

8 PIN DIP HIGH SPEED 10MBit/s LOGIC GATE PHOTOCOUPLER

6N137

Features:

- High speed 10Mbit/s
- Guaranteed performance from -40 to 85°C
- Logic gate output
- High isolation voltage between input and output (Viso=5000 V rms)
- Pb free and RoHS compliant.
- UL approved (No. 214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CSA approved (No. 2037145)

Description

The 6N137 consists of an infrared emitting diode optically coupled to a high speed integrated photo detector logic gate with a strobable output.

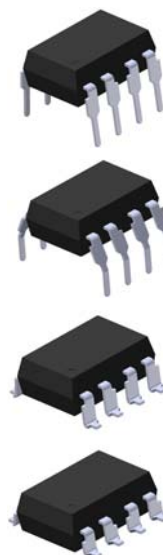
It is packaged in a 8-pin DIP package and available in wide-lead spacing and SMD options.

Applications

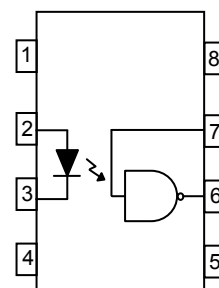
- Ground loop elimination
- LSTTL to TTL, LSTTL or 5 volt CMOS
- Line receiver, data transmission
- Data multiplexing
- Switching power supplies
- Pulse transformer replacement
- Computer peripheral interface

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



Schematic



A 0.1μF bypass capacitor must be connected between pins 8 and 5^{*3}

Pin Configuration

- 1, No Connection
- 2, Anode
- 3, Cathode
- 4, No Connection
- 5, Gnd
- 6, Vout
- 7, V_E
- 8, V_{CC}



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Absolute Maximum Ratings ($T_a=25^{\circ}\text{C}$)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	Enable input voltage Not exceed V_{CC} by more than 500mV	V_E	5.5	V
	Reverse voltage	V_R	5	V
	Power dissipation	P_D	100	mW
Output	Power dissipation	P_C	85	mW
	Output current	I_O	50	mA
	Output voltage	V_O	7.0	V
	Supply voltage	V_{CC}	7.0	V
Output Power Dissipation		P_O	100	mW
Isolation voltage ^{*1}		V_{ISO}	5000	V rms
Operating temperature		T_{OPR}	-40 ~ +85	$^{\circ}\text{C}$
Storage temperature		T_{STG}	-55 ~ +125	$^{\circ}\text{C}$
Soldering temperature ^{*2}		T_{SOL}	260	$^{\circ}\text{C}$

Notes

*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1 & 2 are shorted together, and pins 3 & 4 are shorted together.

*2 For 10 seconds.



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Electrical Characteristics ($T_a=-40$ to 85°C unless specified otherwise)

Input

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Condition
Forward voltage	V_F	-	1.4	1.8	V	$I_F = 10\text{mA}$
Reverse voltage	V_R	5.0	-	-	V	$I_R = 10\mu\text{A}$
Temperature coefficient of forward voltage	$\Delta V_F/\Delta T_A$	-	-1.8	-	mV/ $^\circ\text{C}$	$I_F = 10\text{mA}$
Input capacitance	C_{IN}	-	60	-	pF	$V_F = 0, f = 1\text{MHz}$

Output

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Condition
High level supply current	I_{CCH}	-	7	10	mA	$I_F = 10\text{mA}, V_E = 0.5\text{V}, V_{CC} = 5.5\text{V}$
Low level supply current	I_{CCL}	-	9	13	mA	$I_F = 0\text{mA}, V_E = 0.5\text{V}, V_{CC} = 5.5\text{V}$
High level enable current	I_{EH}	-	-0.6	-1.6	mA	$V_E = 0.5\text{V}, V_{CC} = 5.5\text{V}$
Low level enable current	I_{EL}	-	-0.8	-1.6	mA	$V_E = 2.0\text{V}, V_{CC} = 5.5\text{V}$
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	$I_F = 10\text{mA}, V_{CC} = 5.5\text{V}$

Transfer Characteristics ($T_a=-40$ to 85°C unless specified otherwise)

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Condition
HIGH Level Output Current	I_{OH}	-	2.1	100	μA	$V_{CC} = 5.5\text{V}, V_O = 5.5\text{V}, I_F = 250\mu\text{A}, V_E = 2.0\text{V}$
LOW Level Output Current	V_{OL}	-	0.35	0.6	V	$V_{CC} = 5.5\text{V}, I_F = 5\text{mA}, V_E = 2.0\text{V}, I_{CL} = 13\text{mA}$
Input Threshold Current	I_{FT}	-	2.5	5	mA	$V_{CC} = 5.5\text{V}, V_O = 0.6\text{V}, V_E = 2.0\text{V}, I_{OL} = 13\text{mA}$



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

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Condition
Propagation delay time to output High level (Fig.12)	T _{PHL}	-	35	75	ns	C _L = 15pF, R _L =350Ω, TA=25°C
Propagation delay time to output Low level (Fig.12)	T _{PLH}	-	40	75	ns	C _L = 15pF, R _L =350Ω, TA=25°C
Pulse width distortion	T _{pHl} – T _{plh}	-	5	35	ns	C _L = 15pF, R _L =350Ω
Output rise time (Fig.12)	t _r	-	40	-	ns	C _L = 15pF, R _L =350Ω
Output fall time (Fig.12)	t _f	-	10	-	ns	C _L = 15pF, R _L =350Ω

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

Enable Propagation Delay Time to Output High Level (Fig.13)	t _{ELH}	-	15	-	ns	I _F = 7.5mA , V _{EH} =3.5V, C _L = 15pF, R _L =350Ω
Enable Propagation Delay Time to Output Low Level (Fig.13)	t _{EHL}	-	15	-	ns	I _F = 7.5mA , V _{EH} =3.5V, C _L = 15pF, R _L =350Ω
Common Mode Transient Immunity at Logic High * ⁴	CM _H	5000	-	-	V/μS	I _F = 0mA , V _{CM} =50Vp-p, V _{OH} =2.0V, R _L =350Ω, TA=25°C
Common Mode Transient Immunity at Logic Low * ⁵	CM _L	5000	-	-	V/μS	I _F = 7.5mA , V _{CM} =50Vp-p, V _{OL} =0.8V, R _L =350Ω, TA=25°C

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Typical Performance Curves

Fig.1 Input Diode Forward Voltage vs. Forward Current

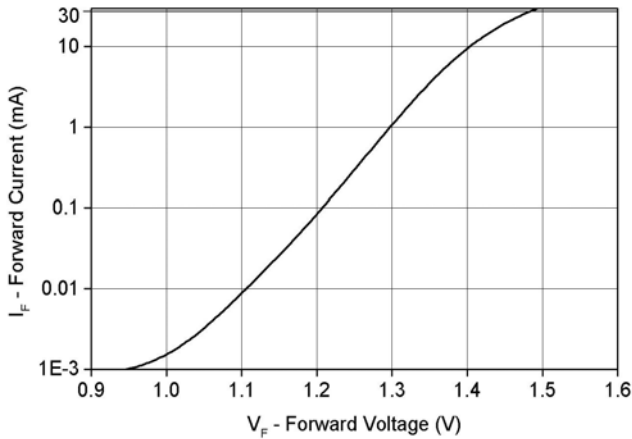


Fig.2 Low Level Output Voltage vs. Ambient Temperature

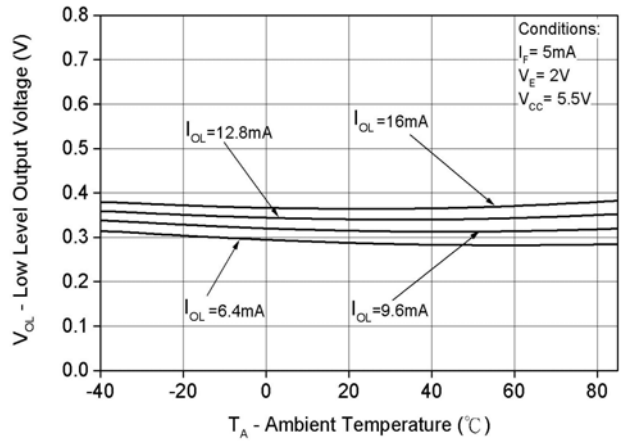


Fig.3 Low Level Output Current vs. Ambient Temperature

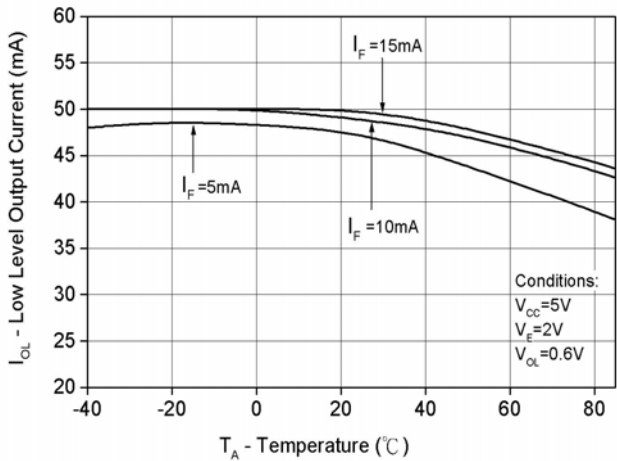


Fig.4 Input Threshold Current vs. Ambient Temperature

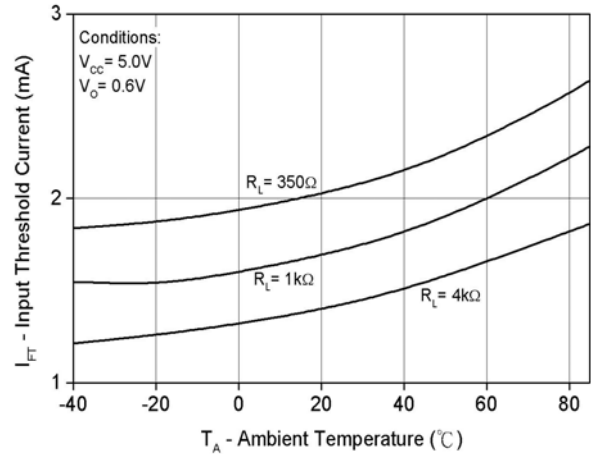


Fig.5 Output Voltage vs. Input Forward Current

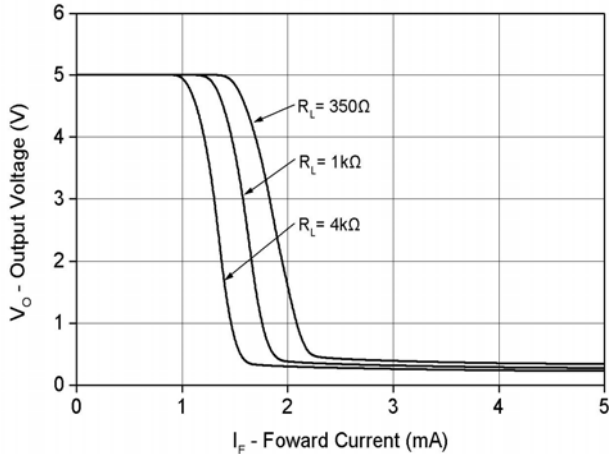
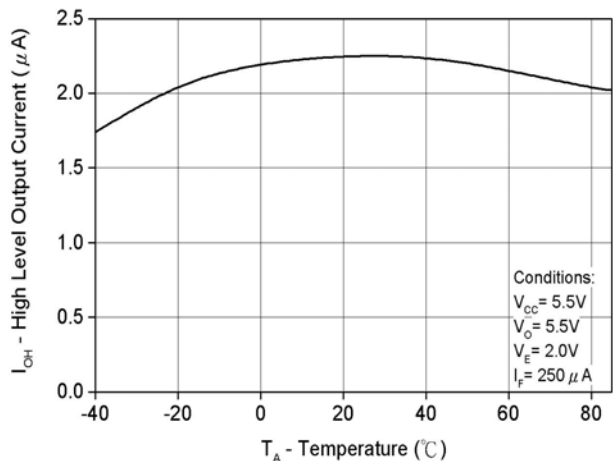
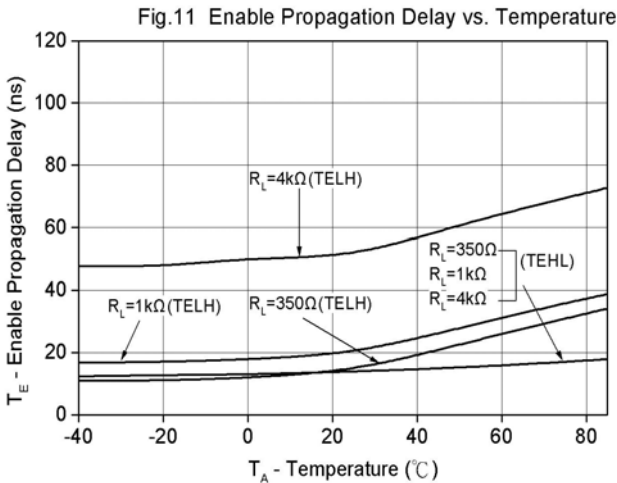
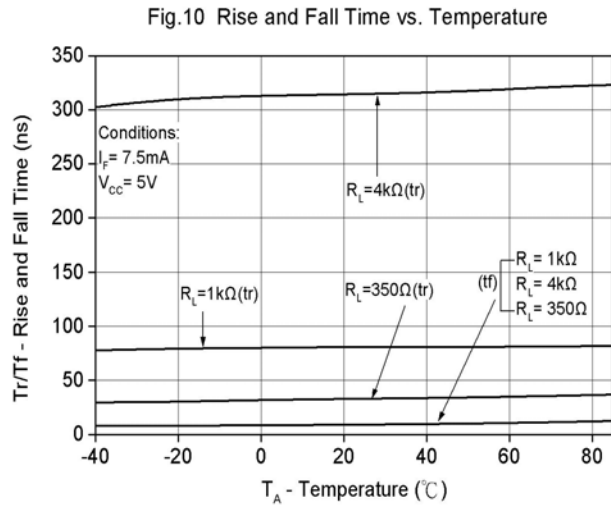
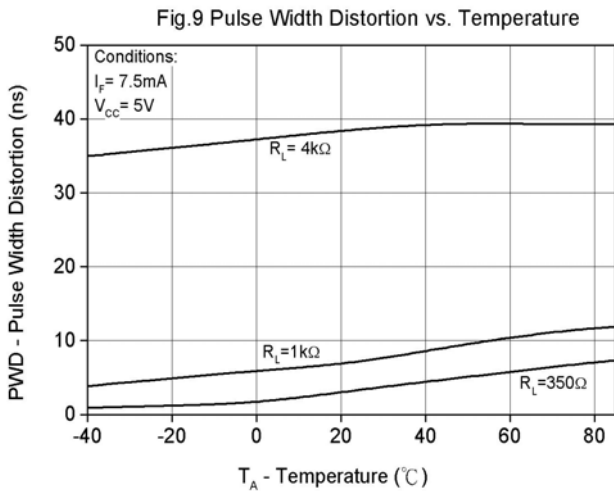
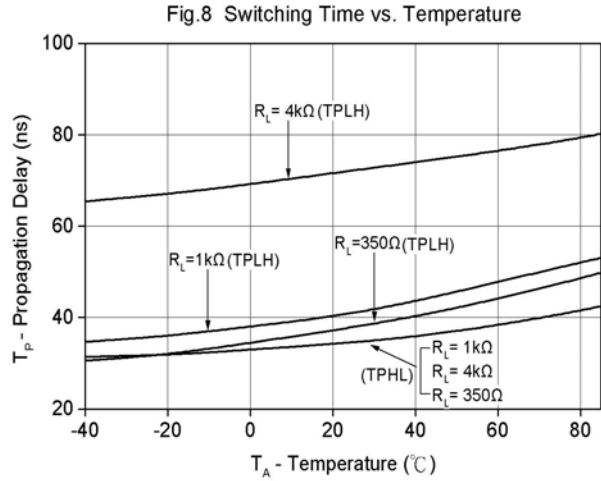
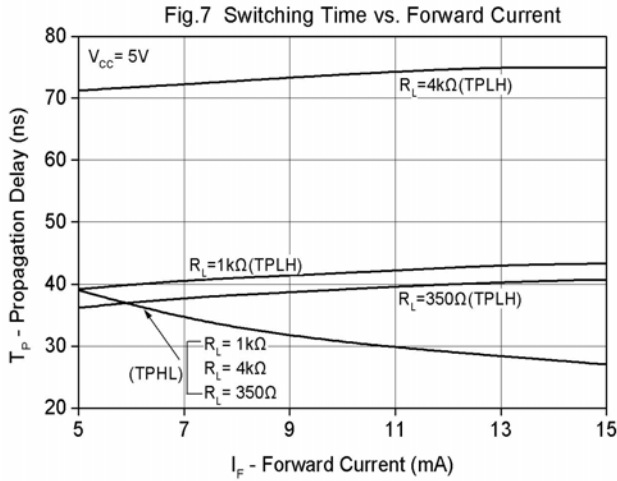


Fig.6 High Level Output Current vs. Temperature



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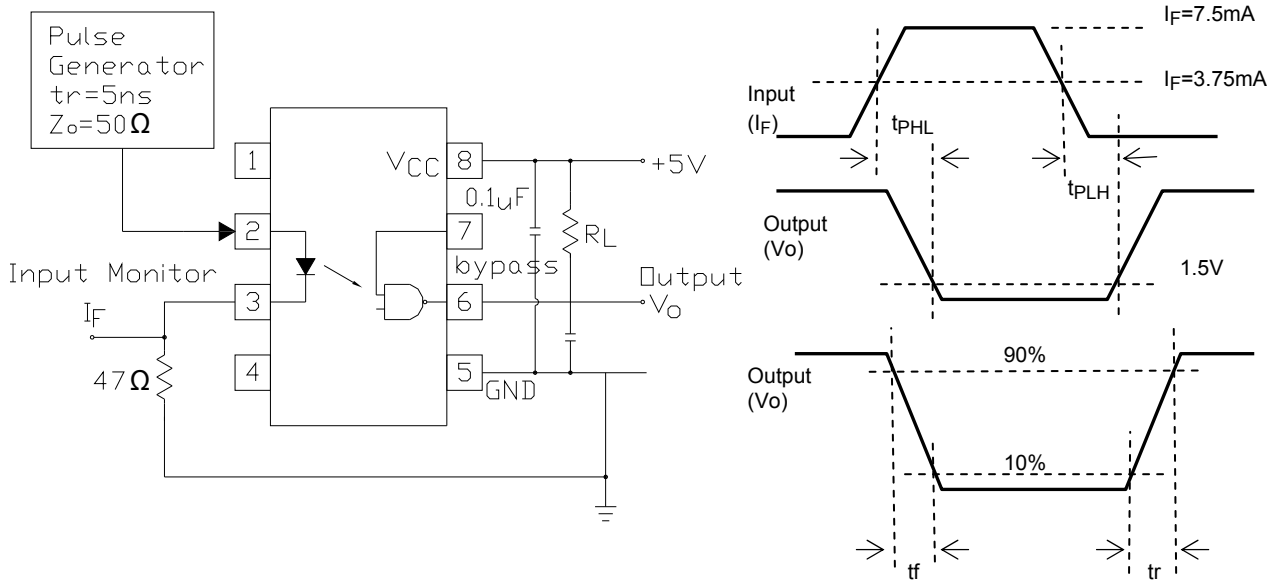


Fig. 12 Test circuit and waveforms for t_{PHL} , t_{PLH} , t_r , and t_f

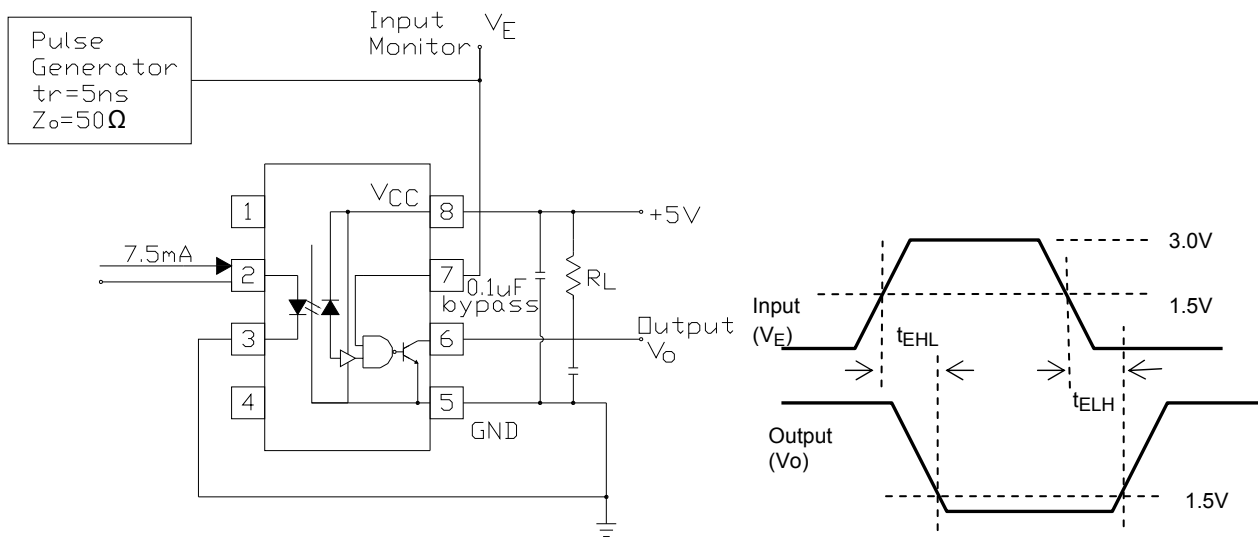


Fig. 13 Test circuit and waveform for t_{EHL} and t_{ELH}

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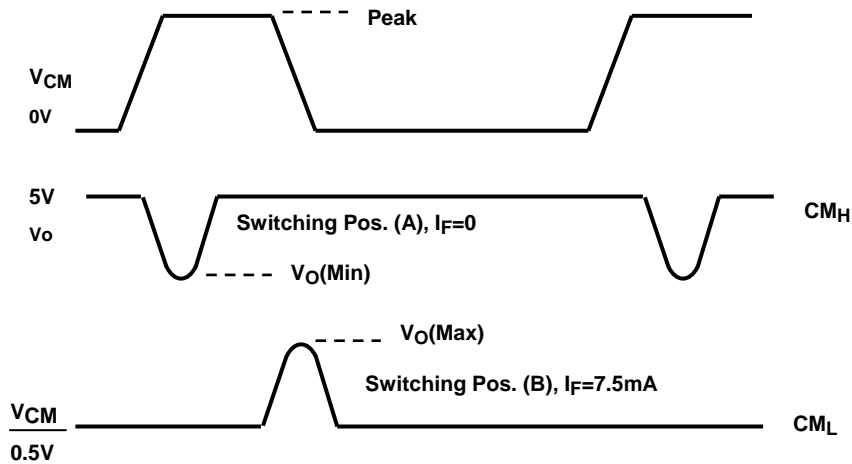
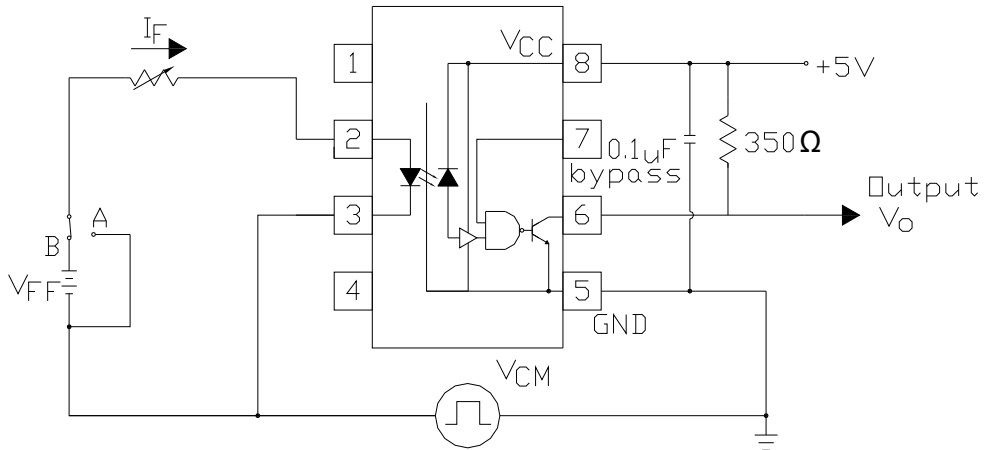


Fig. 14 Test circuit Common mode Transient Immunity

Notes:

- *3 The VCC supply 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 VCC and GND pins
- *4 CMH– The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the HIGH state (i.e., VOUT > 2.0V).
- *5 CML– The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the LOW output state (i.e., VOUT < 0.8V).



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Order Information

Part Number

6N137Y(Z)-V

Note

- Y = Lead form option (S, S1, M or none)
- Z = Tape and reel option (TA, TB or none).
- V = VDE (optional)

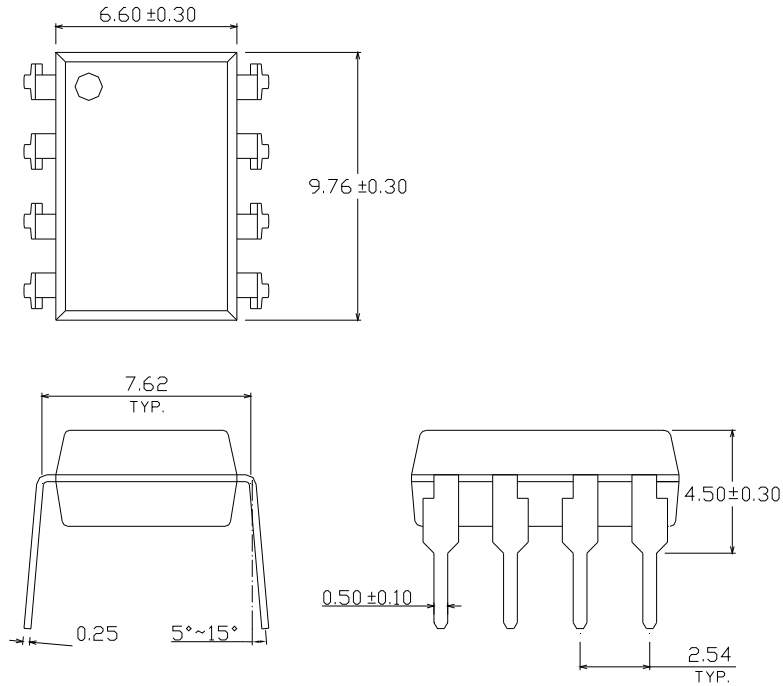
Option	Description	Packing quantity
None	Standard DIP-8	45 units per tube
M	Wide lead bend (0.4 inch spacing)	45 units per tube
S (TA)	Surface mount lead form + TA tape & reel option	1000 units per reel
S (TB)	Surface mount lead form + TB tape & reel option	1000 units per reel
S1 (TA)	Surface mount lead form (low profile) + TA tape & reel option	1000 units per reel
S1 (TB)	Surface mount lead form (low profile) + TB tape & reel option	1000 units per reel

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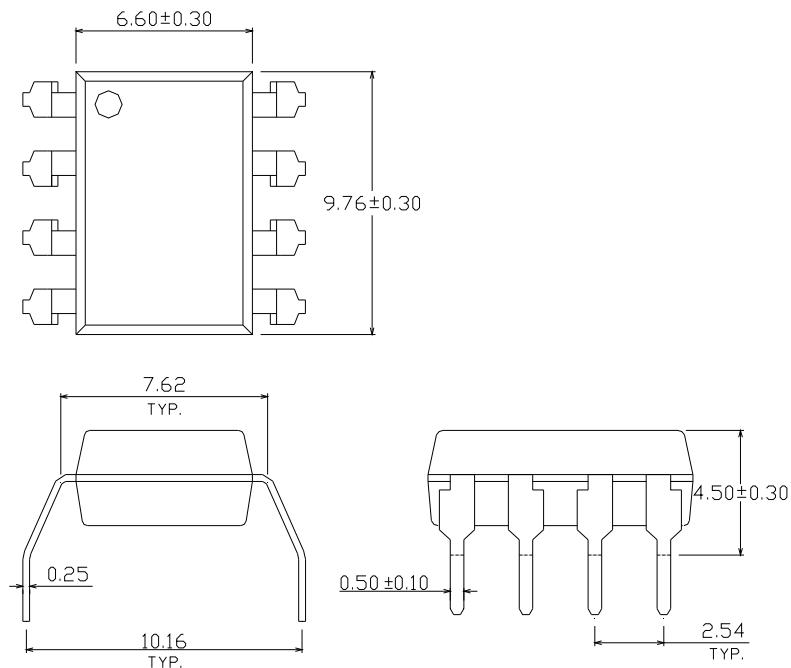
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**Package Drawing
(Dimensions in mm)**

Standard DIP Type



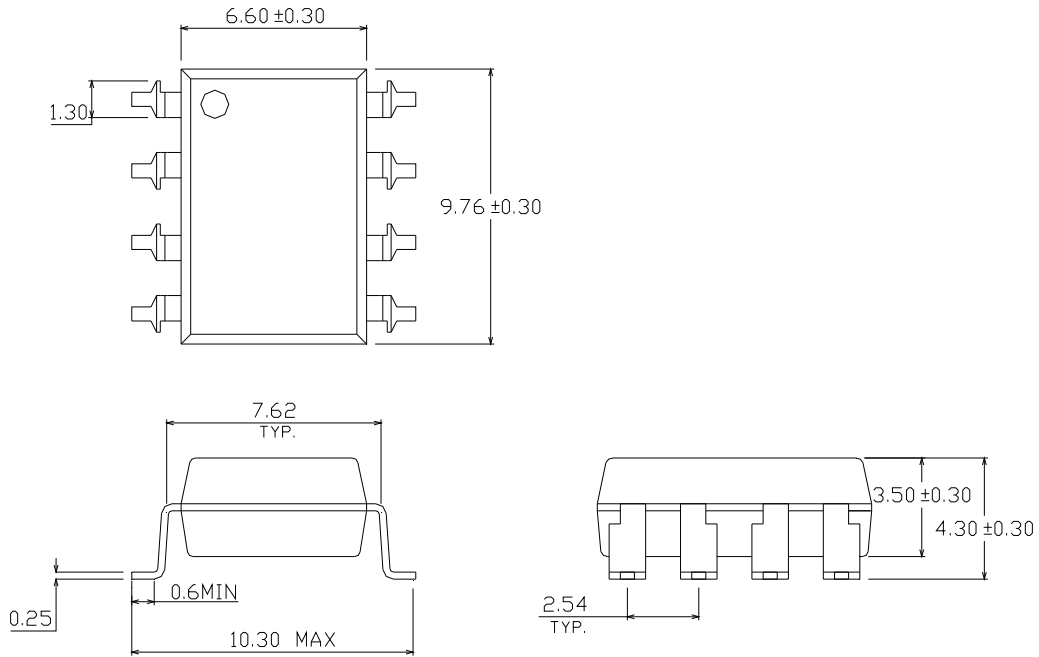
Option M Type



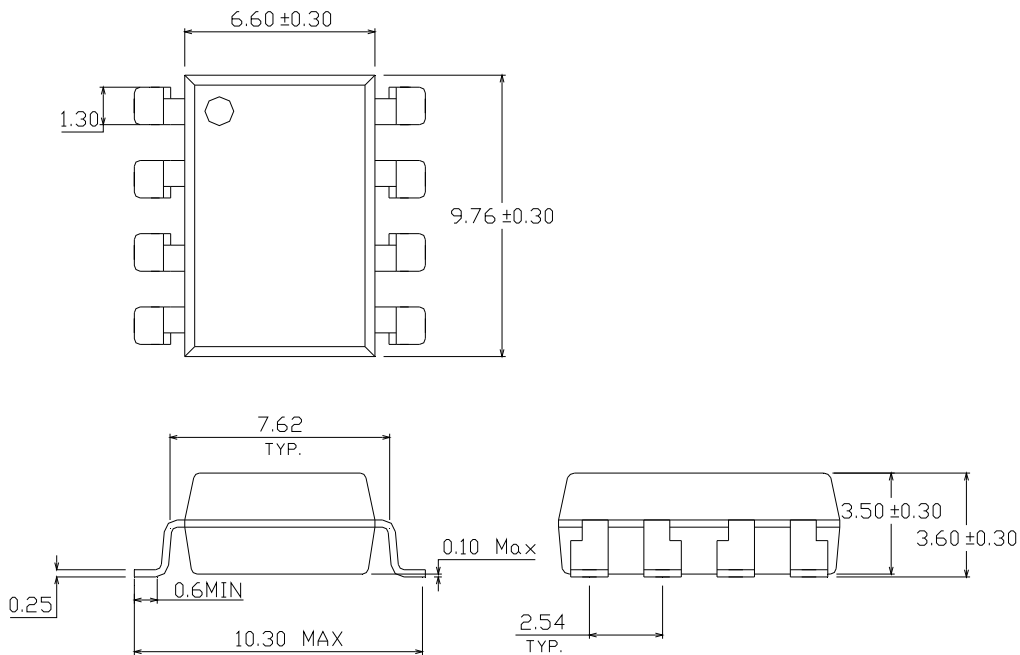
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Option S Type



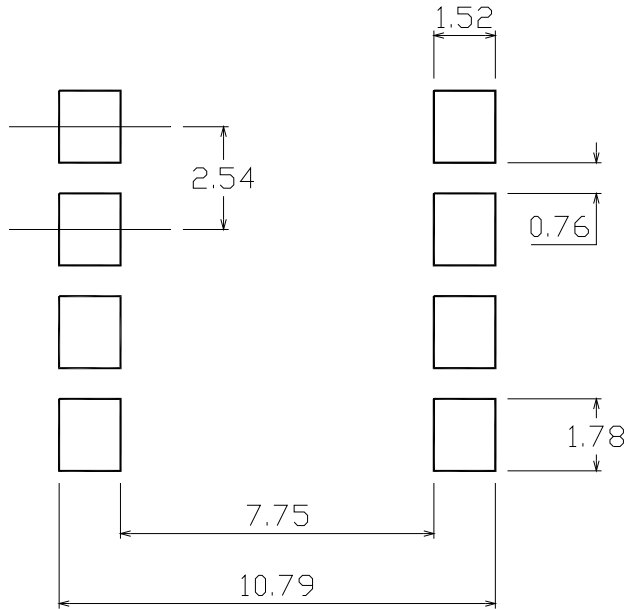
Option S1 Type



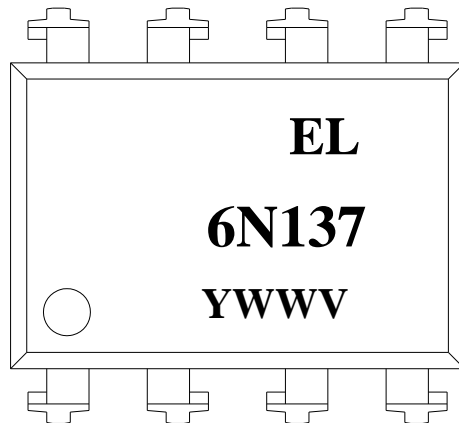
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Recommended pad layout for surface mount leadform



Device Marking



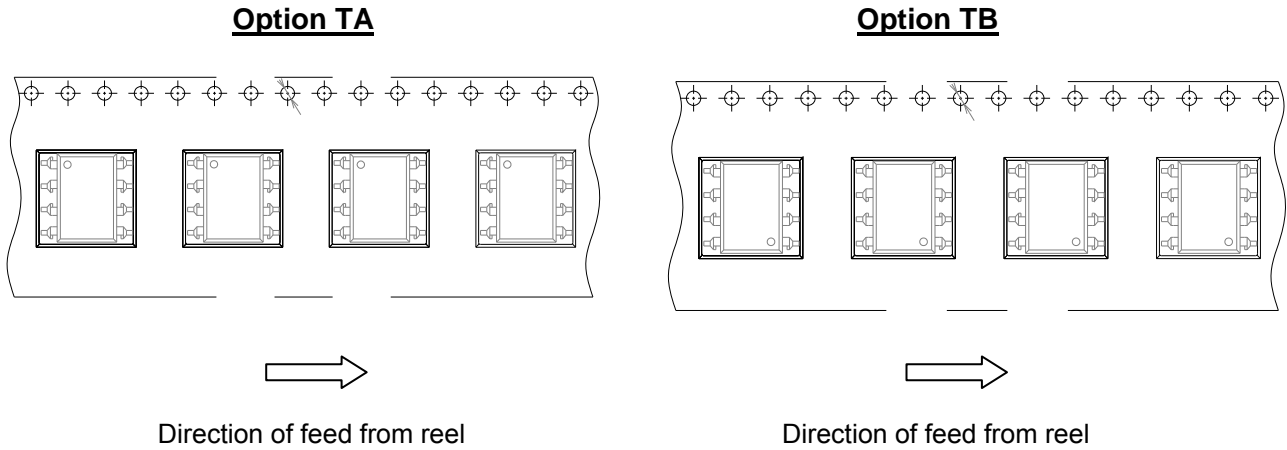
Notes

- 6N137 denotes Device Number
- Y denotes 1 digit Year code
- WW denotes 2 digit Week code
- V denotes VDE (optional)

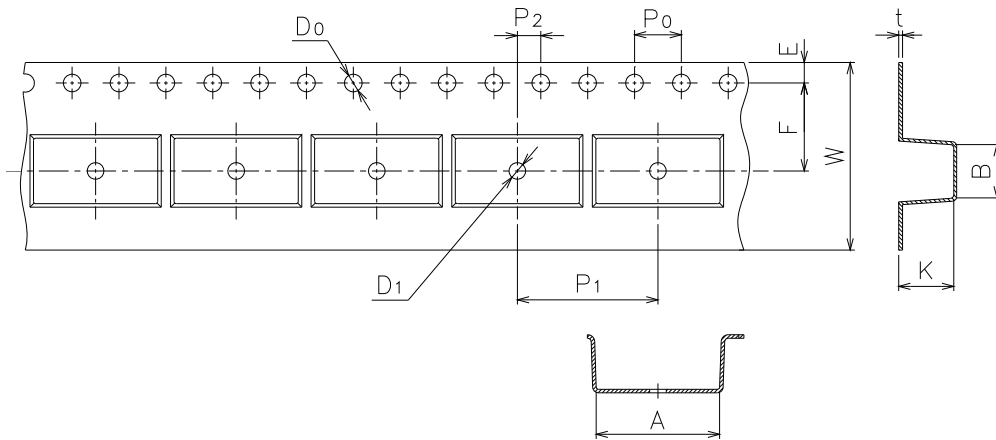
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Tape & Reel Packing Specifications



Tape dimensions

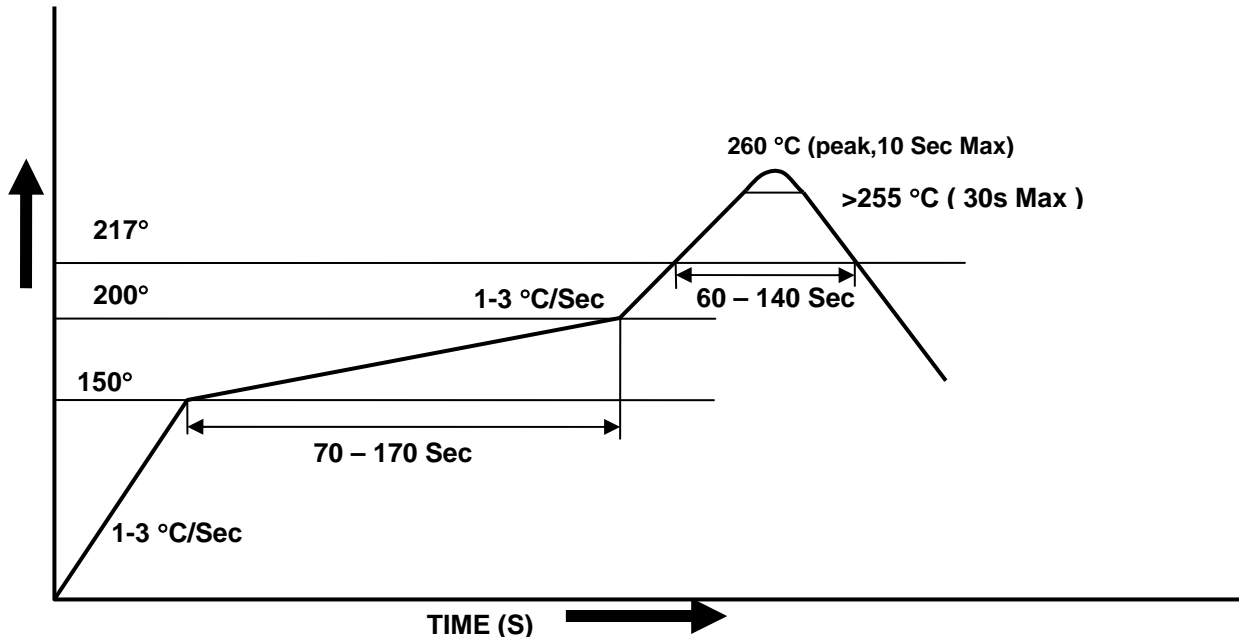


Dimension No.	A	B	Do	D1	E	F
Dimension(mm)	10.4±0.1	10.0±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1
Dimension No.	Po	P1	P2	t	W	K
Dimension(mm)	4.0±0.1	12.0±0.1	2.0±0.1	0.4±0.1	16.0+0.3/ -0.1	4.5±0.1

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Solder Reflow Temperature Profile





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