6N137 – High Speed 10MBd Optocouplers

Aug 2008

DESCRIPTION

These diode-transistor photocouplers consist of an AlGaAs LED optically coupled to a high speed photodetector. The output features is an open collector and coupler parameters are guaranteed over the temperature range from -40℃~85℃. The internal shield provides a guaranteed Common Mode Transient Immunity (typical) 10KV/μs

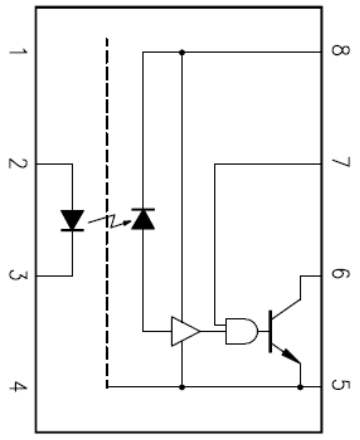
FEATURES

* High speed – 10MBd
* Common mode rejection - 10KV/μs
* UL, CSA, IEC/EN/DIN EN60747-5-2 – Pending
* Dual-in-line package- 6N137
* Wide lead spacing package- 6N137M
* Surface mounting package- 6N137S
* Tape and reel packaging- 6N137S-TA/6N137S-TA1

APPLICATIONS

* High Voltage Isolation
* Line receivers
* Feedback Element in Switching Mode Power Supplies
* High Speed Logic Ground Isolation – TTL/TTL, TTL/CMOS, TTL/LSTTL
* Pulse transformer replacement
* Power transistor isolation in motor drives
* Microprocessor system interfaces
* Ground loop elimination

Schematic



Pin Define

1. NC
2. Anode
3. Cathode
4. NC
5. GND
6. Vo
7. VE
8. Vcc

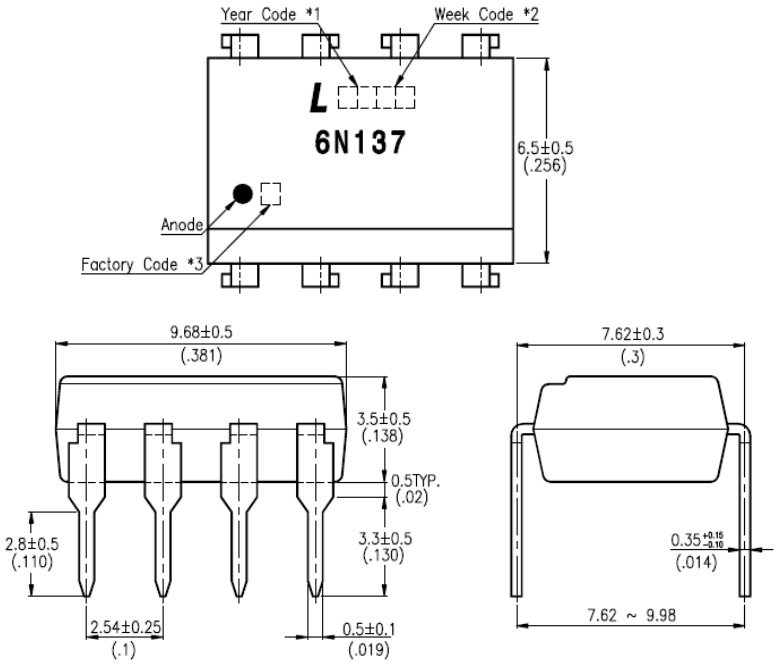
Truth Table (Positive Logic)

Input	EN	Output
ON	H	L
OFF	H	H
ON	L	H
OFF	L	H
ON	NC	L
OFF	NC	H

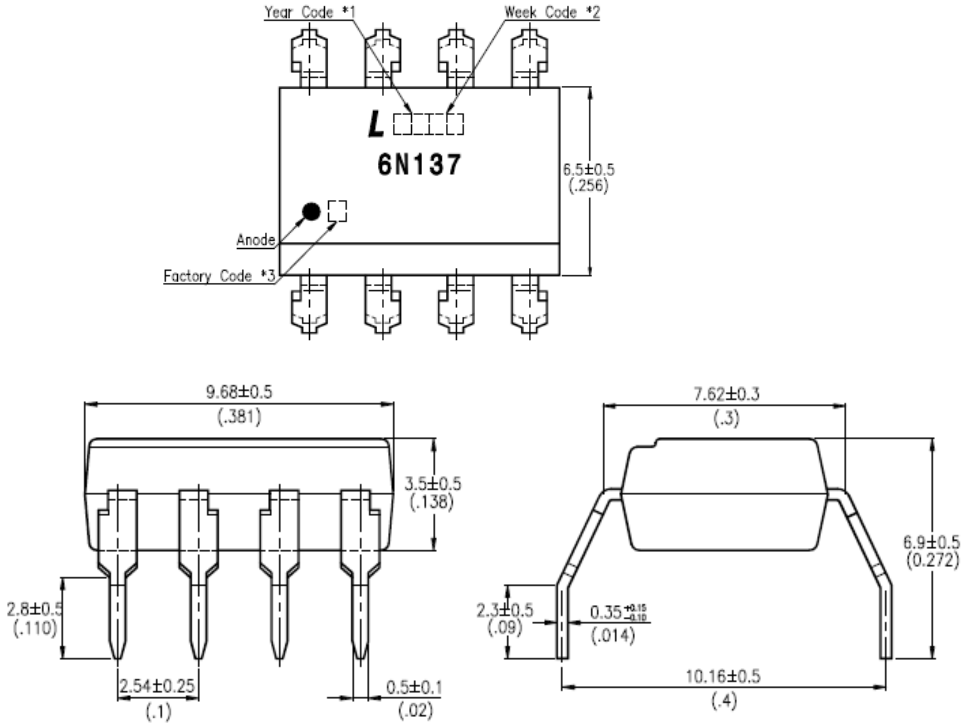
A 0.1uF bypass capacitor must be connected between pin8 and pin5.

OUTLINE DIMENSIONS

6N137:

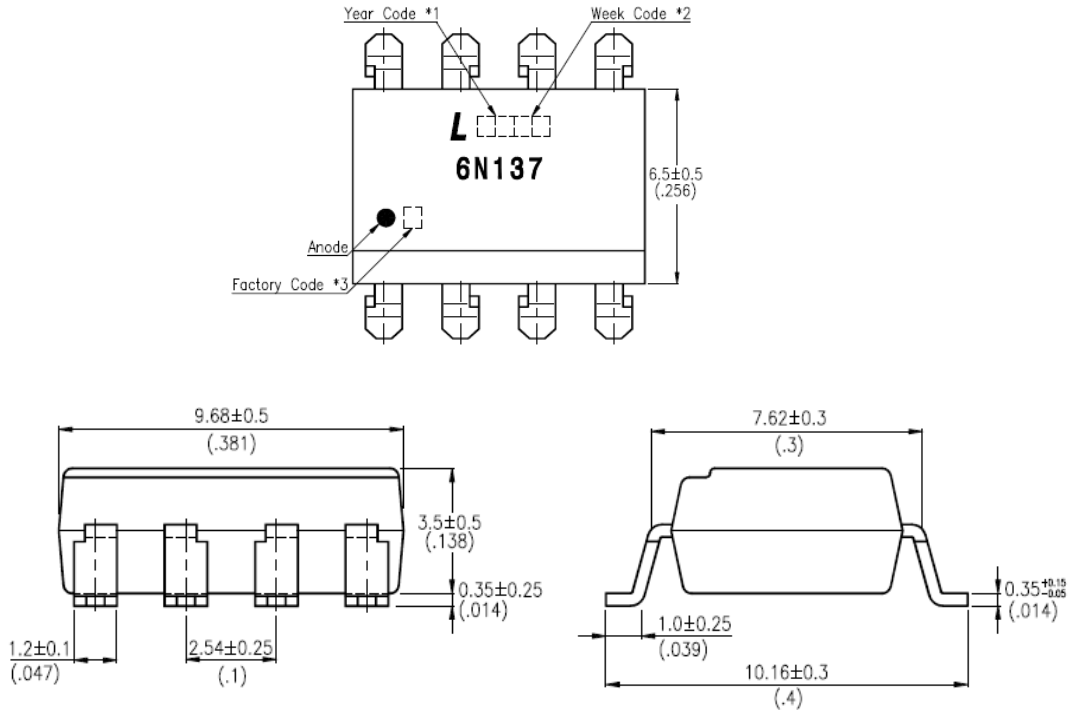


6N137M



OUTLINE DIMENSIONS

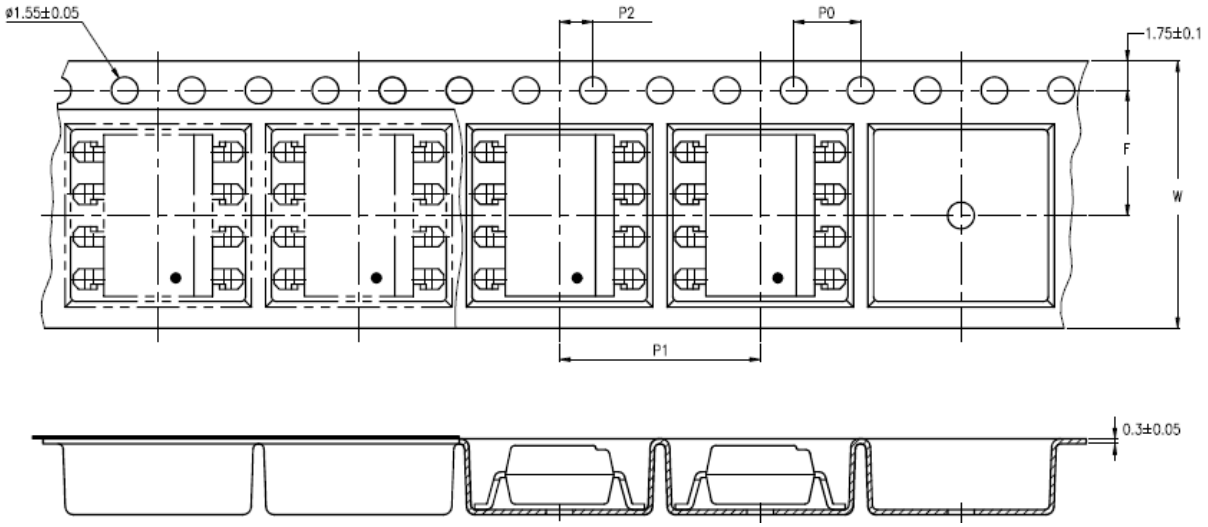
6N137S



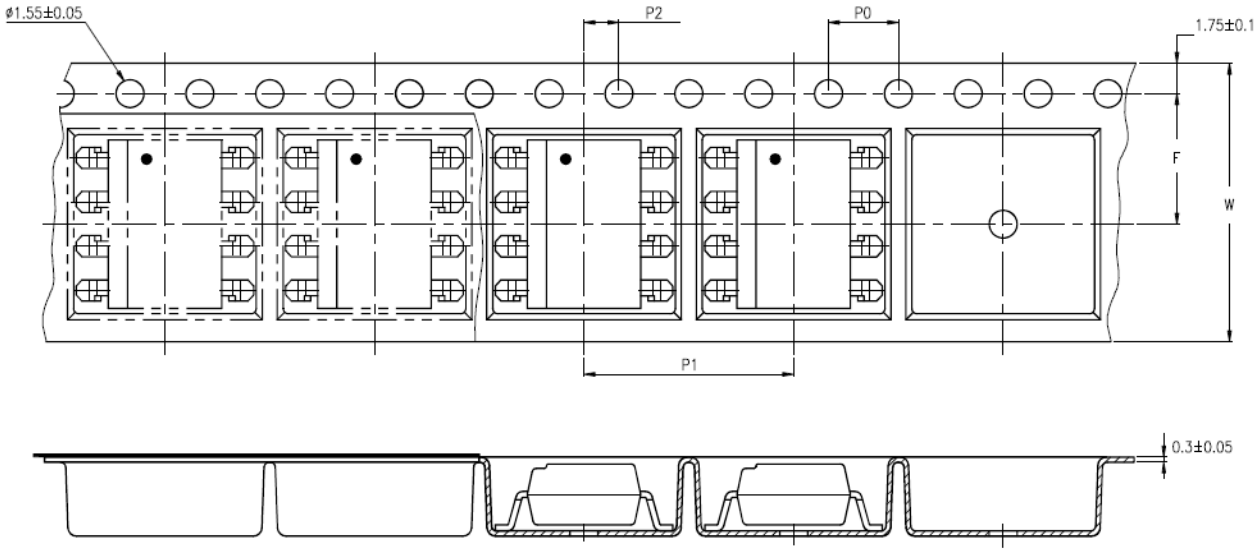
*1. Year date code.
*2. 2-digit work week.
*3. Factory identification mark shall be marked (Z: Taiwan, Y: Thailand).

TAPING DIMENSIONS

6N137S-TA



6N137S-TA1



Description	Symbol	Dimensions in mm (inches)
Tape wide	W	16 ± 0.3 (.63)
Pitch of sprocket holes	P_0	4 ± 0.1 (.15)
Distance of compartment	F P_2	7.5 ± 0.1 (.295) 2 ± 0.1 (.079)
Distance of compartment to compartment	P_1	12 ± 0.1 (.472)

ABSOLUTE MAXIMUM RATING

(Ta = 25°C unless otherwise specified)

PARAMETER		SYMBOL	RATING	UNIT
INPUT	Forward Current	I_F	25	mA
	Reverse Voltage	V_R	5	V
	Power Dissipation	P	40	mW
OUTPUT	Supply Voltage (1minute max)	V_{CC}	7	V
	Output Voltage	V_O	7	V
	Output Current	I_O	50	mA
	Power Dissipation	P_O	85	mW
	Isolation Voltage	V_{iso}	5000	Vrms
	Operating Temperature	T_{opr}	-40 ~ +85	°C
	Storage Temperature	T_{stg}	-55 ~ +125	°C
	Soldering Temperature	T_{sol}	260 for 10 sec	°C

Note

1. AC For 1 Minute, R.H. = 40 ~ 60%
   Isolation voltage shall be measured using the following method.
   (1) Short Pin 1 to Pin4 on the primary side and Pin 5 to Pin 8 on the secondary side.
   (2) The isolation voltage tester with zero-cross circuit shall be used.
   (3) The waveform of applied voltage shall be a sine wave.
2. For 10 sec.

ELECTRICAL - OPTICAL CHARACTERISTICS

(T_A = 0~70°C, unless otherwise specified)

PARAMETER	SYMBOL	MIN.	TYP.**	MAX.	UNIT	CONDITIONS
Input						
Input Forward Voltage	V_F	—	1.45	1.7	V	Ta=25℃, I_F =10mA
Input Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta Ta$	—	-1.6	—	mV/℃	I_F =10mA
Input Reverse Voltage	BV_R	5.0	—	—	V	Ta=25℃, IR=10μA
Output						
High Level Supply Current	I_{CCH}	—	7	10	mA	I_F=0mA, V_E=0.5V V_{CC}=5.5V
Low Level Supply Current	I_{CCL}	—	9	13	mA	I_F=10mA, V_E=0.5V V_{CC}=5.5V
Low Level Enable Current	I_{EL}	—	-0.8	-1.6	mA	V_{CC}=5.5V, V_E=0.5V
High Level Enable Current	I_{EH}	—	-0.6	-1.6	mA	V_{CC}=5.5V, V_E=2.0V
High Level Enable Voltage	V_{EH}	2.0			V	I_F=10mA,V_{CC}=5.5V
Low Level Enable Voltage	V_{EL}			0.8	V	I_F=10mA,V_{CC}=5.5V

** All typical at T_A = 25℃

SWITCHING SPECIFICATIONS (AC)

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

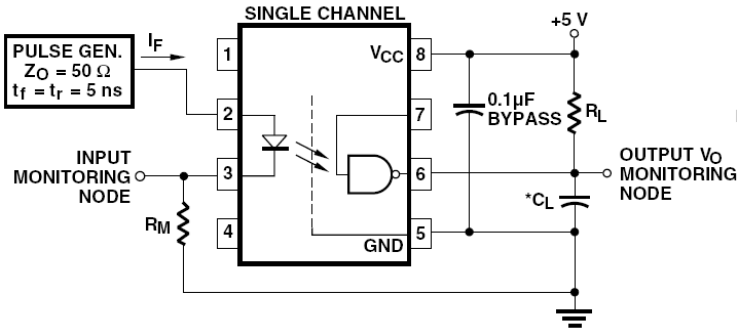
PARAMETER	SYM.	MIN.	TYP**	MAX.	UNIT	CONDITIONS
Propagation Delay time to Logic Low Output (1)→(0)	t_{PHL}	25	30	75	ns	R_L =350Ω C_L = 15pF
				100		
Propagation Delay time to Logic High Output (0)→(1)	t_{PLH}	25	40	75	ns	R_L =350Ω C_L = 15pF
				100		
Pulse Width Distortion	$\lvert t_{PHL} - t_{PLH} \rvert$		10		ns	R_L =350Ω C_L = 15pF
Output Rise Time (10%~90%)	t_r		50		ns	R_L =350Ω C_L = 15pF
Output Fall time (90%~10%)	t_f		12		ns	R_L =350Ω C_L = 15pF
Enable Propagation Delay Time at high level output(1)	t_{ELH}		20		ns	I_F=7.5mA V_{EH} =3.5V R_L =350Ω C_L = 15pF
Enable Propagation Delay Time at low level output(0)	t_{EHL}		20		ns	I_F=7.5mA V_{EH} =3.5V R_L =350Ω C_L = 15pF
Instantaneous common mode rejection at high logic output (1)	$\lvert CM_H \rvert$	1	10	—	KV / μs	I_F=0mA V_{OH}(Min)=2.0V $\lvert V_{CM} \rvert$ =50V_{P-P}, RL=350Ω
Instantaneous common mode rejection at low logic output (0)	$\lvert CM_L \rvert$	1	10	—	KV / μs	I_F=7.5mA V_{OH}(Max)=0.8V $\lvert V_{CM} \rvert$ =50V_{P-P}, RL=350Ω

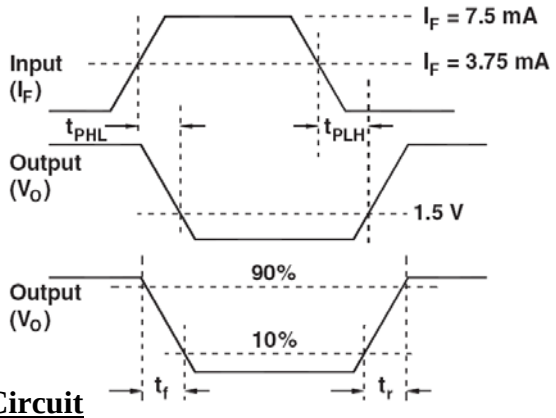
** All typical at T_A = 25℃

SWITCHING TEST CIRCUITS (AC)

Switching Time Test Circuit

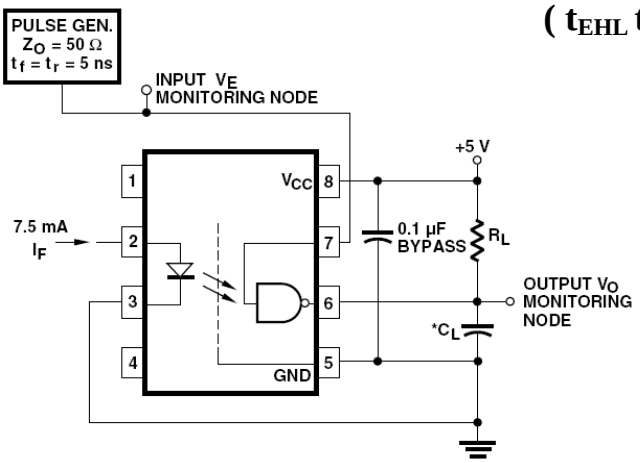
(t_{PHL} t_{PLH}, t_r and t_f)

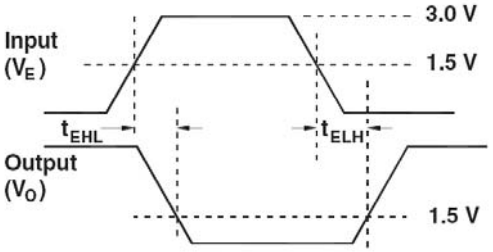




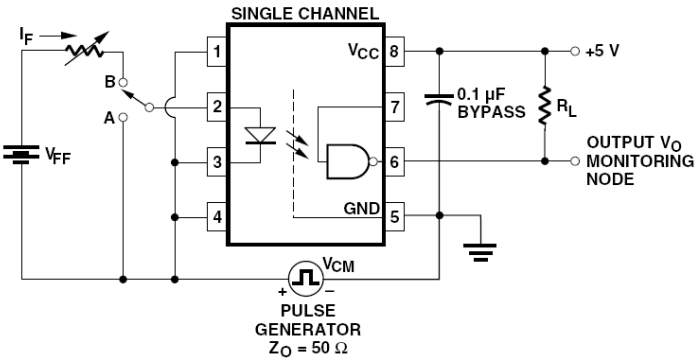
Switching Time Test Circuit

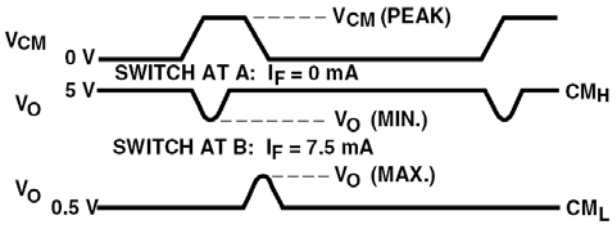
(t_{EHL} t_{ELH})





Common Mode Immunity Test Circuit





ISOLATION CHARACTERISTICS

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

PARAMETER	SYMBOL	MIN.	TYP.**	MAX.	UNIT	CONDITIONS
Isolation Resistance (Input-output) Note4.	R_{I-O}	—	10^{12}	—		Ta=25℃, RH<45%, V_{I-O}=500V DC
Capacitance (Input-output) Note4.	C_{I-O}	—	0.6	—	pF	f=1MHz

TRANSFER CHARACTERISTICS(DC)

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

PARAMETER	SYMBOL	MIN.	TYP.**	MAX.	UNIT	CONDITIONS
High Level Output Current	I_{OH}			100	uA	V_{CC}=5.5V, V_o=0.5V I_F=250 μ A, V_E=2.0V
Low Level Output Voltage	V_{OL}		0.35	0.6	V	V_{CC}=5.5V, I_F=5mA, V_E=2.0V I_{OL}=13mA
Input Threshold Current	I_{FTH}		3	5	mA	V_{CC}=5.5V, V_o=0.5V I_{OL}=13mA, V_E=2.0V

** All typical at Vcc=5V,T_A = 25℃

Note:

1. AC For 1 Minute, R.H. = 40 ~ 60%
   Isolation voltage shall be measured using the following method.
   (1) Considered a two-terminal device: Pin 1,2,3,4 shorted together and Pin 5,6,7,8 shorted together.
   (2) The isolation voltage tester with zero-cross circuit shall be used.
   (3) The waveform of applied voltage shall be a sine wave.
2. For 10 sec.
3. Pin5 and Pin8 must connect a bypass 0.1uF capacitor.

Notes:

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- Do not immerse unit's body in solder paste.