Ta - I_F$ (TYPICAL)



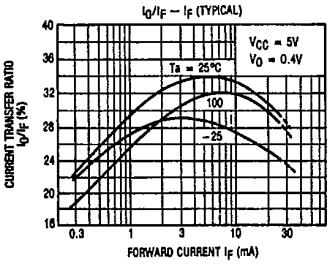
$I_{OH(1)} - Ta$ (TYPICAL)



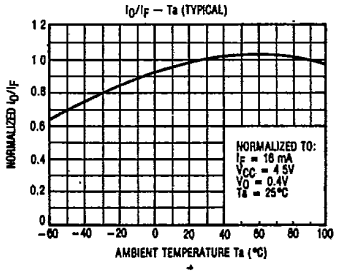
$I_O - I_F$ (TYPICAL)



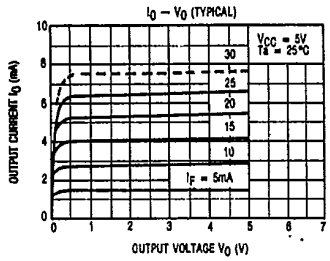
$I_O/I_F - I_F$ (TYPICAL)



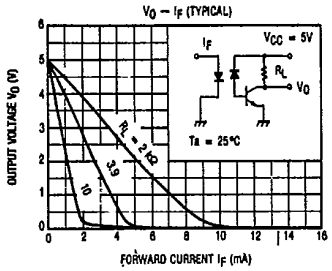
$I_O/I_F - Ta$ (TYPICAL)



$I_O - V_O$ (TYPICAL)



$V_O - I_F$ (TYPICAL)



t_{pHL}, $t_{pLH} - R_L$ (TYPICAL)