UMW 6N137

High Speed 10MBit/s Logic Gate Optocouplers

1.Description

The UMW 6N137 optocoupler consists of a 850 nm AlGaAS LED, optically coupled to a very high speed integrated photo-detector logic gate with astrobable output. This output features an open collector, thereby permitting wired OR outputs. The coupled parameters are guaranteed over the temp-erature range of -40°C to +85°C. A maximum input signal of 5mA will provide a minimum output sink current of 13mA (fan out of 8).An internal noise shield provides superior common mode rejection of typically 10kV/μs. The UMW 6N137 has a minimum CMR of 5kV/μs.

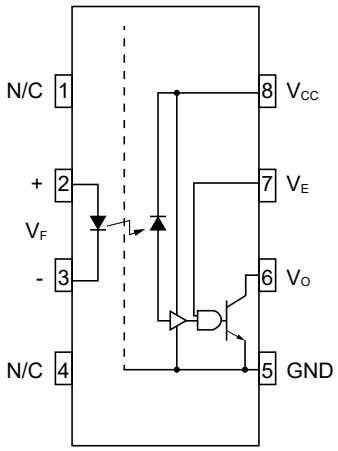
2.Features

- Very high speed - 10 MBit/s
- Superior CMR - 10 kV/μs
- Double working voltage-480V
- Fan-out of 8 over -40°C to +85°C
- Logic gate output
- Strobable output
- Wired OR-open collector
- UL approved: UL1577, file No. E492440

3.Applications

- Ground loop elimination
- LSTTL to TTL, LSTTL or 5-volt CMOS
- Line receiver, data transmission
- Data multiplexing
- Switching power supplies
- Pulse transformer replacement
- Computer-peripheral interface

4.Pinning Information



DIP-8/SOP-8

5.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

6.Absolute Maximum Ratings (T_A=25°C unless otherwise specified)

Parameter	Symbol	Value	Units
Storage Temperature	T_{STG}	-55 to +125	°C
Operating	T_{OPR}	-40 to +85	°C
Lead Solder Temperature (for wave soldering only)	T_{SOL}	260 for 10 sec	°C
EMITTER			
DC/Average Forward Input Current	I_F	50	mA
Enable Input Voltage Not to Exceed V_{CC} by more than 500mV	V_E	5.5	V
Reverse Input Voltage	V_R	5	V
Power Dissipation	P_I	100	mW
DETECTOR			
Supply Voltage	V_{CC}	7	V
Output Current	I_O	50	mA
Output Voltage	V_O	7	V
Collector Output	P_O	85	mW

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only

7.Recommended Operating Conditions

Parameter	Symbol	Min	Max	Units
Input Current, Low Level	I_{FL}	0	250	μA
Input Current, High Level	I_{FH}	*6.3	15	mA
Supply Voltage, Output	V_{CC}	4.5	5.5	V
Enable Voltage, Low Level	V_{EL}	0	0.8	V
Enable Voltage, High Level	V_{EH}	2	V_{CC}	V
Low Level Supply Current	T_A	-40	85	°C
Fan Out (TTL load)	N		8	

Note: *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.

8.Individual Component Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
EMITTER						
Input Forward Voltage	V_F	I_F=10mA			1.8	V
		T_A=25°C		1.4	1.75	
Input Reverse Breakdown Voltage	B_{VR}	I_R=10μA	5			
Input Capacitance	C_{IN}	V_F=0, f=1MHz		60		pF
Input Diode Temperature Coefficient	$\Delta V_F/\Delta T_A$	I_F=10mA		-1.4		mV/°C
DETECTOR						
High Level Supply Current	I_{CCH}	V_{CC}=5.5V, I_F=0mA, V_E=0.5V		7	10	mA
Low Level Supply Current	I_{CCL}	V_{CC}=5.5V, I_F=10mA		9	13	mA
Low Level Enable Current	I_{EL}	V_{CC}=5.5V, V_E=0.5V		-0.8	-1.6	mA
High Level Enable Current	I_{EH}	V_{CC}=5.5V, V_E=2V		-0.6	-1.6	mA
High Level Enable Voltage	V_{EH}	V_{CC}=5.5V, I_F=10mA	2			V
Low Level Enable Voltage	V_{EL}	V_{CC}=5.5V, I_F=10mA (3)			0.8	V

9.Switching Characteristics

(T_A=-40°C to +85°C, V_{CC}=5V, I_F=7.5mA unless otherwise specified)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Propagation Delay Time to Output HIGH Level	T_{PLH}	R_L=350Ω	T_A=25°C	20	45	75	ns
		C_L=15pF (4)(Fig. 12)				100	ns
Propagation Delay Time to Output LOW Level	T_{PHL}	T_A=25°C (5)		25	45	75	ns
		R_L=350Ω, C_L=15pF (Fig.12)				100	ns
Pulse Width Distortion	$\|T_{PHL}-T_{PLH}\|$	R_L=350Ω, C_L=15pF (Fig.12)			3	35	ns
Output Rise Time (10-90%)	t_r	R_L=350Ω, C_L=15pF (6) (Fig.12)			50		ns
Output Rise Time (90-10%)	t_f	R_L=350Ω, C_L=15pF (7) (Fig.12)			12		ns
Enable Propagation Delay Time to Output HIGH Leve	t_{ELH}	I_F=7.5mA, V_{EH}=3.5V, R_L=350Ω C_L=15pF (8) (Fig. 13)			20		ns
Enable Propagation Delay Time to Output LOW Level	t_{EHL}	I_F=7.5mA, V_{EH}=3.5V, R_L=350Ω C_L=15pF (9) (Fig. 13)			20		ns
Common Mode Transient Immunity (at Output HIGH Level)	$\|CM_H\|$	T_A=25°C, $\|V_{CM}\|$=50V (Peak), I_F=0mA, $V_{OH\ (Min.)}$=2V R_L=350Ω (10) (Fig. 14)		5000	10000		V/μs
Common Mode Transient Immunity (at Output LOW Level)	$\|CM_L\|$	R_L=350Ω, I_F=7.5mA $V_{OL\ (Max.)}$=0.8V T_A=25°C(11)(Fig. 14)		5000	10000		V/μs

10.Transfer Characteristics

(T_A=-40°C to +85°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
HGH Level Output Current	I_{OH}	V_{CC}=5.5V, V_O=5.5V I_F=250μA, V_E=2.0V (2)			100	μA
LOW Level Output Current	V_{OL}	V_{CC}=5.5V, V_O=5mA V_E=2V, I_{CL}=13mA (2)		0.35	0.6	V
Input Threshold Current	I_{FT}	V_{CC}=5.5V, V_O=0.6V V_E=2V, I_{OL}=13mA		3	5	mA

11.Isolation Characteristics

(T_A=-40°C to +85°C, unless otherwise specified)

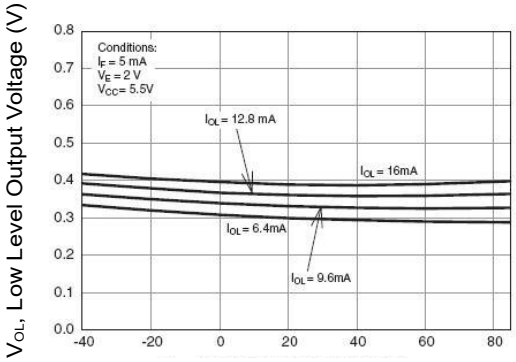
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input-Output Insulation Leakage Current	I_{I-O}	Relative humidity = 45%, T_A=25°C t=5s,V_{I-O}=3000 VDC (12)			10*	μA
Withstand Insulation Test Voltage	V_{ISO}	RH<50%, T_A=25°C I_{I-O}≤2μA, t =1min (12)	2500			V_{RMS}
Resistance (Input to Output)	R_{I-O}	V_{I-O}=500V (12)	10	12		Ω
Capacitance (Input to Output)	C_{I-O}	f=1MHz (12)		0.6		pF

All Typicalsat V_{CC}= 5V, * TA = 25°C

* Note:

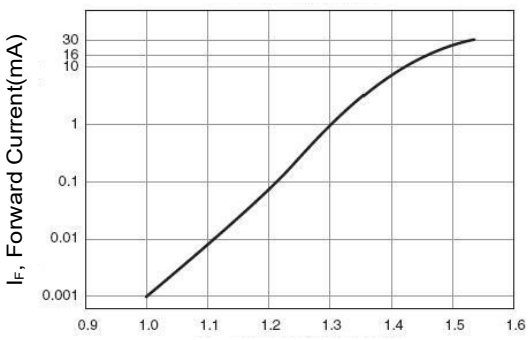
1. The V_{CC} supply to each optoisolator must be bypassed by a 0.1μF capacitor or larger. This can be either a ceramic or solid tantalum capacitor with good high frequency characteristic and should be connected as close as possible to the package V_{CC} and GND pins of each device.
2. One channel.
3. Enable Input – No pull up resistor required as the device has an internal pull up resistor.
4. t_{PLH} – Propagation delay is measured from the 3.75mA level on the HIGH to LOW transition of the input current pulse to the 1.5 V level on the LOW to HIGH transition of the output voltage pulse.
5. t_{PHL} – Propagation delay is measured from the 3.75mA level on the LOW to HIGH transition of the input current pulse to the 1.5 V level on the HIGH to LOW transition of the output voltage pulse.
6. t_r – Rise time is measured from the 90% to the 10% levels on the LOW to HIGH transition of the output pulse.
7. t_f – Fall time is measured from the 10% to the 90% levels on the HIGH to LOW transition of the output pulse.
8. 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.
9. 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.
10. CM_H – The maximum tolerable rate of rise of 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).
11. CM_L – The maximum tolerable rate of rise 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).
12. Device considered a two-terminal device: Pins 1, 2, 3 and 4 shorted together, and Pins 5, 6, 7 and 8 shortedtogether

12.1Typical characteristic



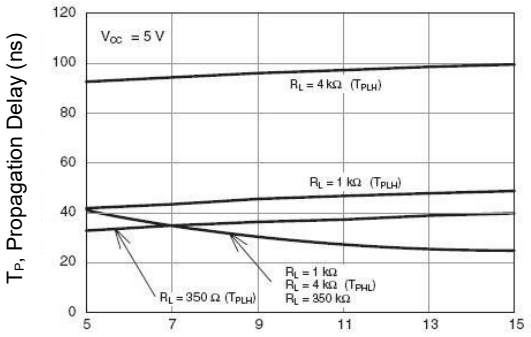
T_A, Ambient Temperature (°C)

Figure 1: Low Level Output Voltage vs. Ambient Temperature



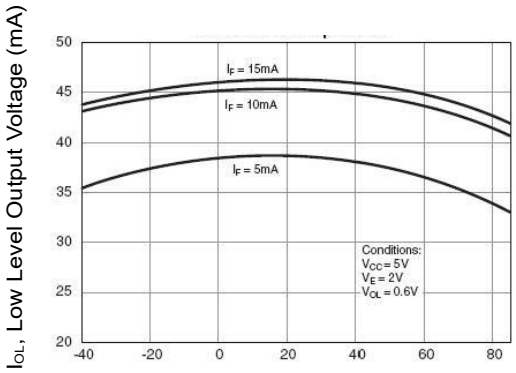
V_F, Forward Voltage (V)

Figure 2: Input Diode Forward Voltagevs. Forward Current



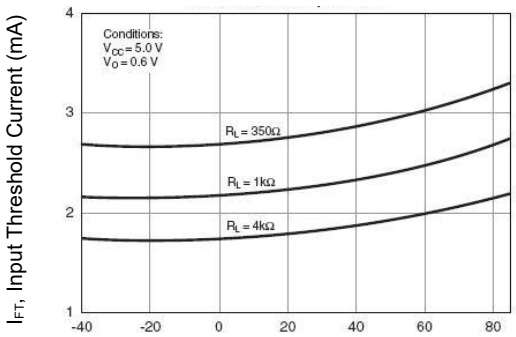
I_F, Forward Current(mA)

Figure 3: Switching Time vs. Forward Current



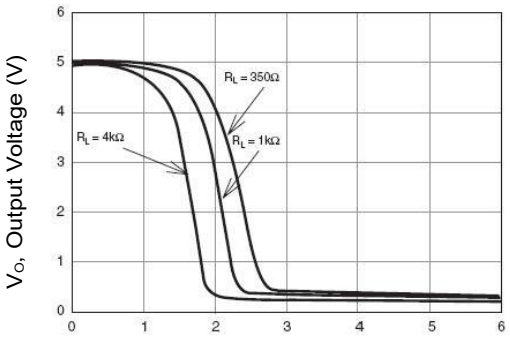
T_A, Ambient Temperature (°C)

Figure 4: Low Level Output Currentvs. Ambient Temperature



T_A, Ambient Temperature (°C)

Figure 5: Input Threshold Currentvs. Ambient Temperature



I_F, Forward Current(mA)

Figure 6: Output Voltage vs. Input Forward Current

12.2Typical characteristic

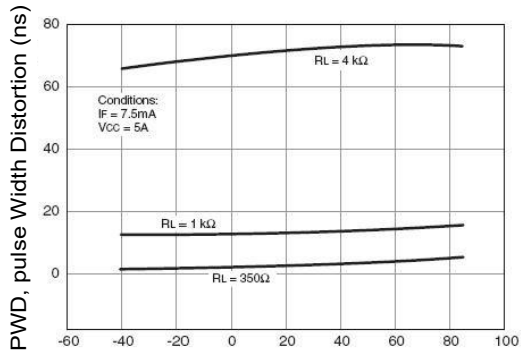


Figure 7: Pulse Width Distortion vs.Temperature

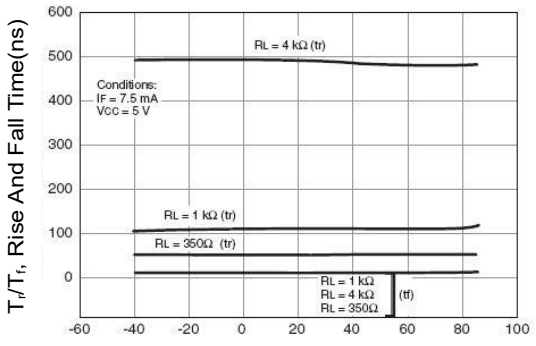


Figure 8: Rise and FallTime vs.Temperature

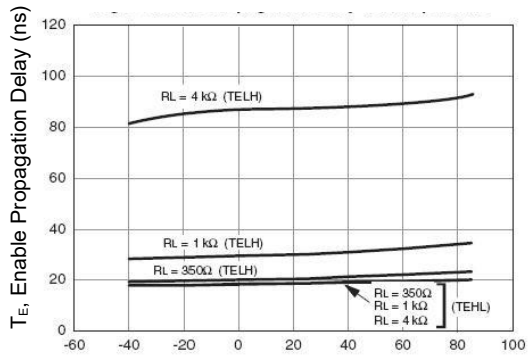


Figure 9: Enable Propagation Delay vs.Temperature

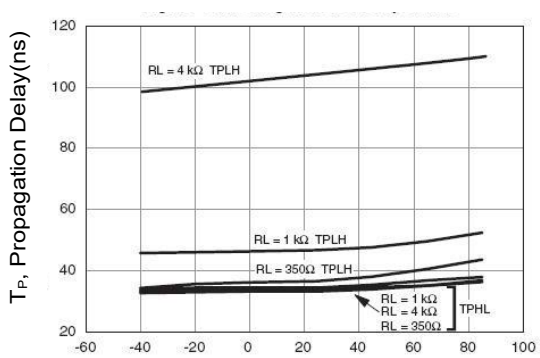


Figure 10: Switching Time vs.Temperature

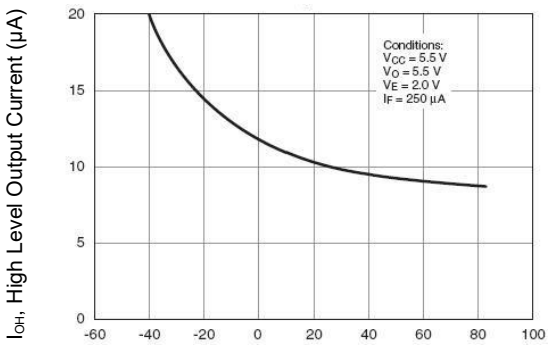


Figure 5: High Level Output Currentvs.Temperature

13.1Test Circuits

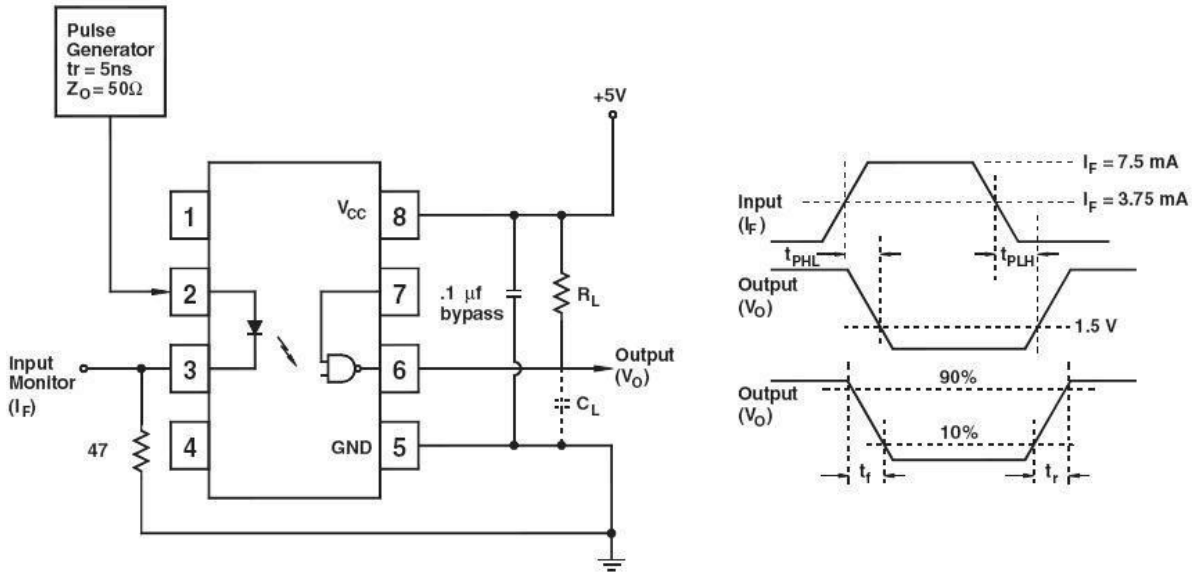


Fig. 12 Test Circuit and Waveforms for t_{PLH}, t_{PHL}, t_r and t_f

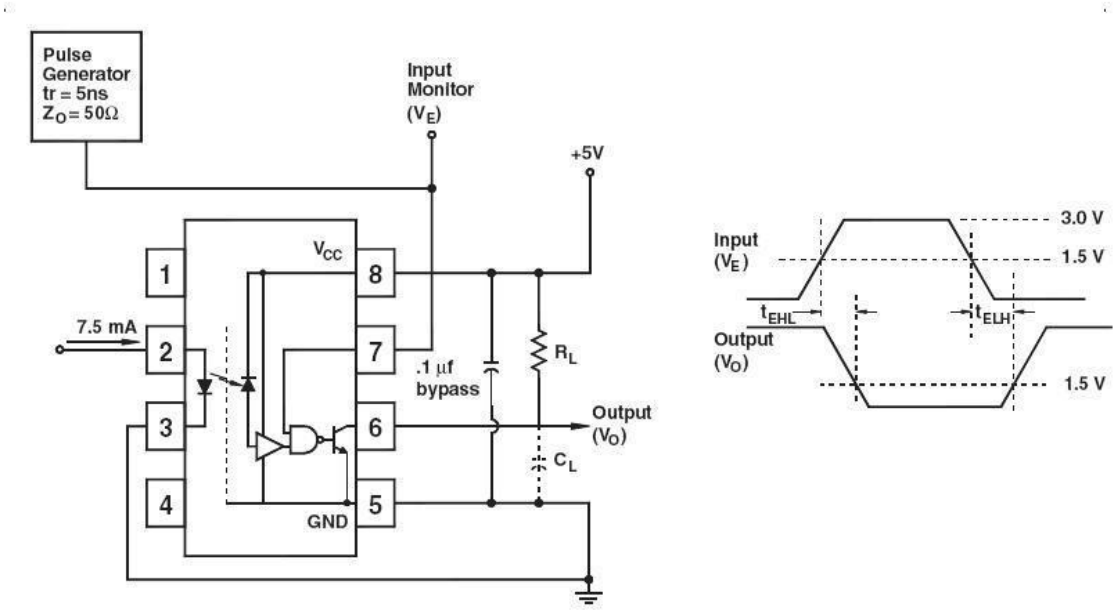


Fig. 13 Test Circuit t_{EHL} and t_{ELH}

13.2Test Circuits (Continued)

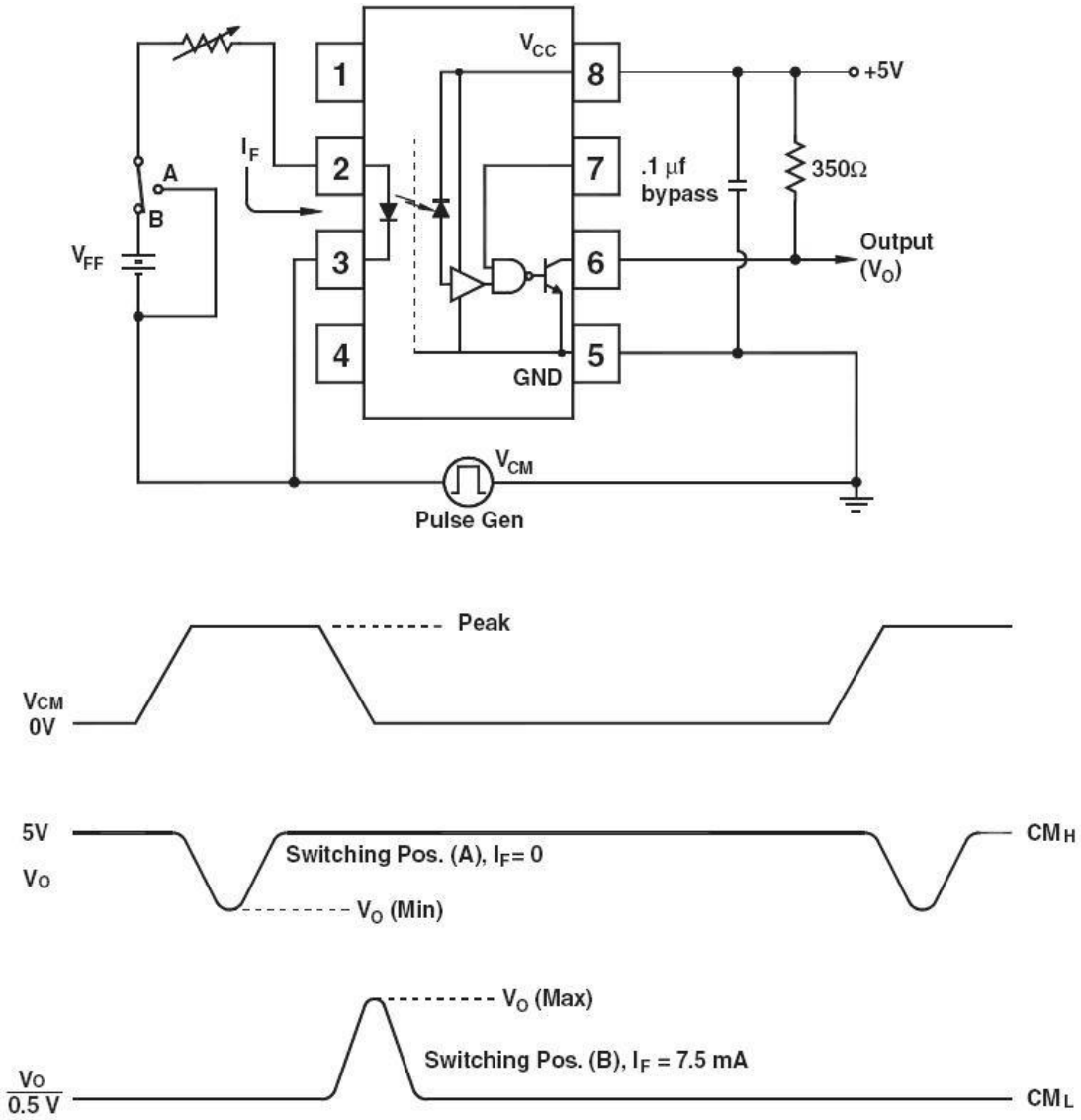
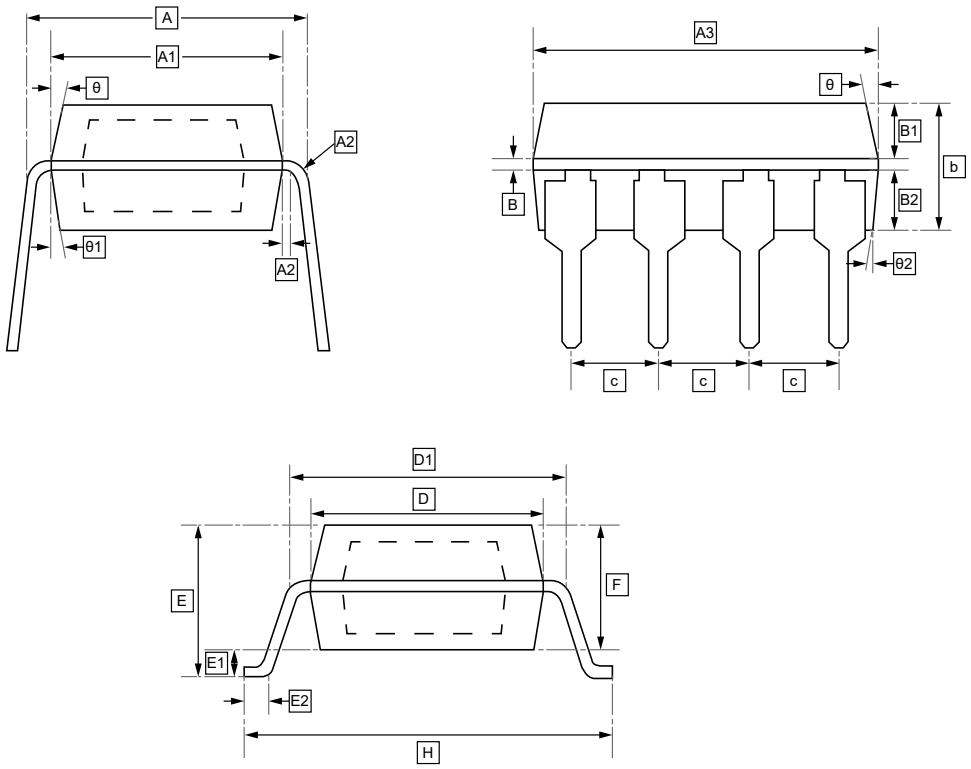


Fig. 14 Test Circuit Common Mode Transient Immunity

14.DIP-8/SOP-8 Package Outline Dimensions

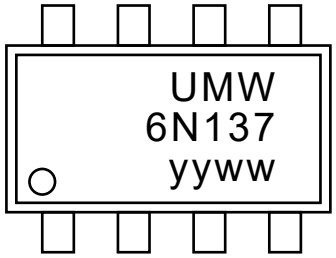


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	A3	B	B1	B2	b	c	D	D1	E
Min	7.65	6.55	0.2	9.71	0.25	1.6	1.62	3.45	2.54	6.55	7.65	4.15
Max	7.95	6.65	(typ.)	9.78	(typ.)	(typ.)	1.68	3.55	(typ.)	6.65	7.95	4.35

Symbol	E1	E2	F	H	θ	θ1	θ2
Min	0.75	0.66	3.45	10.1	12°	9°	5°
Max	(typ.)	(typ.)	3.55	10.5	(typ.)	(typ.)	(typ.)

15.Ordering information



yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW 6N137M	6N137	DIP-8	2250	Tube and box
UMW 6N137S	6N137	SOP-8	1000	Tape and reel

16.Disclaimer

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