6N137, ICPL2601, ICPL2611

DESCRIPTION

The 6N137, ICPL2601 and ICPL2611 devices each consists of an infrared emitting diode, optically coupled to a high speed integrated photo detector logic gate with a strobable output.

FEATURES

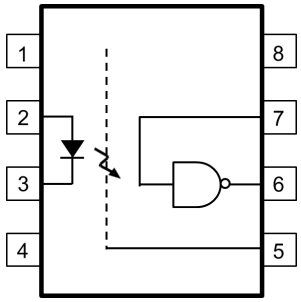
- High Speed 10Mbit/s
- Minimum Common Mode Transient Immunity 10kV/µs for ICPL2611
- High AC Isolation Voltage 5000V_{RMS}
- Guaranteed Performance from -40°C to 85°C
- Logic Gate Output
- Pb Free and RoHS Compliant
- UL File E91231 for 6N137 and ICPL2601
- VDE File 40044376 for 6N137
- Safety Approvals Pending for ICPL2611

APPLICATIONS

- Line Receivers, Data Communication
- LSTTL to TTL, LSTTL or 5V CMOS
- Data Multiplexing
- Pulse Transformer Replacement
- Switch Mode Power Supplies
- Ground Loop Elimination
- Computer Peripheral Interface

ORDER INFORMATION

- Add V after PN for VDE Approval for 6N137 only
- Add G after PN for 10mm Lead Spacing
- Add SM after PN for Surface Mount
- Add SMT&R after PN for Surface Mount Tape & Reel



1 NC
2 Anode
3 Cathode
4 NC
5 GND
6 V_O
7 V_E
8 V_{CC}

A 0.1µF bypass Capacitor must be connected between Pins 8 and 5.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Stresses exceeding the absolute maximum ratings can cause permanent damage to the device.
Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

Input	
Forward Current	50mA
Reverse Voltage	5V
Power dissipation	100mW
Output	
Output Current	50mA
Output Voltage	7.0V
Supply Voltage	7.0V
Enable Input Voltage (maximum 500mV above V_{CC})	5.5V
Power Dissipation	85mW
Total Package	
Isolation Voltage	5000V_{RMS}
Total Power Dissipation	100mW
Operating Temperature	-40 to 85°C
Storage Temperature	-55 to 125°C
Lead Soldering Temperature (10s)	260°C

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Truth Table

Input	Enable	Output
H	H	L
L	H	H
H	L	H
L	L	H
H	NC	L
L	NC	H

ELECTRICAL CHARACTERISTICS (T_A = -40 to 85°C unless otherwise specified)

INPUT

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Forward Voltage	V_F	I_F = 10mA		1.4	1.8	V
Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta T$	I_F = 10mA		−1.8		mV/°C
Reverse Voltage	V_R	I_R = 10µA	5.0			V
Input Capacitance	C_{IN}	V_F = 0V, f = 1MHz		60		pF

OUTPUT

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
High Level Supply Current	I_{CCH}	I_F = 0mA, V_{CC} = 5.5V V_E = 0.5V		7	10	mA
Low Level Supply Current	I_{CCL}	I_F = 10mA, V_{CC} = 5.5V		9	13	mA
High Level Output Current	I_{OH}	I_F = 250µA, V_{CC} = 5.5V, V_E = 2.0V, V_O = 5.5V		2.1	100	µA
Low Level Output Voltage	V_{OL}	I_F = 5mA, V_{CC} = 5.5V, V_E = 2.0V, I_{OL} = 13mA		0.35	0.6	V
High Level Enable Current	I_{EH}	V_{CC} = 5.5V, V_E = 2.0V		-0.6	-1.6	mA
Low Level Enable Current	I_{EL}	V_{CC} = 5.5V, V_E = 0.5V		-0.8	-1.6	mA
High Level Enable Voltage	V_{EH}	I_F = 10mA, V_{CC} = 5.5V	2.0			V
Low Level Enable Voltage	V_{EL}	I_F = 10mA, V_{CC} = 5.5V			0.8	V

COUPLED

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Input Threshold Current	I_{FT}	V_{CC} = 5.5V, V_O = 0.6V V_E = 2.0V, I_{OL} = 13mA		2.5	5	mA

* Typical values at T_A = 25°C

ELECTRICAL CHARACTERISTICS (T_A = -40 to 85°C unless otherwise specified)

SWITCHING (I_F = 7.5mA, V_{CC} = 5V unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Propagation Delay Time to High Output Level	t_{PLH}	R_L = 350Ω, C_L = 15pF, T_A = 25°C		40	75	ns
Propagation Delay Time to Low Output Level	t_{PHL}			35	75	
Pulse Width Distortion	$\|t_{PHL} - t_{PLH}\|$	R_L = 350Ω, C_L = 15pF		5	35	
Output Rise Time (10% to 90%)	t_r			40		
Output Fall Time (90% to 10%)	t_f			10		
Enable Propagation Delay Time to High Output Level	t_{ELH}	V_{EH} = 3.5V, R_L = 350Ω, C_L = 15pF		15		
Enable Propagation Delay Time to Low Output Level	t_{EHL}			15		

* Typical values at T_A = 25°C

ELECTRICAL CHARACTERISTICS (T_A = -40 to 85°C unless otherwise specified)

SWITCHING (I_F = 7.5mA, V_{CC} = 5V unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Common Mode Transient Immunity at Logic High	CM_H	6N137 I_F = 0mA, V_{OH} = 2.0V, R_L = 350Ω, V_{CM} = 10Vp-p, T_A = 25°C		5000		V/µs
		ICPL2601 I_F = 0mA, V_{OH} = 2.0V, R_L = 350Ω, V_{CM} = 50Vp-p, T_A = 25°C	5000			
		ICPL2611 I_F = 0mA, V_{OH} = 2.0V, R_L = 350Ω, V_{CM} = 400Vp-p, T_A = 25°C	10000			
		ICPL2611 High CMR Test Circuit I_F = 0mA, V_{OH} = 2.0V, R_L = 350Ω, V_{CM} = 400Vp-p, T_A = 25°C	20000			
Common Mode Transient Immunity at Logic Low	CM_L	6N137 I_F = 7.5mA, V_{OL} = 0.8V, R_L = 350Ω, V_{CM} = 10Vp-p, T_A = 25°C		5000		V/µs
		ICPL2601 I_F = 7.5mA, V_{OL} = 0.8V, R_L = 350Ω, V_{CM} = 50Vp-p, T_A = 25°C	5000			
		ICPL2611 I_F = 7.5mA, V_{OL} = 0.8V, R_L = 350Ω, V_{CM} = 400Vp-p, T_A = 25°C	10000			
		ICPL2611 High CMR Test Circuit I_F = 7.5mA, V_{OL} = 0.8V, R_L = 350Ω, V_{CM} = 400Vp-p, T_A = 25°C	20000			

* Typical values at T_A = 25°C

ELECTRICAL CHARACTERISTICS (T_A = -40 to 85°C unless otherwise specified)

ISOLATION

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Insulation Voltage	V_{ISO}	RH = 40% - 60%, T_A = 25°C t = 1 min,	5000			V_{RMS}

* Typical values at T_A = 25°C

Note :

- V_{CC} supply must be bypassed by a 0.1µF capacitor or larger with good high frequency characteristic and should be connected as close as possible to the package V_{CC} and GND pins.
- Enable Input – No pull up resistor required as the device has an internal pull up resistor.
- t_{PLH} 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.
- t_{PHL} 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.
- t_r Rise time is measured from the 10% to the 90% levels on the LOW to HIGH transition of the output pulse.
- t_f Fall time is measured from the 90% to the 10% levels on the HIGH to LOW transition of the output pulse.
- t_{ELH} is measured from the 1.5V level on the HIGH to LOW transition of the input Enable voltage pulse to the 1.5V level on the LOW to HIGH transition of the output voltage pulse.
- t_{EHL} is measured from the 1.5V level on the LOW to HIGH transition of the input Enable voltage pulse to the 1.5V level on the HIGH to LOW transition of the output voltage pulse.
- 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_O > 2.0V).
- 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_O < 0.8V).

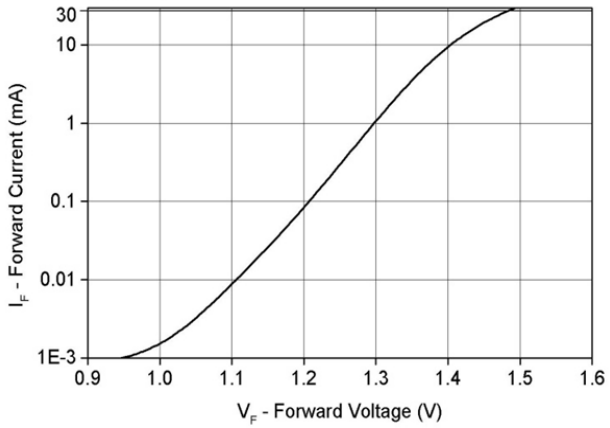


Fig 1 Forward Current vs Forward Voltage

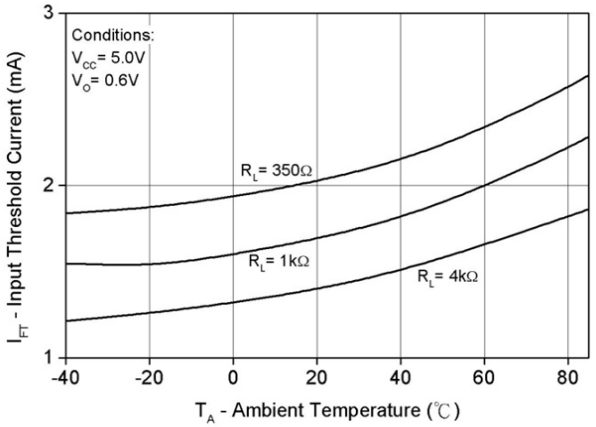


Fig 2 Input Threshold Current vs T_A

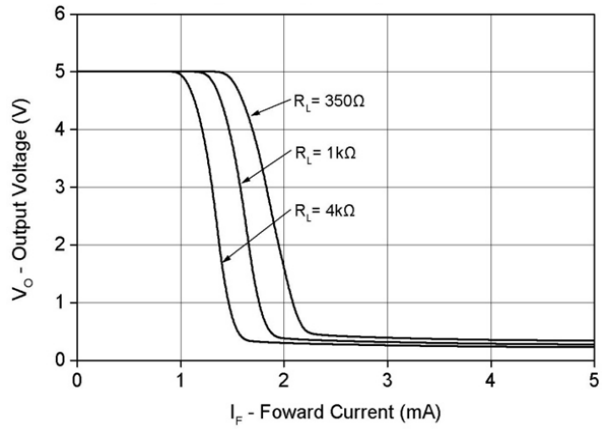


Fig 3 Output Voltage vs Forward Current

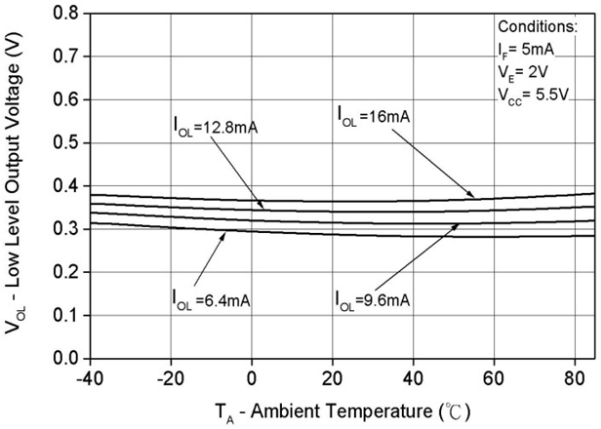


Fig 4 Output Low Level Voltage vs T_A

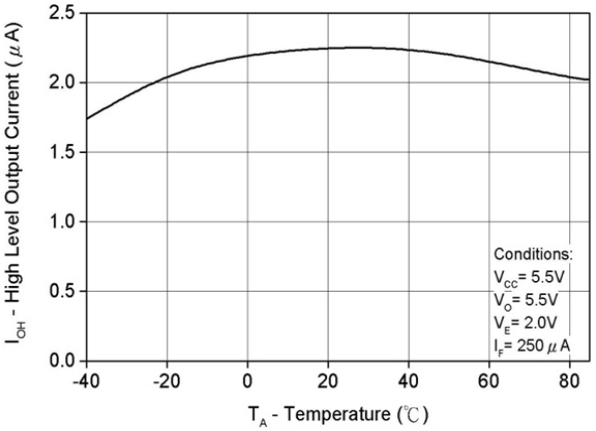


Fig 5 Output High Level Current vs T_A

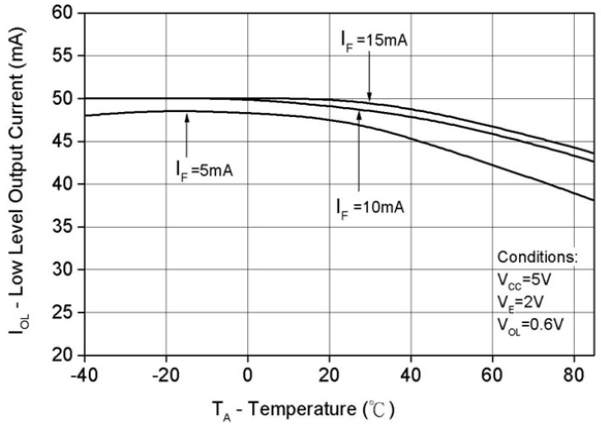


Fig 6 Output Low Level Current vs T_A

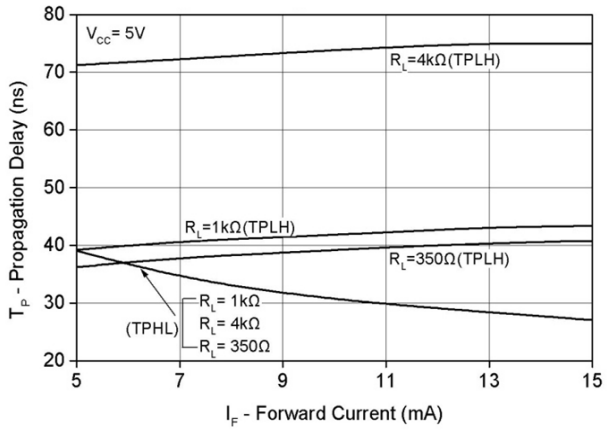


Fig 7 Propagation Delay vs Forward Current

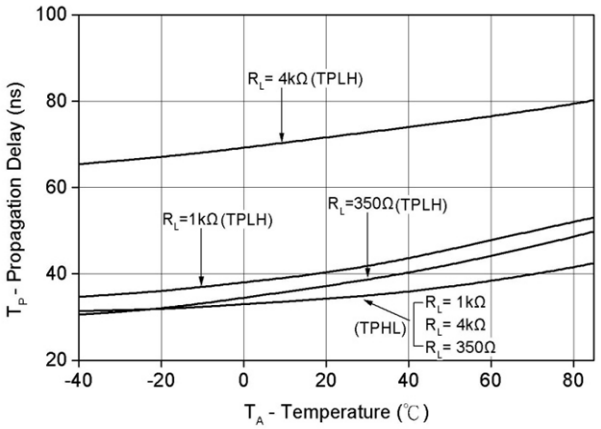


Fig 8 Propagation Delay vs T_A

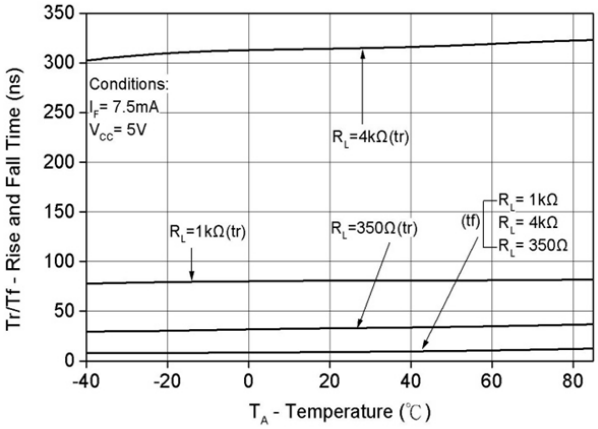


Fig 9 Rise / Fall Time vs T_A

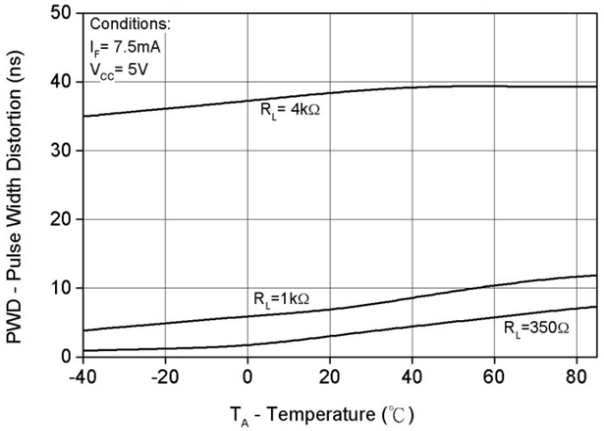


Fig 10 Pulse Width Distortation vs T_A

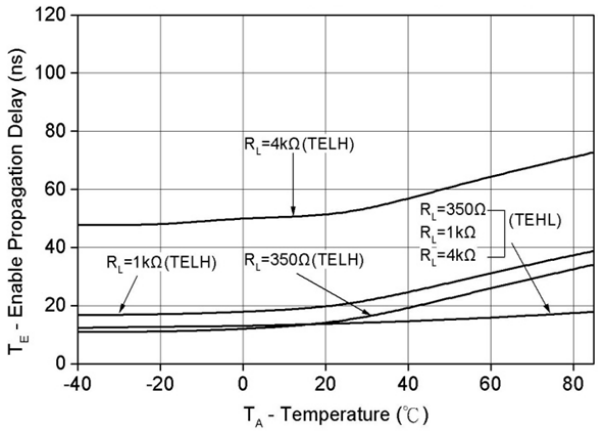
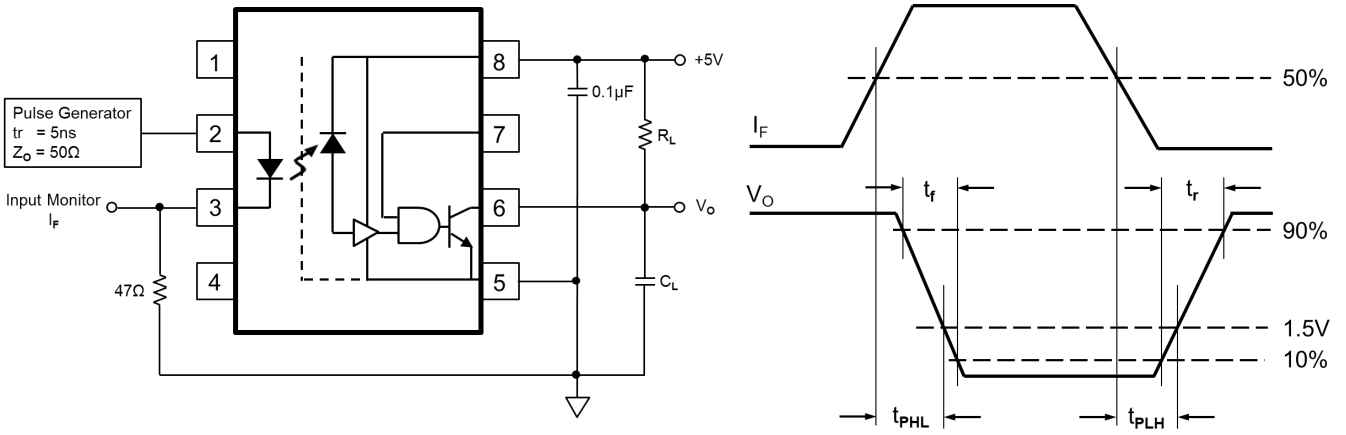
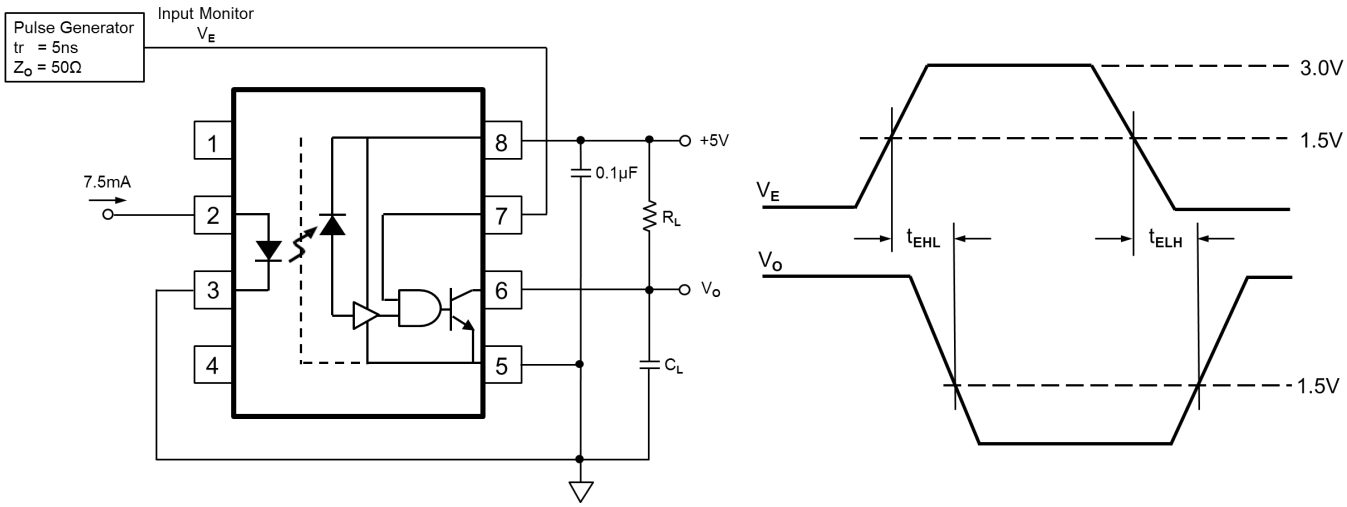


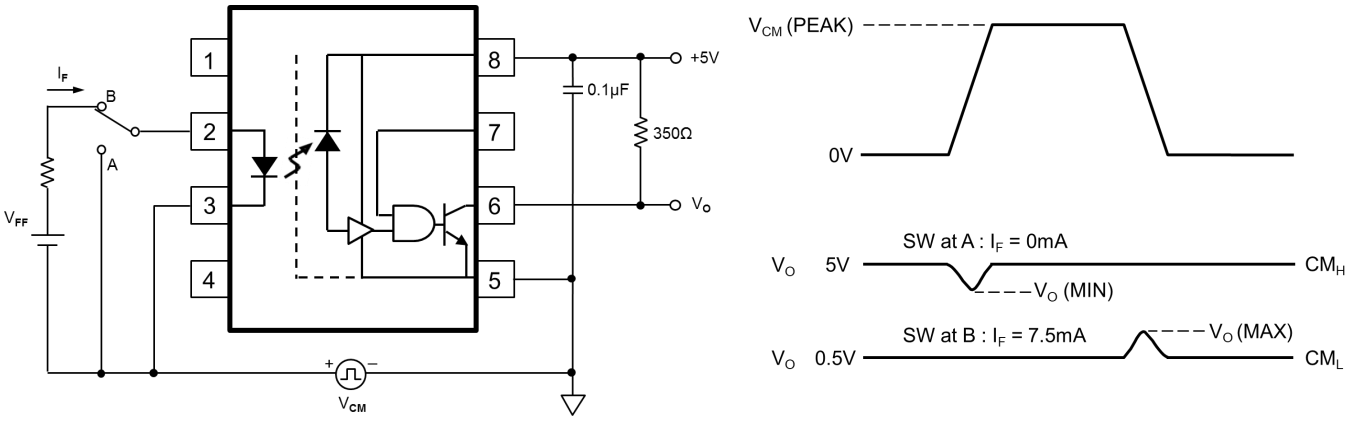
Fig 11 Enable Propagation Delay vs T_A



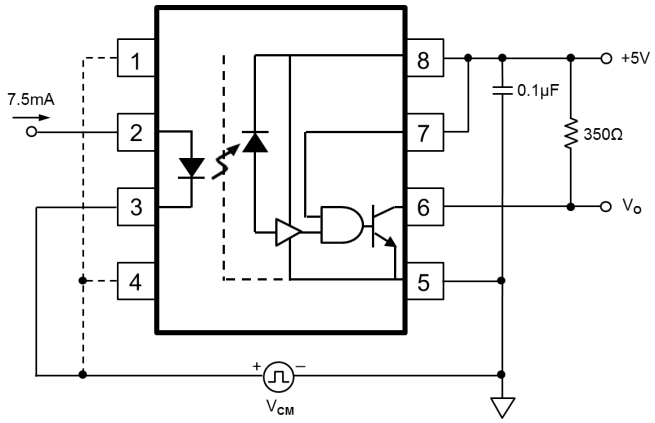
t_r, t_f, t_{PLH} and t_{PHL} Test Circuit and Waveform



t_{ELH} and t_{EHL} Test Circuit and Waveform



CMR Test Circuit



High CMR Test Circuit for ICPL2611

ORDER INFORMATION

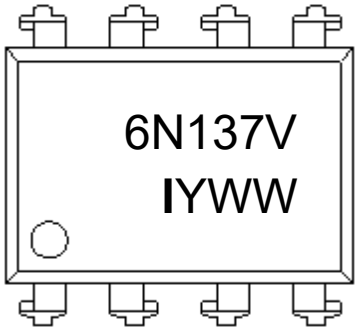
UL Approval			
After PN	**PN**	**Description**	**Packing quantity**
None	6N137, ICPL2601	Standard DIP8	45 pcs per tube
G	6N137G, ICPL2601G	10mm Lead Spacing	45 pcs per tube
SM	6N137SM, ICPL2601SM	Surface Mount	45 pcs per tube
SMT&R	6N137SMT&R, ICPL2601SMT&R	Surface Mount Tape & Reel	1000 pcs per reel
NOTE : 6N137V may be supported when ordering 6N137			

UL and VDE Approvals			
After PN	**PN**	**Description**	**Packing quantity**
None	6N137V	Standard DIP8	45 pcs per tube
G	6N137VG	10mm Lead Spacing	45 pcs per tube
SM	6N137VSM	Surface Mount	45 pcs per tube
SMT&R	6N137VSMT&R	Surface Mount Tape & Reel	1000 pcs per reel

Safety Approval Pending			
After PN	**PN**	**Description**	**Packing quantity**
None	ICPL2611	Standard DIP8	45 pcs per tube
G	ICPL2611G	10mm Lead Spacing	45 pcs per tube
SM	ICPL2611SM	Surface Mount	45 pcs per tube
SMT&R	ICPL2611SMT&R	Surface Mount Tape & Reel	1000 pcs per reel

DEVICE MARKING

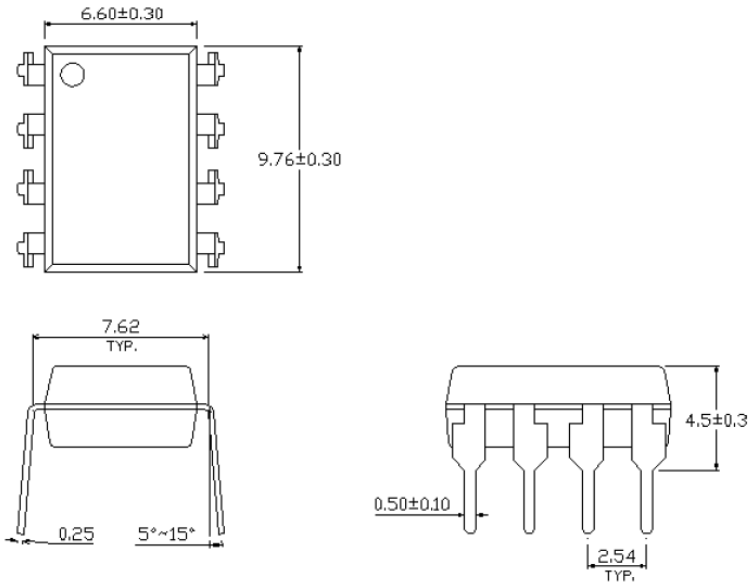
Example : 6N137V



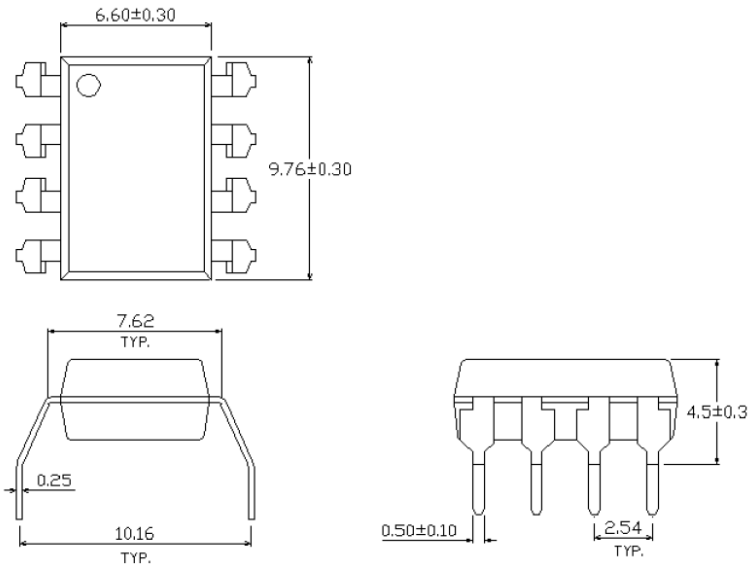
6N137V	Device Part Number
I	Isocom
Y	1 digit Year code
WW	2 digit Week code

PACKAGE DIMENSIONS (mm)

DIP

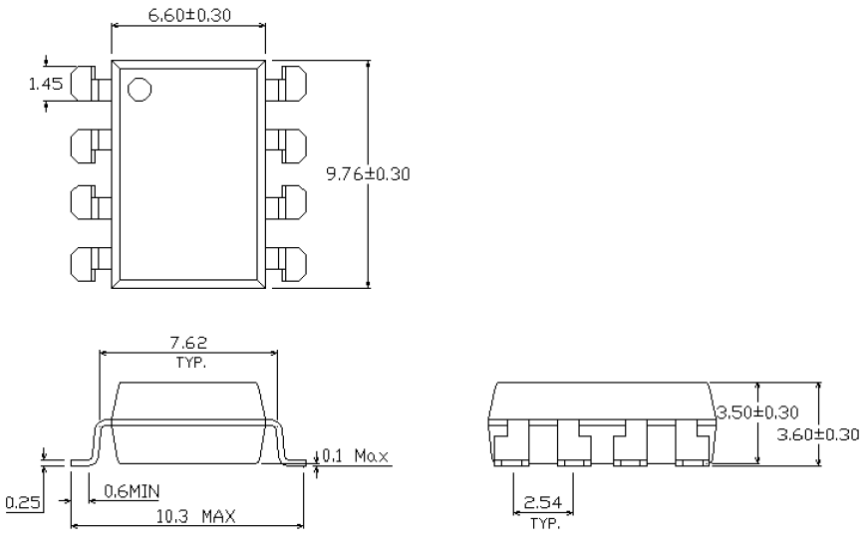


G-Form

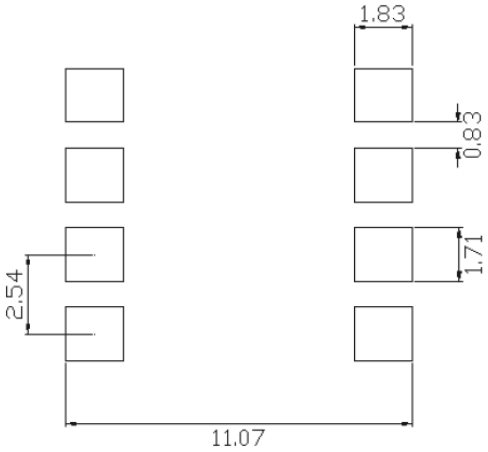


PACKAGE DIMENSIONS (mm)

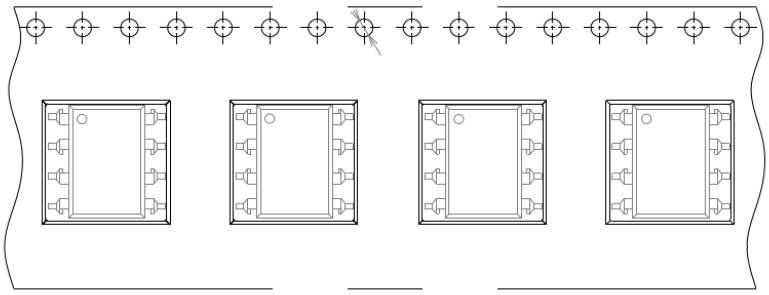
SMD



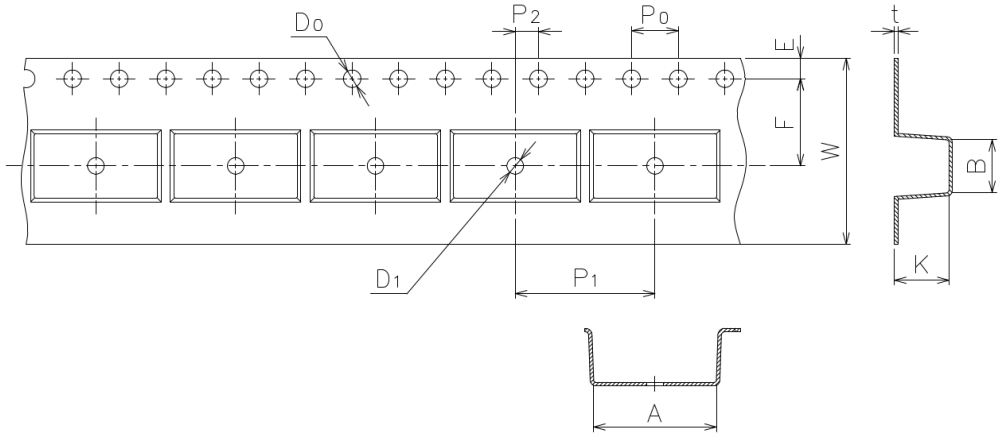
RECOMMENDED PAD LAYOUT FOR SMD (mm)



TAPE AND REEL PACKAGING

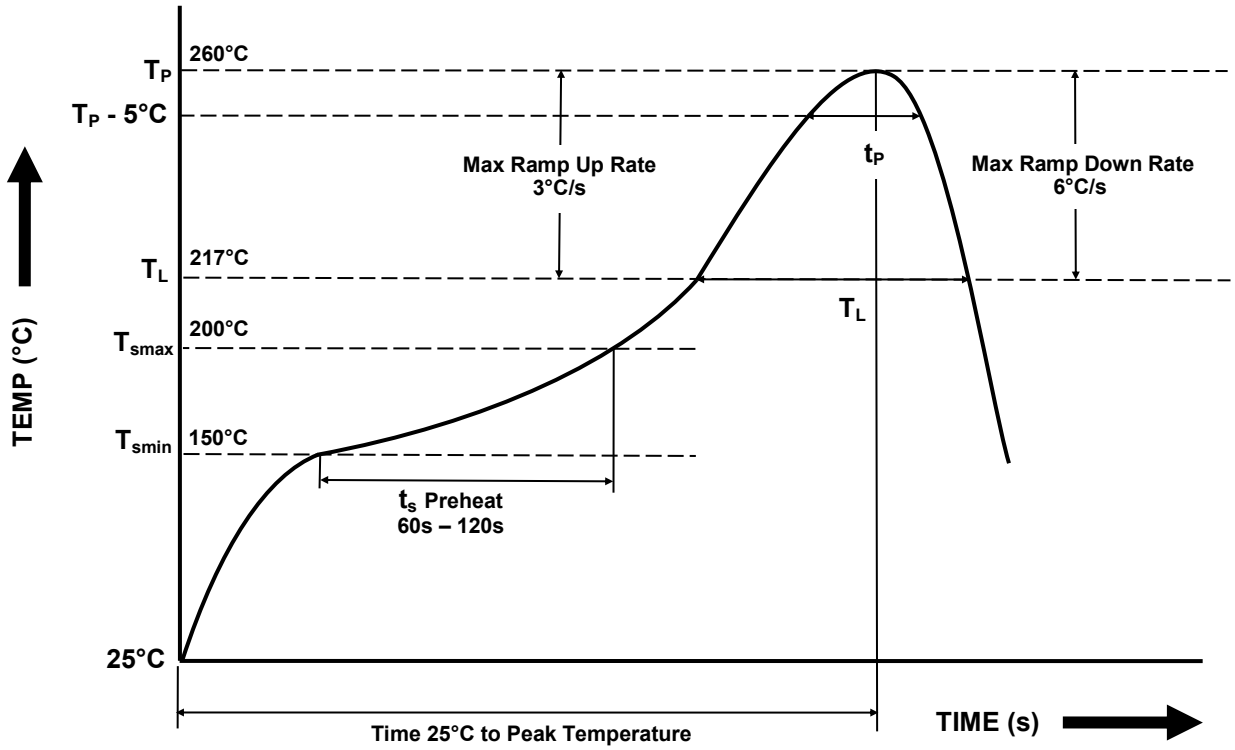


Direction of feed from reel



Dimension No.	A	B	D_0	D_1	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.	P_0	P_1	P_2	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

IR REFLOW SOLDERING TEMPERATURE PROFILE
One Time Reflow Soldering is Recommended.
Do not immerse device body in solder paste.



Profile Details	Conditions
Preheat - Min Temperature (T_{SMIN}) - Max Temperature (T_{SMAX}) - Time T_{SMIN} to T_{SMAX} (t_s)	 150°C 200°C 60s - 120s
Soldering Zone - Peak Temperature (T_P) - Time at Peak Temperature - Liquidous Temperature (T_L) - Time within 5°C of Actual Peak Temperature (T_P – 5°C) - Time maintained above T_L (t_L) - Ramp Up Rate (T_L to T_P) - Ramp Down Rate (T_P to T_L)	 260°C 10s max 217°C 30s max 60s - 100s 3°C/s max 6°C/s max
Average Ramp Up Rate (T_{smax} to T_P)	3°C/s max
Time 25°C to Peak Temperature	8 minutes max

ISOCOM COMPONENTS

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