

### DESCRIPTION

The ICPLM452 and ICPLM453 devices each consists of an infrared emitting diode optically coupled to a high speed integrated photo detector. A separate connection of the photodiode bias and output transistor collector increases the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance.

These devices belong to Isocom Compact Range of optocouplers.

# 1 5 5

- 1. Anode
- 3. Cathode
- 4. GND
- 5. Vout
- 6. Vcc

### **FEATURES**

- High speed 1Mbit/s
- Half Pitch 1.27mm
- Common Mode Transient Immunity 15kV/µs min (ICPLM453)
- High AC Isolation Voltage 3750V<sub>RMS</sub>
- Guaranteed Performance from 0°C to 70°C
- Operating Temperature Range from -40°C to 85°C
- Pb Free and RoHS Compliant
- Safety Approvals Pending

### **APPLICATIONS**

- Line Receivers
- Field Bus Communication and Control
- Power Transformer Isolation in Motor Drives
- Replacement for Low Speed phototransistor Couplers
- High Speed Logic Ground isolation
- Analog Signal Ground Isolation

### ORDER INFORMATION

 Available in Tape and Reel with 3000pcs per reel.

### ABSOLUTE MAXIMUM RATINGS $(T_A = 25^{\circ}C)$

### **Input Diode**

Forward Current	25mA
Peak Forward Current	50mA
(50% Duty Cycle, 1ms P.W)	
Peak Transient Current	1A
(≤ 1µs P.W., 300pps)	
Reverse Voltage	5V
Power dissipation	45mW

### Output

Output Current	8mA
Peak Output Current	16mA
Output Voltage	-0.5 to 20V
Supply Voltage	-0.5 to 30V
Power Dissipation	100mW

### **Total Package**

Isolation Voltage	$3750V_{RMS}$
Operating Temperature	-40 to 85 °C
Storage Temperature	-55 to 125 °C
Lead Soldering Temperature (10s)	260°C

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# **ELECTRICAL CHARACTERISTICS** ( $T_A = 0$ °C to 70°C unless otherwise specified)

### **INPUT**

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Forward Voltage	$V_{F}$	$I_F = 16mA$		1.45	1.8	V
Reverse Voltage	$V_R$	$I_R = 10 \mu A, T_A = 25 ^{\circ} C$	5.0			V
Temperature Coefficient of $V_F$	$\Delta V_F/\Delta T_A$	$I_F = 16mA$		-1.6		mV/°C

### **OUTPUT**

Parameter	Symbol	Test Condition	Min	Тур.*	Max	Unit
High Level Supply Current	$I_{CCH}$	$I_F = 0mA, V_O = Open,$ $V_{CC} = 15V, T_A = 25^{\circ}C$		0.05	1	μΑ
		$I_F = 0$ mA, $V_O = O$ pen, $V_{CC} = 15V$			2	
Low Level Supply Current	$I_{CCL}$	$I_F = 16\text{mA}, V_O = \text{Open},$ $V_{CC} = 15\text{V}$		100	200	μΑ

### **COUPLED**

Parameter	Symbol	Test Condition	Min	Тур.*	Max	Unit
Current Transfer Ratio	CTR	$I_F = 16\text{mA}, V_O = 0.4\text{V}, \ V_{CC} = 4.5\text{V}, T_A = 25^{\circ}\text{C}$	20		50	%
		$I_F = 16 \text{mA}, V_O = 0.5 \text{V}, \ V_{CC} = 4.5 \text{V}$	15			
High Level Output Current	$I_{OH}$	$I_F = 0$ mA, $V_O = V_{CC} = 5.5$ V, $T_A = 25$ °C		0.001	0.5	μΑ
		$I_F = 0 \text{mA}, V_O = V_{CC} = 15 \text{V},$ $T_A = 25 ^{\circ}\text{C}$		0.001	1	
		$I_F = 0 \text{mA}, V_O = V_{CC} = 15 \text{V}$			50	
Low Level Output Voltage	$V_{ m OL}$	$I_F = 16\text{mA}, I_O = 3\text{mA},$ $V_{CC} = 4.5\text{V}, T_A = 25^{\circ}\text{C}$			0.4	V
		$I_F = 16mA, I_O = 2.4mA,$ $V_{CC} = 4.5V$			0.5	

<sup>\*</sup> Typical values at  $T_A = 25$ °C



### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 0°C to 70°C unless otherwise specified)

### **Switching Characteristics** (V<sub>cc</sub> = 5V unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Тур.*	Max	Unit
Propagation Delay Time to Logic Low	$T_{ m PHL}$	$I_F = 16\text{mA}, \ R_L = 1.9\text{k}\Omega,$ $T_A = 25^{\circ}\text{C}$		0.4	0.8	μs
		$I_F = 16\text{mA}, \ R_L = 1.9\text{k}\Omega,$			1.0	
Propagation Delay Time to Logic High	$T_{PLH}$	$I_F = 16\text{mA}, \ R_L = 1.9k\Omega,$ $T_A = 25^{\circ}\text{C}$		0.35	0.8	μs
		$I_F = 16\text{mA}, \ R_L = 1.9\text{k}\Omega,$			1.0	ns
Common Mode Transient Immunity at Logic High	CM <sub>H</sub>	$ICPLM452$ $I_F = 0mA, R_L = 1.9k\Omega,$ $V_{CM} = 10Vp-p, T_A = 25^{\circ}C$	5000			V/µs
		ICPLM453 $I_F = 0 mA, R_L = 1.9 k\Omega,$ $V_{CM} = 1500 Vp-p, T_A = 25 ^{\circ}C$	15000			
Common Mode Transient Immunity at Logic Low	$CM_L$	ICPLM452 $I_F = 16\text{mA}, R_L = 1.9\text{k}\Omega, \\ V_{CM} = 10\text{Vp-p}, T_A = 25^{\circ}\text{C}$	5000			V/µs
		ICPLM453 $I_F = 16\text{mA}, R_L = 1.9\text{k}Ω, \\ V_{CM} = 1500\text{Vp-p}, T_A = 25^{\circ}\text{C}$	15000			

<sup>\*</sup> Typical values at T<sub>A</sub> = 25°C

 $CM_L$  – The maximum tolerable rate of fall of the common mode voltage to  $dV_{CM}/t$ , to ensure the output will remain in the LOW output state (i.e.,  $V_{OUT}$  < 0.8V).

 $CM_H$  – The maximum tolerable rate of rise of the common mode voltage  $dV_{CM}/t$ , to ensure the output will remain in the HIGH state (i.e.,  $V_{OUT} > 2.0V$ ).



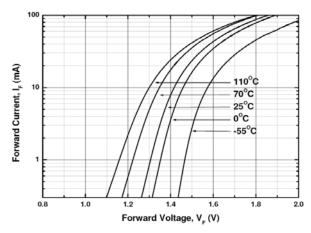


Fig 1 Forward Current vs Forward Voltage

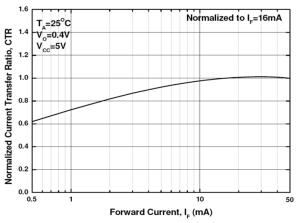


Fig 3 Normalized CTR vs Forward Current

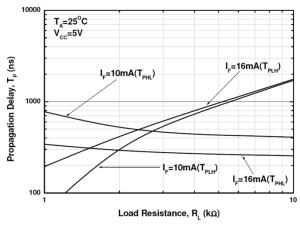


Fig 5 Propagation Delay vs Load Resistance

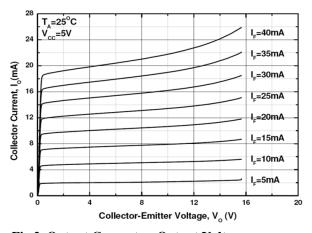


Fig 2 Output Current vs Output Voltage

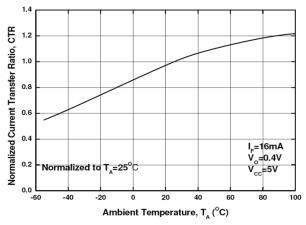


Fig 4 Normalized CTR vs T<sub>A</sub>

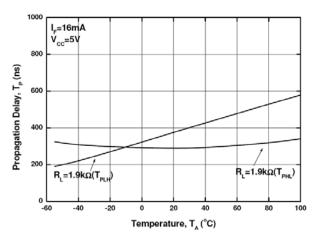


Fig 6 Propagation Delay vs T<sub>A</sub>



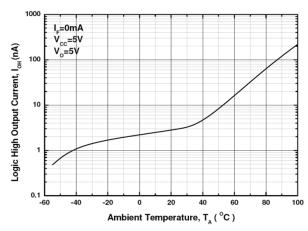


Fig 7 Logic High Output Current vs  $T_A$ 

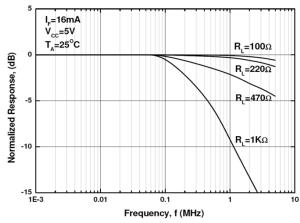


Fig 8 Frequency Response



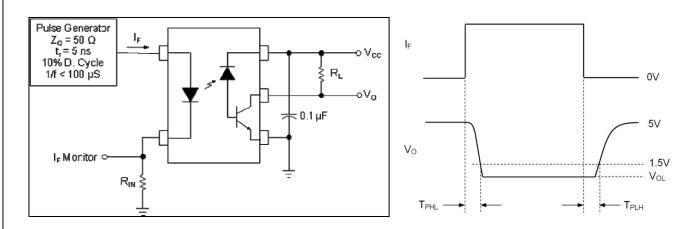


Fig 9 Switching Time Test Circuit

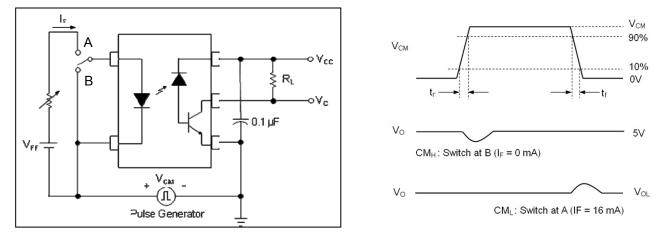


Fig 10 Common Mode Transient Immunity Test Circuit

Common mode transient immunity in logic high level is the maximum tolerable (positive)  $dV_{CM}/dt$  on the leading edge of the common mode pulse signal  $V_{CM}$ , to assure that the output will remain in a logic high state (i.e.,  $V_O > 2.0V$ ).

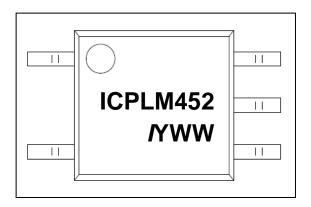
Common mode transient immunity in logic low level is the maximum tolerable (negative)  $dV_{CM}/dt$  on the trailing edge of the common mode pulse signal,  $V_{CM}$ , to assure that the output will remain in a logic low state (i.e.,  $V_O < 0.8V$ ).



### **ORDER INFORMATION**

ICPLM452, ICPLM453					
After PN	PN Description Packing quantity				
None	ICPLM452, ICPLM453	Surface Mount Tape & Reel	3000 pcs per reel		

### **DEVICE MARKING**



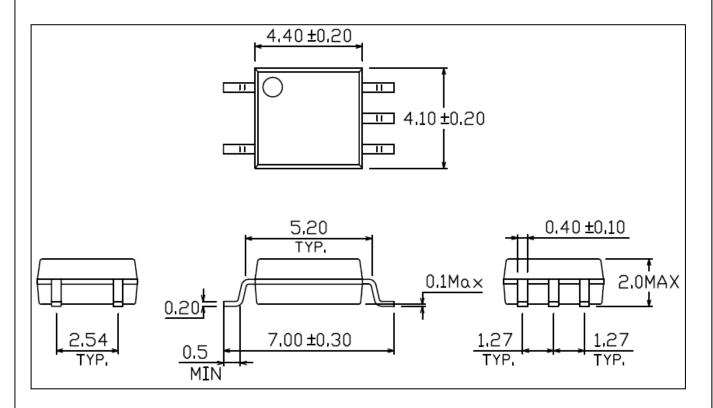
ICPLM600 denotes Device Part Number (ICPLM452 is used as example)

Y denotes 1 digit Year code WW denotes 2 digit Week code

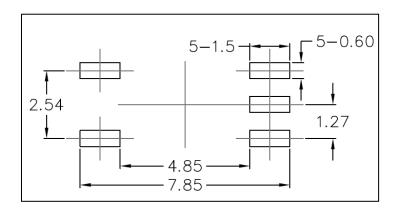
denotes Isocom



# **PACKAGE DIMENSIONS (mm)**

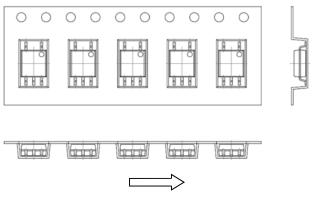


## **RECOMMENDED PAD LAYOUT (mm)**

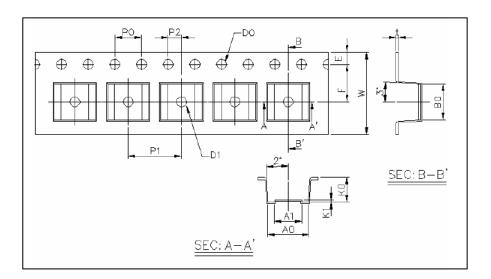




### **TAPE AND REEL PACKAGING**



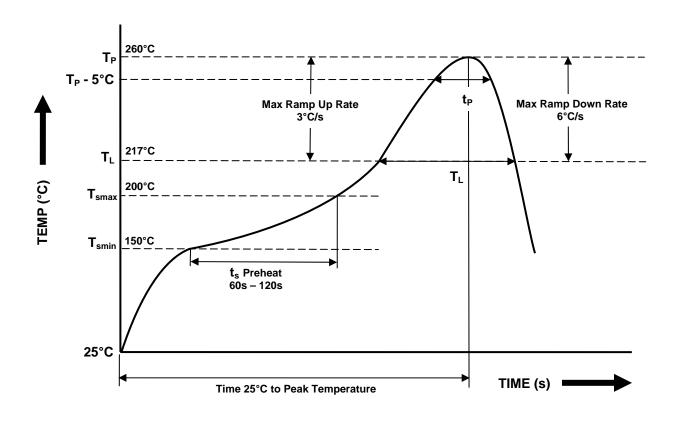
Direction of feed from reel



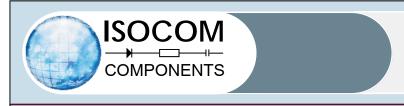
Dimension No.	Α0	<b>A</b> 1	В0	D0	D1	E	F
Dimension (mm)	6.2±0.1	4.1±0.1	5.28±0.1	1.5±0.1	1.5±0.3	1.75±0.1	5.5±0.1
Dimension No.	P0	P1	P2	t	w	K0	K0
Dimension (mm)	4.0±0.1	8.0±0.1	2.0±0.1	0.4±0.1	12.0 +0.3/-0.1	3.7±0.1	0.3±0.1



# IR REFLOW SOLDERING TEMPERATURE PROFILE (One Time Reflow Soldering is Recommended)

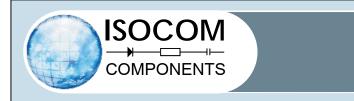


Profile Details	Conditions
Preheat - Min Temperature (T <sub>SMIN</sub> ) - Max Temperature (T <sub>SMAX</sub> ) - Time T <sub>SMIN</sub> to T <sub>SMAX</sub> (t <sub>s</sub> )	150°C 200°C 60s - 120s
$\begin{tabular}{lll} \textbf{Soldering Zone} \\ - & \mbox{Peak Temperature } (T_P) \\ - & \mbox{Liquidous Temperature } (T_L) \\ - & \mbox{Time within } 5^{\circ}\mbox{C of Actual Peak Temperature } (T_P - 5^{\circ}\mbox{C}) \\ - & \mbox{Time maintained above } T_L \ (t_L) \\ - & \mbox{Ramp Up Rate } (T_L \ \mbox{to } T_P) \\ - & \mbox{Ramp Down Rate } (T_P \ \mbox{to } T_L) \\ \end{tabular}$	260°C 217°C 30s 60s - 100s 3°C/s max 6°C/s max
Average Ramp Up Rate (T <sub>smax</sub> to T <sub>P</sub> )	3°C/s max
Time 25°C to Peak Temperature	8 minutes max



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- When requiring a device for any "specific" application, please contact our sales for advice.
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- Do not immerse device body in solder paste.



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