

6N138/6N139 – High Speed Darlington Optocouplers

Aug 2008

FEATURES

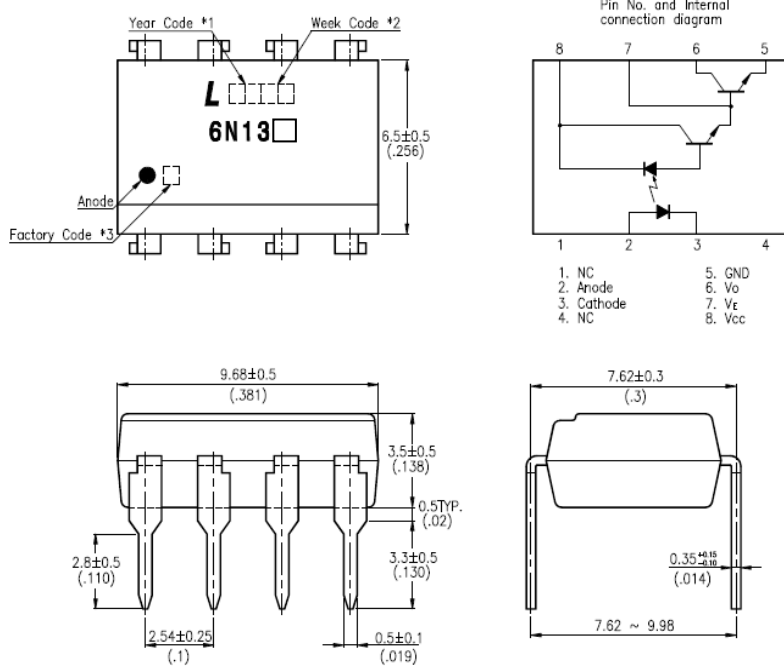
- * High current transfer ratio – 2000% typical
- * Low input current requirements – 0.5mA
- * High output current – 60mA
- * CTR guarantee - 0 ~ 70°C
- * Instantaneous common mode rejection– 10KV/ μ s
- * TTL compatible output – 0.1V V_{OL} typical
- * UL, CSA, IEC/EN/DIN EN60747-5-2 – Pending
- * Dual-in-line package - 6N138 / 6N139
- * Wide lead spacing package - 6N138M / 6N139M
- * Surface mounting package - 6N138S / 6N139S
- * Tape and reel packaging - 6N138S-TA / 6N139S-TA, 6N138S-TA1 / 6N139S-TA1

APPLICATIONS

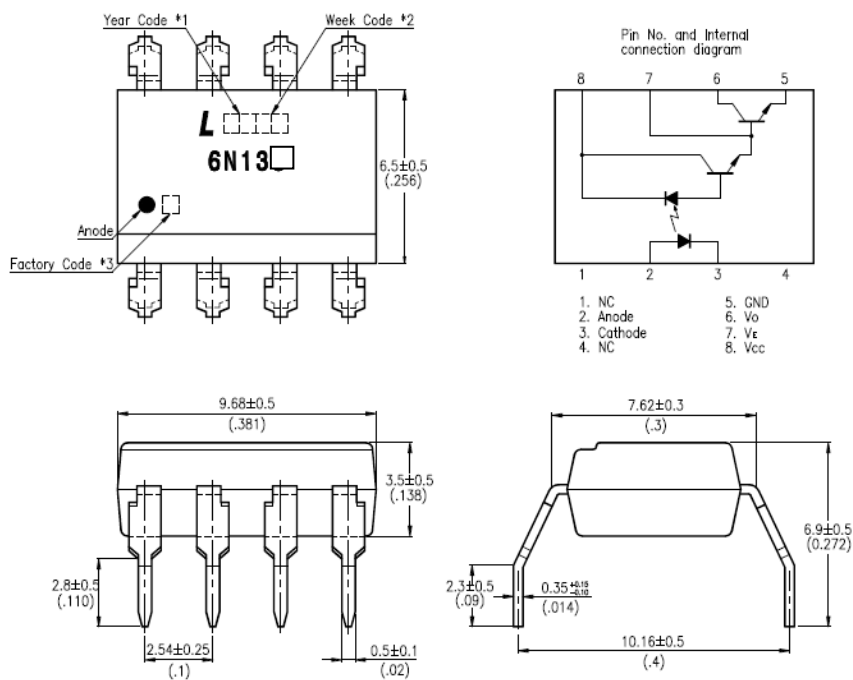
- * Digital logic ground isolation
- * Low input current line receiver
- * Telephone ring detector
- * EIA-RS-232C line receiver
- * Current loop receiver
- * High common mode noise line receiver

OUTLINE DIMENSIONS

6N138 / 6N139



6N138M / 6N139M



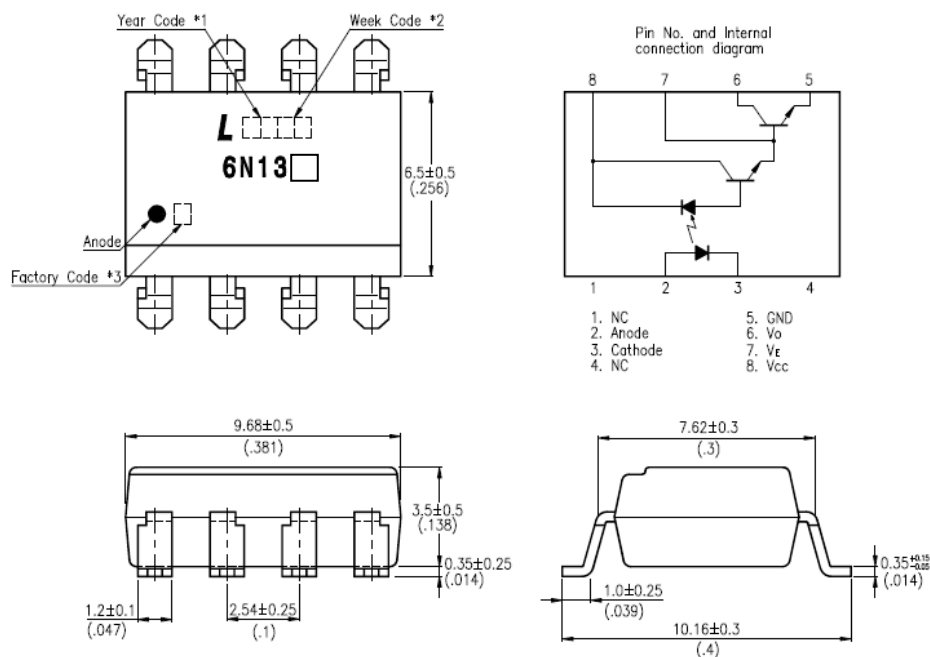
*1. Year date code.

*2. 2-digit work week.

*3. Factory identification mark shall be marked (Z : Taiwan, Y : Thailand).

OUTLINE DIMENSIONS

6N138S / 6N139S



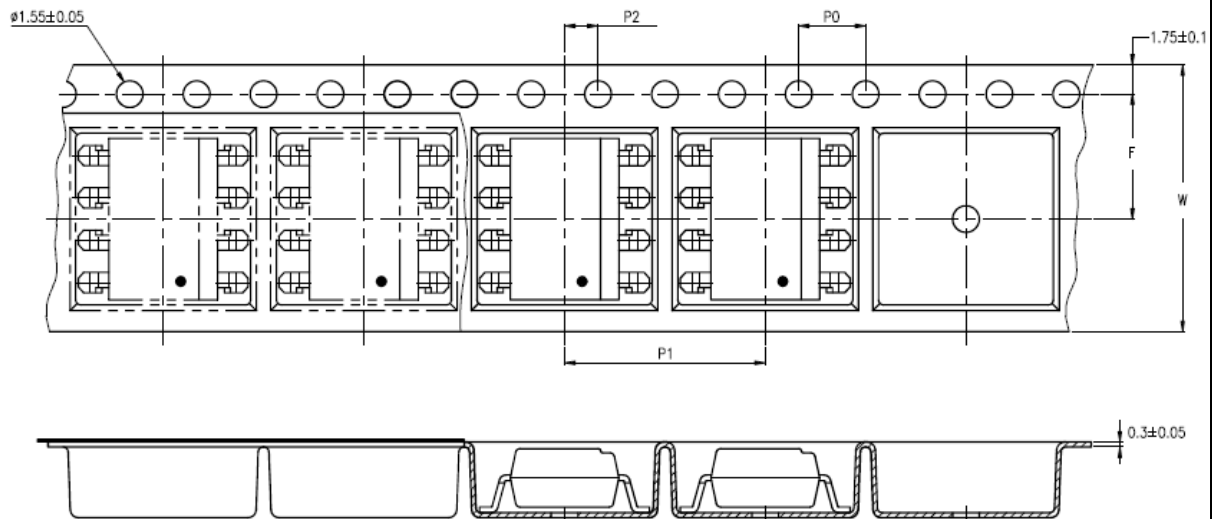
*1. Year date code.

*2. 2-digit work week.

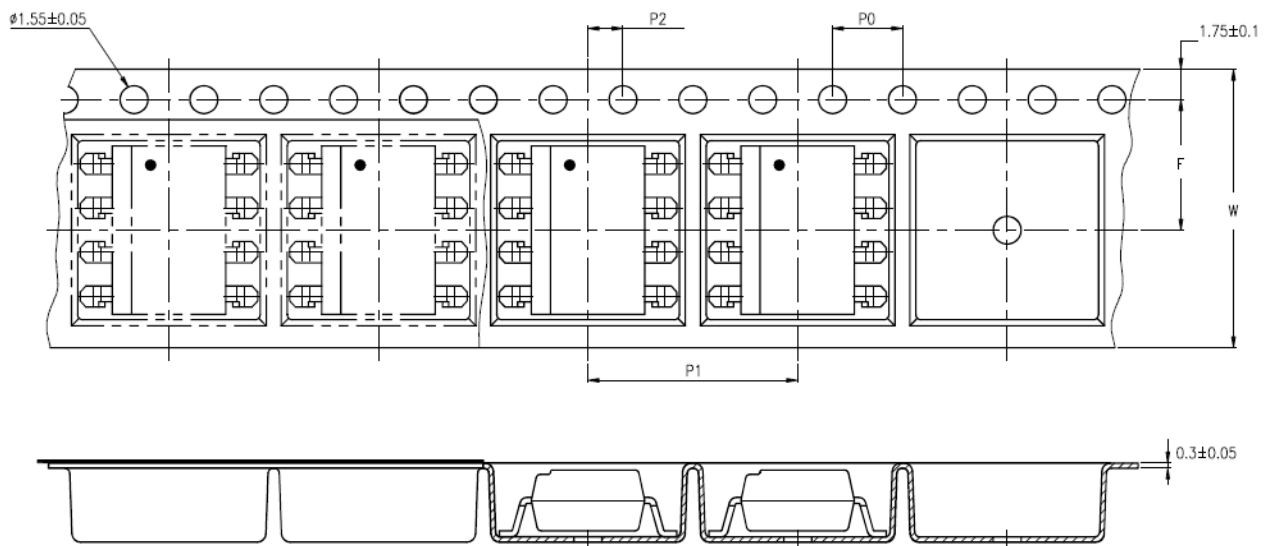
*3. Factory identification mark shall be marked (Z : Taiwan, Y : Thailand).

TAPING DIMENSIONS

6N138S-TA / 6N139S-TA



6N138S-TA1 / 6N139S-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	7.5 ± 0.1 (.295)
Distance of compartment to compartment	P_2	2 ± 0.1 (.079)
	P_1	12 ± 0.1 (.472)

ABSOLUTE MAXIMUM RATING

(Ta = 25°C)

PARAMETER		SYMBOL	RATING	UNIT
INPUT	Forward Current	I _F	20	mA
	Reverse Voltage	V _R	5	V
	Power Dissipation	P	35	mW
OUTPUT	Supply Voltage, Output Voltage	6N138 V _{CC} , V _O	-0.5 ~ +7	V
		6N139 V _{CC} , V _O	-0.5 ~ +18	V
	Emitter-base Reverse Withstand Voltage (pin 5 to 7)	V _{EBO}	0.5	V
	Average Output Current	I _O	60	mA
	Power Dissipation	P _O	100	mW
1	Isolation Voltage	V _{iso}	5000	V _{rms}
	Operating Temperature	T _{opr}	-40 ~ +85	°C
	Storage Temperature	T _{stg}	-55 ~ +125	°C
2	Soldering Temperature	T _{sol}	260	°C

Notes:

1. AC For 1 Minute, R.H. = 40 ~ 60%

Isolation voltage shall be measured using the following method.

- (1) Short between anode and cathode on the primary side and between collector and emitter 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 Seconds

ELECTRICAL - OPTICAL CHARACTERISTICS

(T_A = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
	Input Forward Voltage	V _F	—	1.1	1.7	V	Ta=25°C, IF=1.6mA
	Input Forward Voltage Temperature Coefficient	ΔV _F / ΔTa	—	-1.9	—	mV/°C	IF=1.6mA
	Input Reverse Voltage	BV _R	5.0	—	—	V	Ta=25°C, IR=10 μA
	Input Capacitance	C _{IN}	—	60	—	pF	V _F =0, f=1MHz
3 4	Current Transfer Ratio	CTR	400	2000	—	%	I _F =0.5mA, V _O =0.4V, V _{CC} =4.5V
			500	1600	—		I _F =1.6mA, V _O =0.4V, V _{CC} =4.5V
			300	1600	—		
4	Logic Low (0) Output Voltage	V _{OL}	—	0.1	0.4	V	I _F =0.5mA, I _O =2mA, V _{CC} =4.5V
							I _F =1.6mA, I _O =8mA, V _{CC} =4.5V
							I _F =5mA, I _O =15mA, V _{CC} =4.5V
				0.2			I _F =12mA, I _O =24mA, V _{CC} =4.5V
				0.1			I _F =1.6mA, I _O =4.8mA, V _{CC} =4.5V
4	Logic High (1) Output Current	I _{OH}	—	0.05	250	μA	I _F =0, V _{CC} =V _O =18V
				0.1	100		I _F =0, V _{CC} =V _O =7V
4	Logic Low (0) Supply Current	I _{CCL}	—	0.4	1.5	mA	IF=1.6mA, V _{CC} =18V Vo=open
4	Logic High (1) Supply Current	I _{CCH}	—	0.01	10	μA	I _F =0, V _{CC} =18V, Vo= open

** All typical at T_A = 25°C

SWITCHING SPECIFICATIONS (AC)

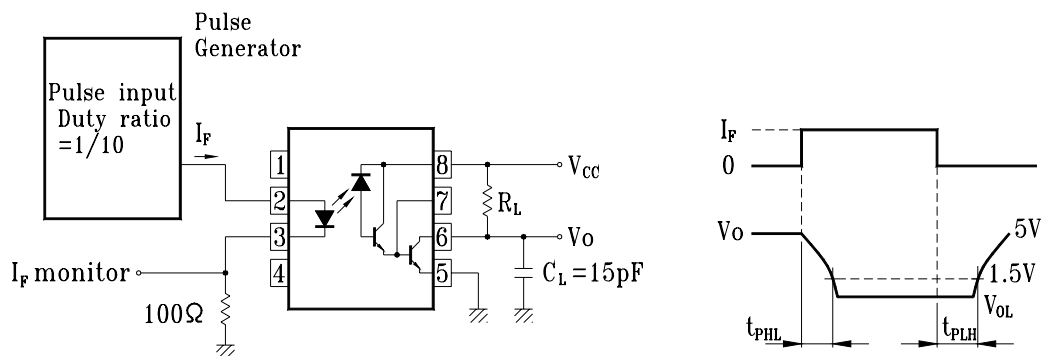
 ($T_A = 0 \sim 70^\circ\text{C}$, $V_{CC} = 5\text{V}$, unless otherwise specified)

PARAMETER		SYM.	MIN.	TYP.	MAX.		UNIT	CONDITIONS	
					T _A =25°C				
4	Propagation Delay time to Logic Low Output (1)→(0)	6N139	t _{PHL}	—	5	25	30	μs	IF = 0.5mA, R _L = 4.7kΩ
				—	0.1	1	2		IF = 12mA, R _L = 270Ω
				—	1.6	10	15		IF = 1.6mA, R _L = 2.2kΩ
4	Propagation Delay time to Logic High Output (0)→(1)	6N139	t _{PLH}	—	18	60	90	us	IF = 0.5mA, R _L = 4.7kΩ
				—	2	7	10		IF = 12mA, R _L = 270Ω
				—	10	35	50		IF = 1.6mA, R _L = 2.2kΩ
5	Instantaneous common mode rejection at high logic output (1)	CM _{Hi}	1000	10000	—		V / μs	I _F =0, V _{CM} =10V _{P-P} , RL=2.2kΩ	
5	Instantaneous common mode rejection at low logic output (0)	CM _L	1000	10000	—		V / μs	I _F =1.6mA V _{CM} =10V _{P-P} , RL=2.2kΩ	

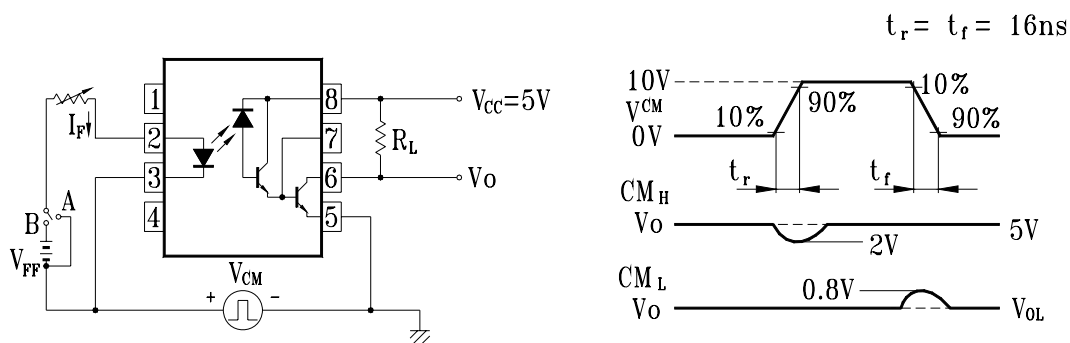
 ** All typical at $T_A = 25^\circ\text{C}$

SWITCHING TEST CIRCUITS (AC)

Switching Time Test Circuit



Common Mode Immunity Test Circuit



ISOLATION CHARACTERISTICS

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

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

Notes,

1. AC For 1 Minute, R.H. = 40 ~ 60%

Isolation voltage shall be measured using the following method.

- (1) Short between anode and cathode on the primary side and between collector and emitter 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 Seconds

3. Current Transfer Ratio (CTR) is defined as the ration of output collector current, I_o , to the forward LED input current, I_F , times 100%.

4. Pin 7 open.

5. Instantaneous common mode rejection voltage "output (1)" represents a common mode voltage variation that can hold the output above (1) level ($V_o > 2.0\text{V}$).

Instantaneous common mode rejection voltage "output (0)" represents a common mode voltage variation that can hold the output above (0) level ($V_o < 0.8\text{V}$).

6. Device considered a two terminal device. Pins 1, 2, 3 and 4 shorted together and Pins 5, 6, 7 and 8 shorted together.

Notes:

- Lite-On is continually improving the quality, reliability, function or design and Lite-On reserves the right to make changes without further notices.
- The products shown in this publication are designed for the general use in electronic applications such as office automation equipment, communications devices, audio / visual equipment, electrical application and instrumentation.
- For equipment/devices where high reliability or safety is required, such as space applications, nuclear power control equipment, medical equipment, etc, please contact our sales representatives.
- When requiring a device for any "specific" application, please contact our sales in advice.
- If there are any questions about the contents of this publication, please contact us at your convenience.
- The contents described herein are subject to change without prior notice.
- Do not immerse unit's body in solder paste.