

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°C ~ 85°C . The internal shield provides a guaranteed Common Mode Transient Immunity (typical) $10\text{KV}/\mu\text{s}$

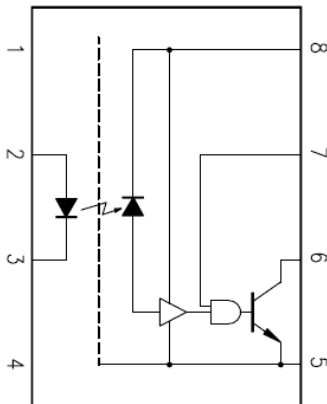
FEATURES

- * High speed – 10MBd
- * Common mode rejection - $10\text{KV}/\mu\text{s}$
- * 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

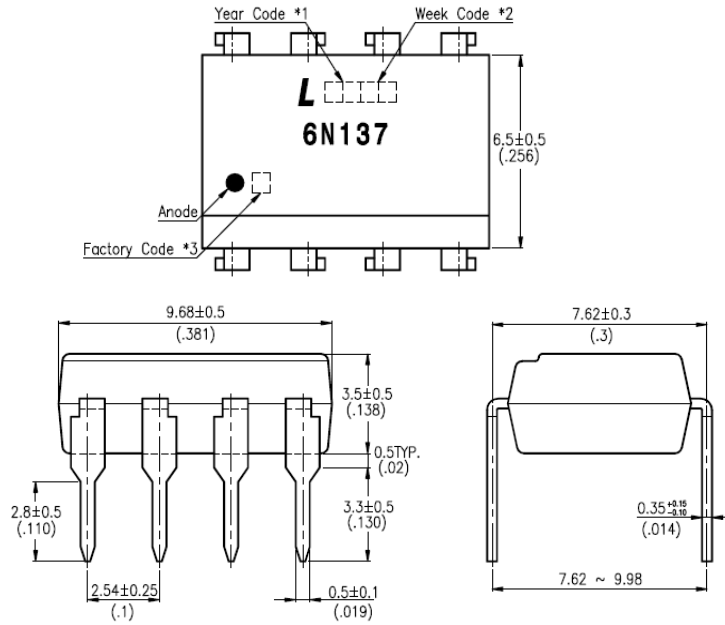
(Positive Logic)

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

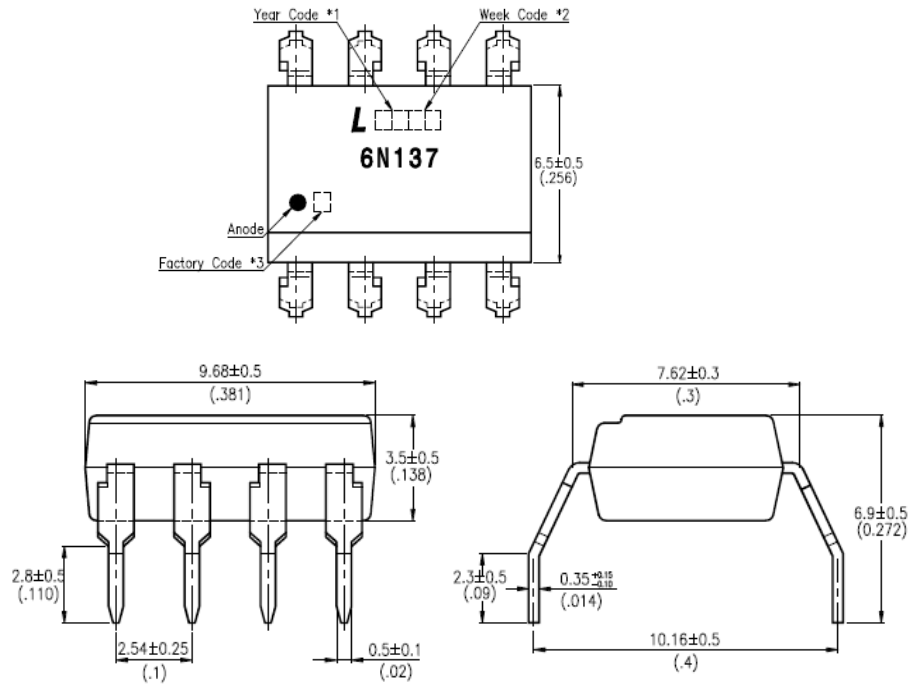
A 0.1uF bypass capacitor must be connected between pin8 and pin5.

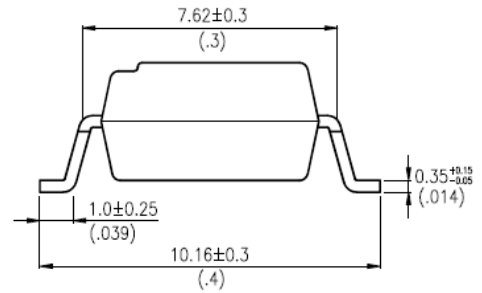
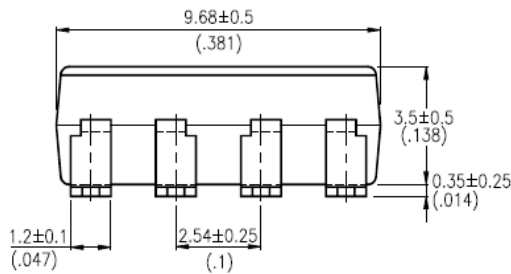
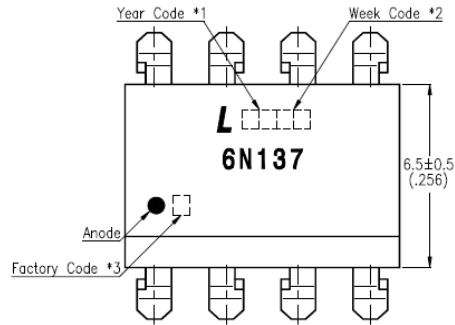
OUTLINE DIMENSIONS

6N137:



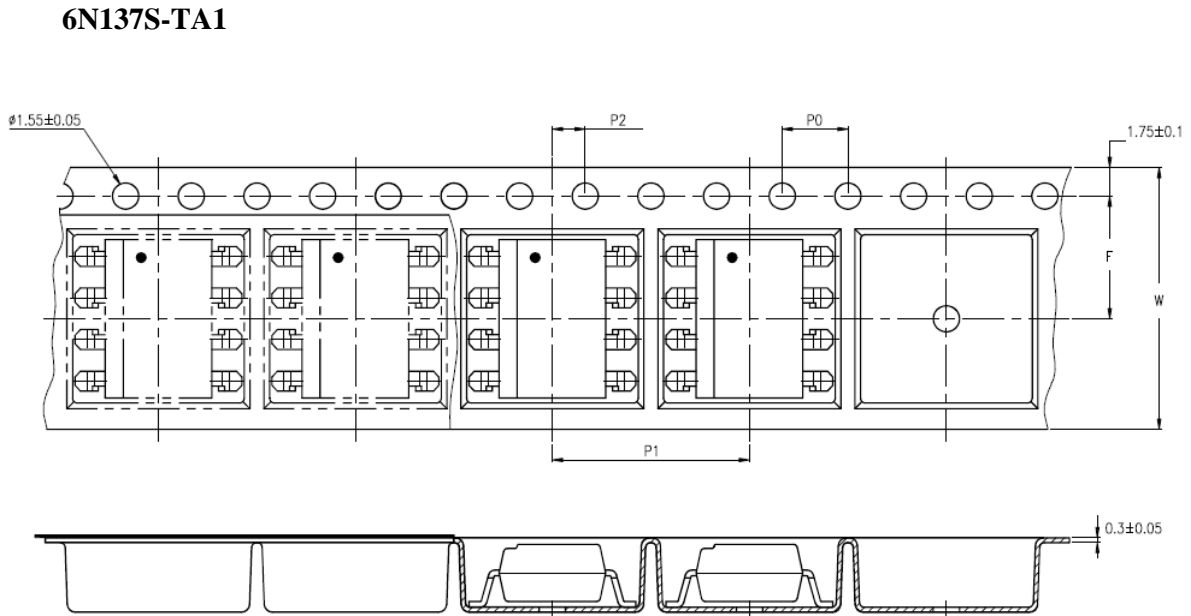
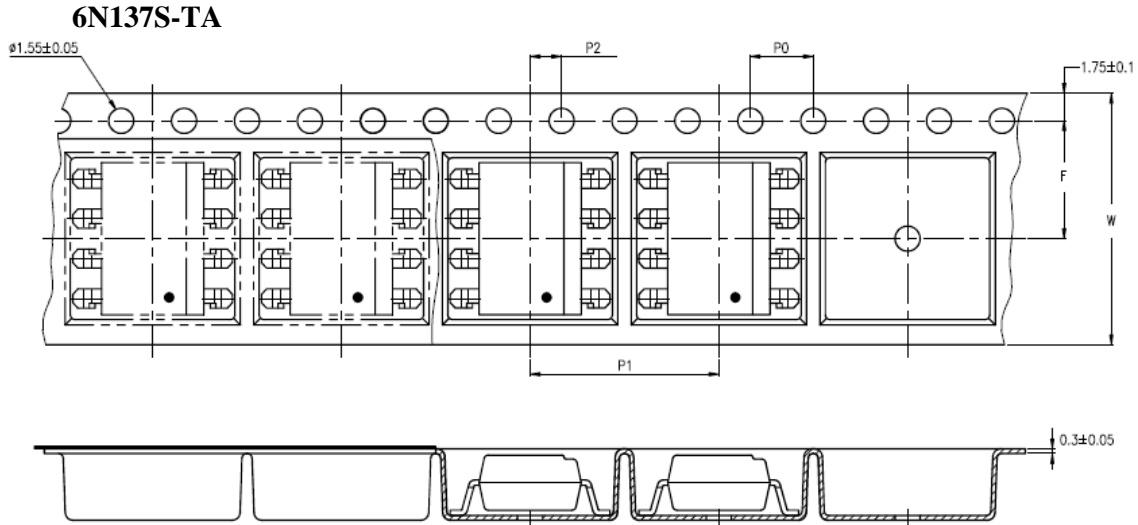
6N137M



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



| 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 | 7.5 ± 0.1 (.295) |
| Distance of compartment to compartment | P_2 | 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 | V _{Rms} |
| | 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

 ($T_A = 0\sim 70^\circ\text{C}$, unless otherwise specified)

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

 ** All typical at $T_A = 25^\circ\text{C}$

SWITCHING SPECIFICATIONS (AC)

 ($T_A = -40\sim 85^\circ\text{C}$, $V_{CC} = 5\text{V}$, $I_F = 7.5\text{mA}$ unless otherwise specified)

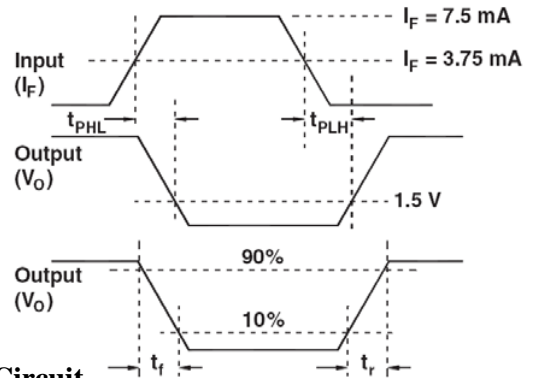
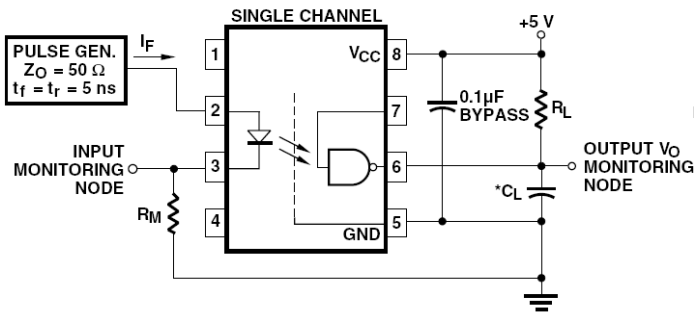
| PARAMETER | SYM. | MIN. | TYP** | MAX. | UNIT | CONDITIONS |
|--|-------------------------|------|-------|------|--------------------|--|
| Propagation Delay time to Logic Low Output (1)→(0) | t_{PHL} | 25 | 30 | 75 | ns | $R_L = 350\Omega$ $C_L = 15\text{pF}$ |
| | | | | 100 | | |
| Propagation Delay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

 ** All typical at $T_A = 25^\circ\text{C}$

SWITCHING TEST CIRCUITS (AC)

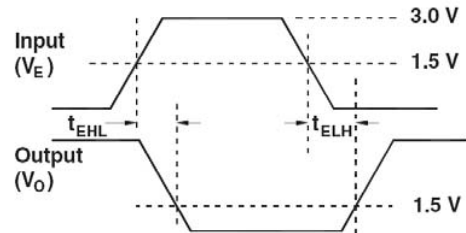
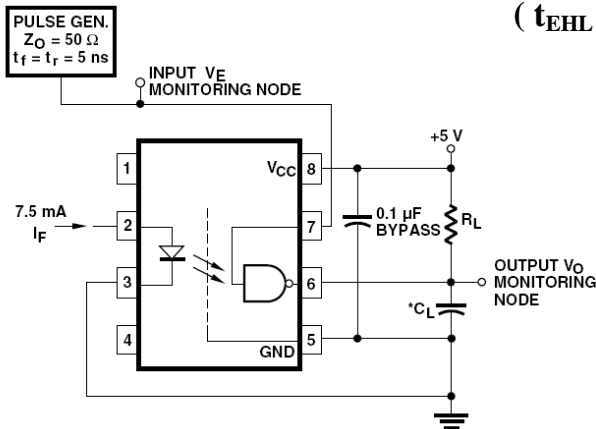
Switching Time Test Circuit

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

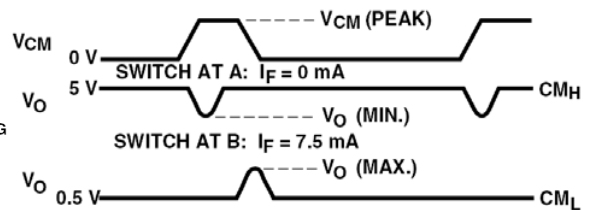
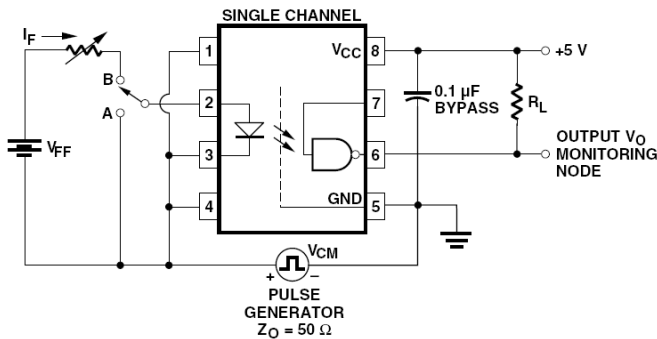


Switching Time Test Circuit

(t_{EHL} t_{ELH})



Common Mode Immunity Test Circuit



ISOLATION CHARACTERISTICS

($T_A = -40\sim 85^\circ\text{C}$, $V_{CC} = 5\text{V}$, $I_F = 7.5\text{mA}$ unless otherwise specified)

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

TRANSFER CHARACTERISTICS(DC)

($T_A = -40\sim 85^\circ\text{C}$, $V_{CC} = 5\text{V}$, $I_F = 7.5\text{mA}$ unless otherwise specified)

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

** All typical at $V_{CC}=5\text{V}$, $T_A = 25^\circ\text{C}$

Note:

- 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.
- For 10 sec.
- Pin5 and Pin8 must connect a bypass 0.1 μF capacitor.

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