Single Channel，High Speed 1MBit/s Transistor Optocouple

Description

The UMW6N135/6N136 optocoupler consists of an 850nm AlGaAs LED optically coupled to a high speed photodetector transistor. A separate connection for the bias of the photodiode improves the speed by several orders of magnitude over conventional phototransistor optocouplers by reducing the base-collector capacitance of the input transistor. The devices are packaged in an 8-pin DIP package and available in wide-lead spacing (M-type) and SMD option.

Features

- Open-Collector Output
- TTL Compatible
- High bit rate: 1 MBit/s
- Superior CMR-10 kV/μs
- CTR guaranteed: 0-70℃
- RoHS compliant

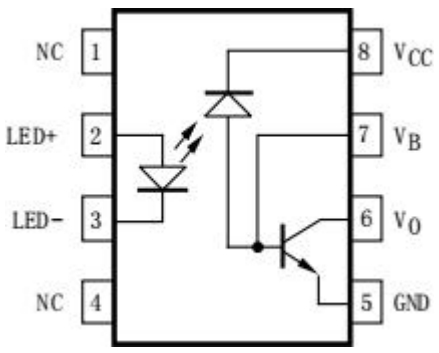
Truth Table (Positive Logic)

Input	Enable	Output
H	H	L
L	H	H
H	L	H
L	L	H
H	NC	L
L	NC	H

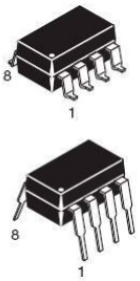
Applications

- Output interface to CMOS-LSTTL-TTL
- Telecommunication equipment
- Power transistor isolation in motor drives
- Replacement for low speed phototransistor photo couplers
- Home applianWXW

Schematics



Package Outlines



Absolute Maximum Ratings (T_A = 25℃ unless otherwise specified)

Parameter	Symbol	Value	Units
Storage temperature	T_{STG}	-55 to +125	°C
Operating temperature	T_{OPR}	-55 to +100	°C
Lead solder temperature	T_{SOL}	260 for 10 sec	°C
Emitter			
DC/Average forward input current (Note 1)	$I_{F\ (avg)}$	25	mA
Peak forward input current (50% duty cycle, 1 ms p.w.) (Note 2)	$I_{F\ (pk)}$	50	mA
Peak transient input current (≤1μs p.w., 300 pps)	$I_{F\ (trans)}$	1	A
Reverse input voltage	V_R	5	V
Input power dissipation (Note 3)	$P_{D\ (i)}$	100	mW
Detector			
Average output current	$I_{O\ (avg)}$	8	mA
Peak output current	$I_{O\ (pk)}$	16	mA
Emitter-base reverse voltage	V_{EBR}	5	V
Supply voltage	V_{CC}	-0.5 to 30	V
Output voltage	V_O	-0.5 to 20	V
Base current	I_B	5	mA
Output power dissipation (Note 4)	$P_{D\ (o)}$	100	mW

Notes
1. Derate linearly above 70℃ free -air temperature at a rate of 0.8 mA/℃.
2. Derate linearly above 70℃ free -air temperature at a rate of 1.6 mA/℃.
3. Derate linearly above 70℃ free -air temperature at a rate of 0.9 mW/℃.
4. Derate linearly above 70℃ free -air temperature at a rate of 2.0 mW/℃.

Electro-optical Characteristics (T_A= 0 to 70°C unless otherwise specified)

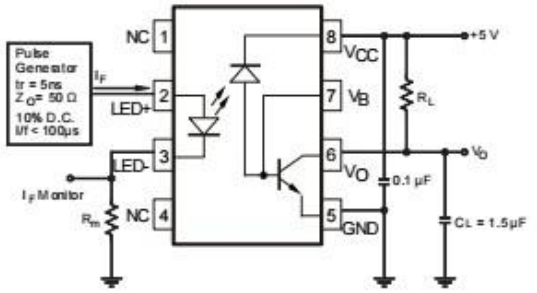
Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Emitter						
Input forward voltage	(I_F=16mA, T_A=25°C)	VF		1.45	1.7	V
	(IF=16mA)				1.8	
Input reverse breakdown voltage	(I_R=10μA)	BV_R	5			V
Temperature coefficient of forward voltage	(I_F=16mA)	($\Delta V_F/\Delta T_A$)		-1.6		mV/°C
Detector						
Logic high output current	(I_F=0mA, V_O=V_{CC}=5.5V) (TA=25°C)	IOH		0.001	0.5	μA
	(I_F=0mA, V_O=V_{CC}=15V) (TA=25°C)			0.005	1	
	(I_F=0mA, V_O=V_{CC}=15V)				50	

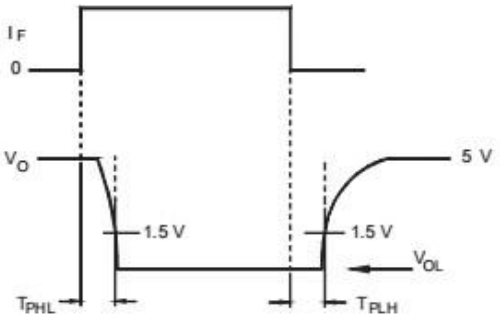
Logic low supply current		(I_F=16mA, V_O=Open) (VCC=15V)	ICCL		120	200	μA
Logic high supply current		(I_F=0mA, V_O=Open, VCC=15V) (TA=25°C)	ICCH			1	μA
		(I_F=0mA, V_O=Open) (VCC=15V)				2	
Coupled							
Current transfer ratio (Note 1)	WXW6N135	(I_F=16mA, V_{CC}=4.5V) (VO=0.4V), (TA=25°C)	CTR	7	18	50	%
		(IF=16mA, VCC=4.5V) (VO=0.5V)		5	19		
	WXW6N136	(I_F=16mA, V_{CC}=4.5V) (VO=0.4V), (TA=25°C)		19	24	50	
		(I_F=16mA, V_{CC}=4.5V) (VO=0.5V)		15	25		
Logic low output voltage output voltage	WXW6N135	(I_F=16mA, V_{CC}=4.5V) (IO=1.1mA, TA=25°C)	VOL		0.18	0.4	V
		(I_F=16mA, V_{CC}=4.5V) (IO=0.8mA)				0.5	
	WXW6N136	(I_F=16mA, V_{CC}=4.5V) (IO=3.0mA, TA=25°C)			0.1	0.4	
		(I_F=16mA, V_{CC}=4.5V) (IO=2.4mA)			0.1	0.5	
Switching (VCC = 5 V)							
Propagation delay time to logic low	WXW6N135	T_A=25°C, (R_L=4.1kΩ, IF=16mA) (Note 2)	TPHL		0.45	1.5	μs
		(R_L=4.1kΩ, I_F=16mA) (Note 3)				2	
	WXW6N136	T_A=25°C, (R_L=1.9kΩ, IF=16mA) (Note 2)			0.2	0.8	
		(R_L=1.9kΩ, I_F=16mA) (Note 3)				1	
Propagation delay time to logic high	WXW6N135	TA=25°C, (RL=4.1kΩ, IF=16mA) (Note 2)	TPLH		0.5	1.5	μs
		(RL=4.1kΩ, IF=16mA) (Note 3)				2	
	WXW6N136	TA=25°C, (RL=4.1kΩ, IF=16mA) (Note 2)			0.6	0.8	
		(RL=4.1kΩ, IF=16mA) (Note 3)				1	
Common mode transient immunity at logic high	WXW6N135	(I_F=0mA, V_{CM}=10V_{P-P}, RL=4.1kΩ) (Note 4)TA=25°C	|CMH|		10,000		V/μs
	WXW6N136	(IF=0mA, VCM=10VP-P, RL=1.9kΩ) (Note 4)TA=25°C			10,000		
Common mode transient immunity at logic low	WXW6N135	(I_F=16mA, V_{CM}=10V_{P-P}, RL=4.1kΩ) (Note 4) TA=25°C	|CML|		10,000		V/μs
	WXW6N136	(IF=0mA, VCM=10VP-P, RL=1.9kΩ) (Note 4)TA=25°C			10,000		
Isolation							
Input-output insulation leakage current		(Relative humidity=45%) (TA=25°C, t=5s) (V_{I-O} =3000VDC) (Note 5)	I_{I-O}			1	μA
Withstand insulation test voltage		(RH≤50%, T_A=25°C) (Note5) (t=1min.)	VISO	5000			VRMS
Resistance (input to output)		(Note 5) (V_{I-O}=500VDC)	RI-O		1012		W

Capacitance (input to output)	(Note 5) (f=1MHz)	CI-O		0.6		pF
DC Current gain	(I_O=3mA, V_O=5V)	HFE		150		

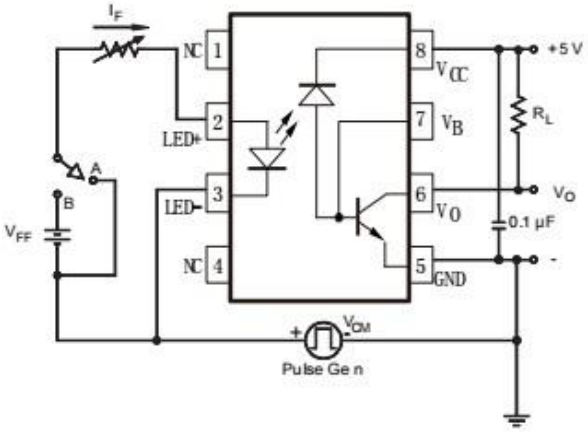
Notes
1. Current Transfer Ratio is defined as a ratio of output collector current, I_O, to the forward LED input current, I_F, times 100%.
2. The 4.1 kΩ load represents 1 LSTTL unit load of 0.36 mA and 6.1kΩ pull-upresistor.
3. The 1.9 kΩ load represents 1 TTL unit load of 1.6 mA and 5.6 kΩ pull-upresistor.
4. 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 signal V_{CM}, to assure that the output will remain in a logic high state (i.e., V_O>2.0 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 V).
5. Device is considered a two terminal device: Pins 1, 2, 3 and 4 are shorted together and Pins 5, 6, 7 and 8 areshorted together.

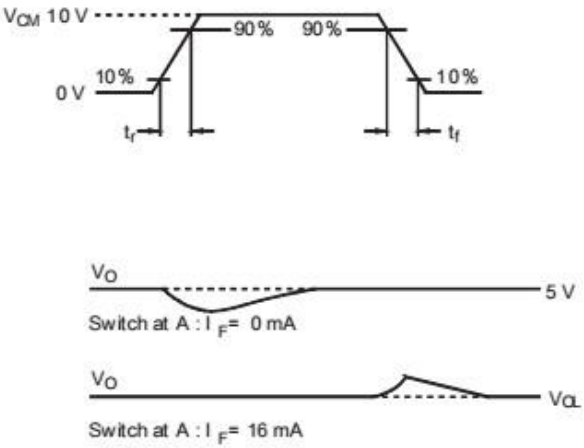
Test Circuits





Switching Time Test Circuit





Common Mode Immunity Test Circuit

Typical Performance Curves

Fig. 1 Normalized CTR vs.Forward Current

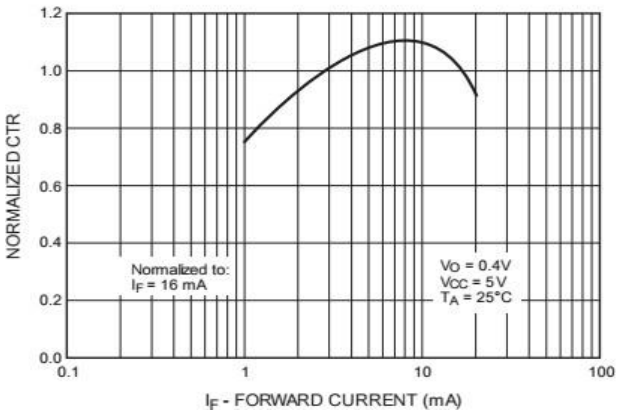


Fig. 2 Normalized CTR vs.Temperature

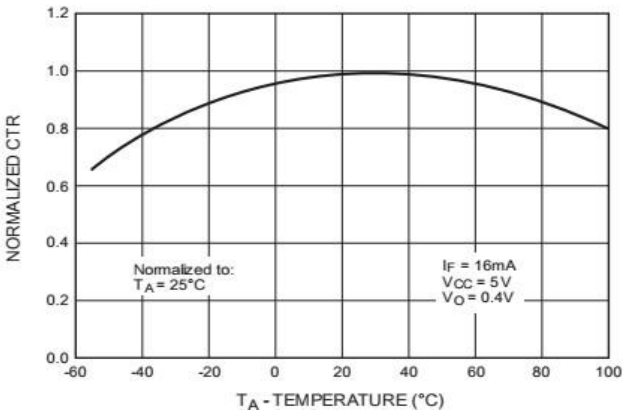


Fig. 3 Output Current vs.Output Voltage

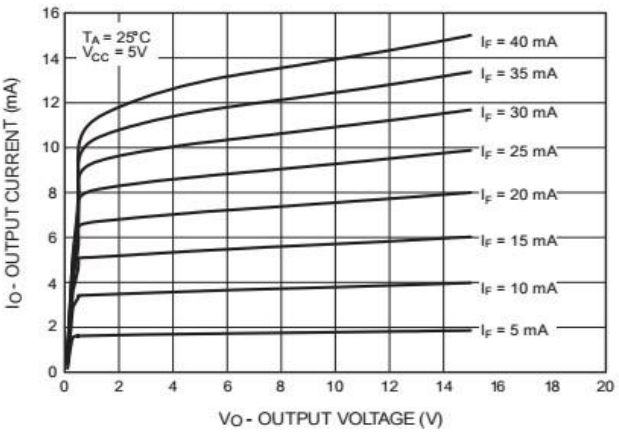


Fig. 4 Logic High Output Current vs.Temperature

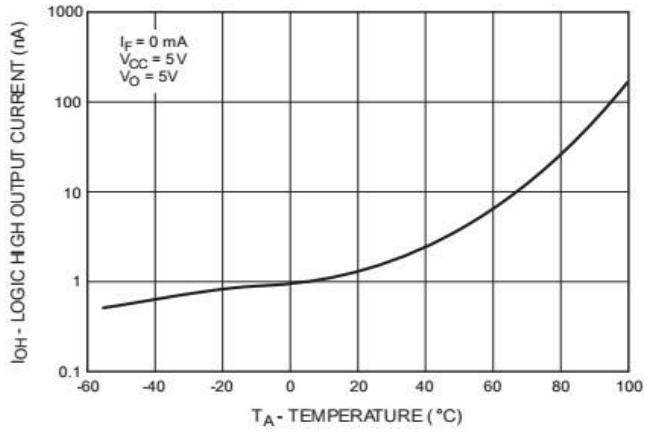


Fig. 5 Propagation Delay vs.Temperature

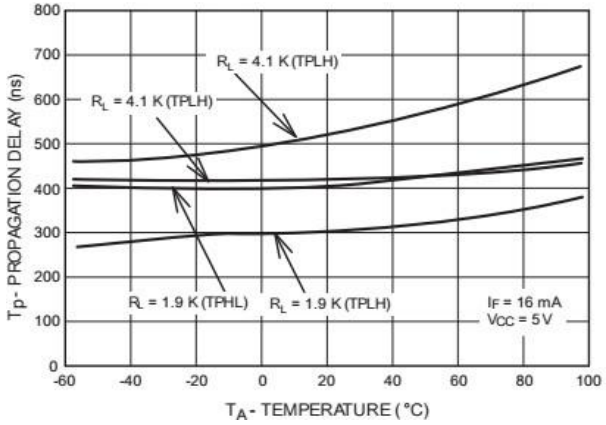
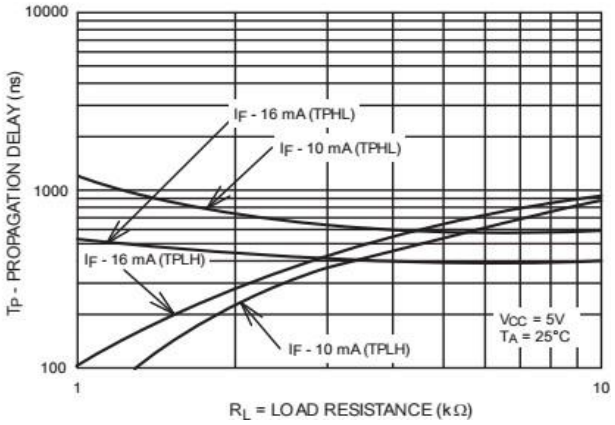
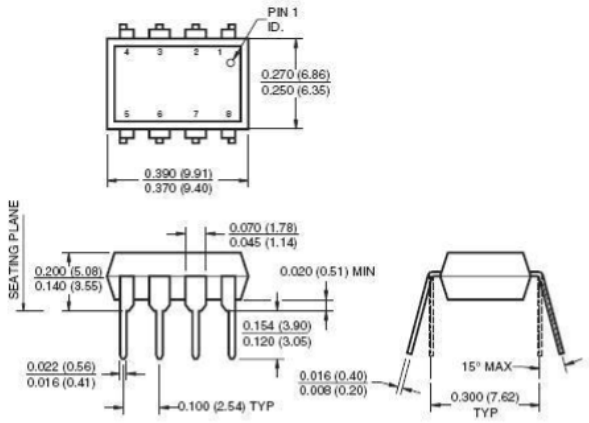


Fig. 6 Propagation Delay vs. Load Resistance

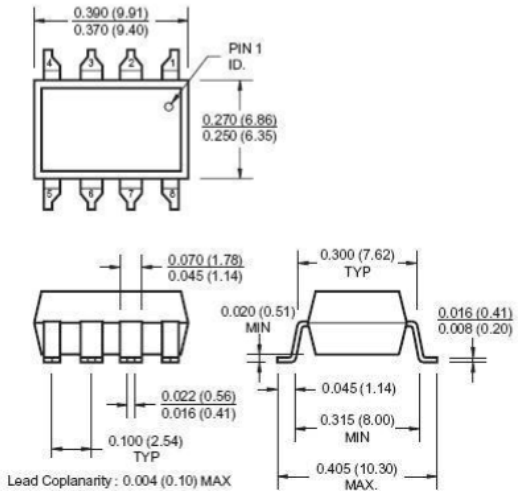


Package Dimensions

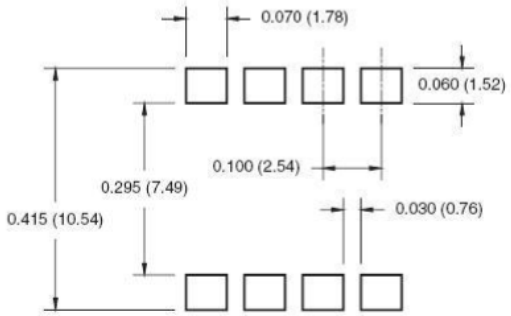
Through Hole



Surface Mount

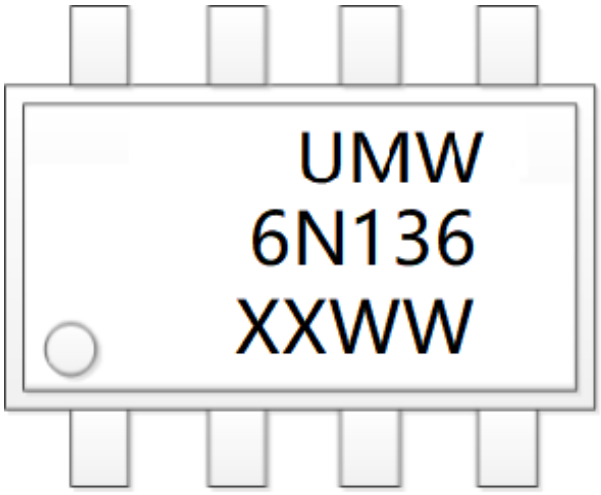


8-Pin DIP – Land Pattern



Note: All dimensions are in inches (millimeters)

Marking



- “XX” denotes YEAR;
- “WW” denotes WEEK

ORDERING INFORMATION

Order Code	Description	Base qty
UMW 6N135M	Iron frame, DIP-8, Halogen/lead -free	1280/BOX
UMW 6N135S	Copper frame,SOP-8,Halogen-free	1000/REEL
UMW 6N136M	Iron frame, DIP-8, Halogen/lead -free	1280/BOX
UMW 6N136S	Copper frame,SOP-8,Halogen-free	1000/REEL