PC915

Wide Band Linear Output Type OPIC Photocoupler

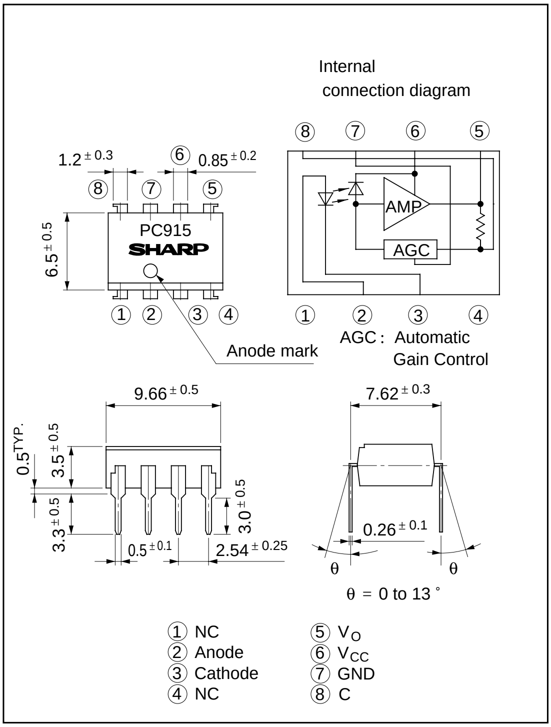
■ Features

1. Wide band linear output type (Frequency band width : TYP. 10Hz to 8MHz)
2. Fluctuation free stable output (Output fluctuation : TYP. ± 5% at within operating temperature 50 000hr)
3. High isolation voltage (V_{iso} : 5 000V $_{rms}$)
4. Standard dual-in-line package
5. Recognized by UL, file No, E64380

■ Applications

1. Video signal insulation in TV
2. Insulation amplifier in measuring instrument and FA equipment

■ Outline Dimensions



* " OPIC " (Optical IC) is a trademark of the SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.

■ Absolute Maximum Ratings

(Ta= 25˚C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	25	mA
	Reverse voltage	V_R	6	V
	Power dissipation	P	45	mW
Output	Supply voltage	V_{CC}	- 0.5 to + 13	V
	Output power dissipation	P_O	250	mW
	Output current	I_O	- 1.0 to + 0.5	mA
*1 Isolation voltage		V_{iso}	5 000	V_{rms}
Operating temperature		T_{opr}	- 25 to + 85	˚C
Storage temperature		T_{stg}	- 55 to + 125	˚C
*2 Soldering temperature		T_{sol}	260	˚C

*1 40 to 60% RH, AC for 1 minute
*2 For 10 seconds

■ Electro-optical Characteristics

(Unless otherwise spcified, Ta = 25˚C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Fig.
Input	Forward voltage	V_F	I_F = 10mA	-	1.6	1.8	V	1
	Reverse voltage	I_R	V_R = 5V	-	-	10	μA	-
	Terminal capacitance	C_t	V = 0, f = 1MHz	-	60	250	pF	-
Output	Supply current	I_{CC}	I_F = 10mA	-	9	16	mA	1
	DC output voltage	V_{ODC}	I_F = 10mA	4	6	8	V	1
	Output noise voltage	V_{ONO}	I_F = 10mA, Band width = 100Hz to 4.2MHz	-	4	-	mV_{rms}	1
Transfer charac- teristics	AC output voltage	V_{OAC}	R_E = 230Ω	0.8	1.0	1.2	V_{P-P}	2
	AC output voltage fluctuation: *1 Temperature characteristics	ΔV_{OAC-1}	R_E = 230Ω, Ta = 10 to 70˚C	-	± 3	-	%	2
	AC output voltage fluctuation: *2 Forward current characteristics	ΔV_{OAC-2}	R_E = 230 to 460Ω	-	± 3	-	%	2
	*3 Cut-off frequency: High frequency	f_{CH}	R_E = 230Ω	6	8	-	MHz	2
	*3 Cut-off frequency: Low frequency	f_{CL}	R_E = 230Ω	-	10	20	Hz	2
	Differential gain	DG		-	+ 3	-	%	3
	Differential phase	DP		-	- 3	-	˚	3
	Isolation resistance	R_{ISO}	DC500V, 40 to 60% RH	5×10^{10}	1×10^{11}	-	Ω	-
	Floating capacitance	C_f	V = 0, f = 1MHz	-	0.6	5	pF	-

*1 Fluctuation ratio of V_{OAC} at Ta = - 10 to 70˚C on the basis of V_{OAC} at Ta = 25˚C

*2 Fluctuation ratio of V_{OAC} at R_E = 230 to 460Ω on the basis of V_{OAC} at R_E = 230Ω

*3 Frequency of V_{IN} when V_{OAC} falls by 3dB on the basis of V_{OAC} when frequency of V_{IN} in Fig. 2 is 100kHz.

■ Recommended Operating Conditions

Parameter		Symbol	MIN.	MAX.	Unit
Input	Forward bias current	I_{FB}	8	15	mA
Output	Supply voltage	V_{CC}	8	13	V
	AC output voltage	V_{OAC}	-	4	V_{P-P}
	Output current	I_O	- 0.6	+ 0.2	mA
	C terminal capacitance	C_C	10	-	μF

■ Test Circuit

Fig.1

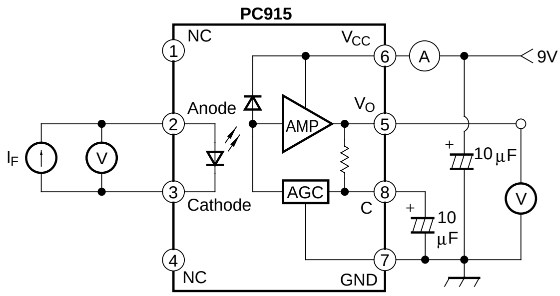
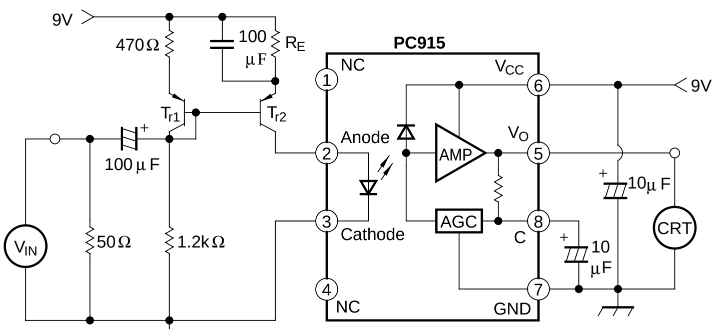
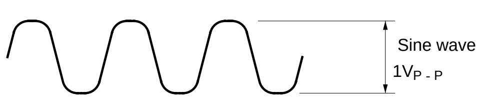


Fig. 2



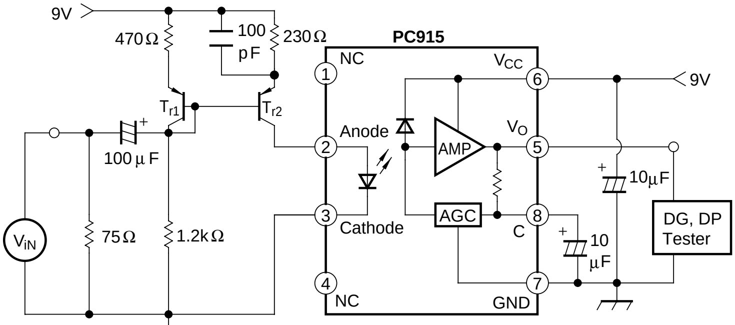
T_{r1}, T_{r2} : 2SA1029 or other same rank products

V_{IN} Waveform



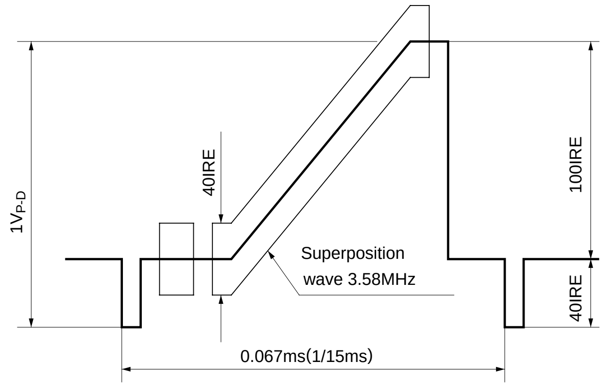
(Frequency) 15kHz at measuring V_{OAC}, ΔV_{OAC-1} and ΔV_{OAC-2}
and shall be swept at measuring f_{CH} and f_{CL}.

Fig. 3



T_{r1}, T_{r2} : 2SA1029 or other same rank products

V_{IN} Waveform



❋ APL (Average Picture Level)
❋ IRE (International Radio Engineers)
1IRE = 7.14mV (NTSC System)

Fig. 4 Forward Current vs. Ambient Temperature

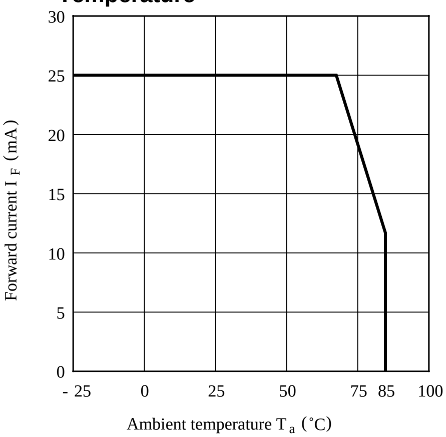


Fig. 5 Power Dissipation vs. Ambient Temperature

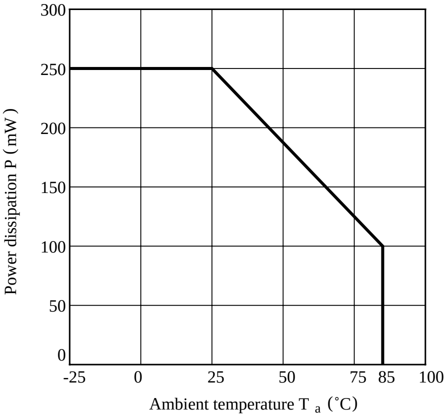


Fig. 6 Forward Current vs. Forward Voltage

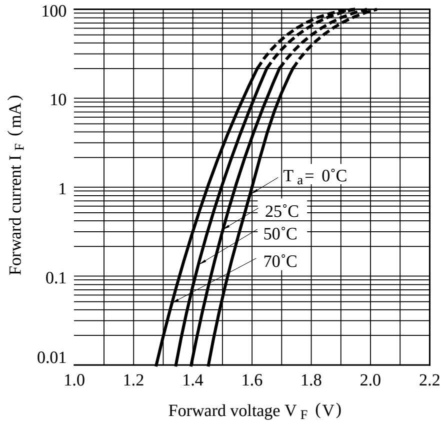


Fig. 7 Supply Current vs. Ambient Temperature

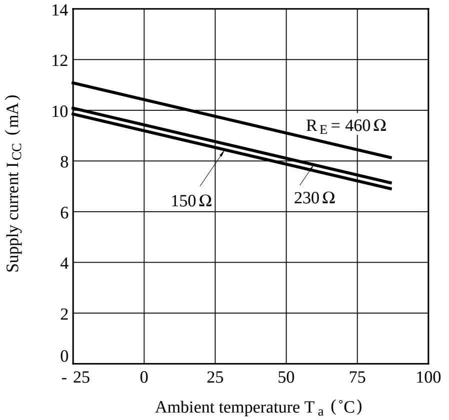
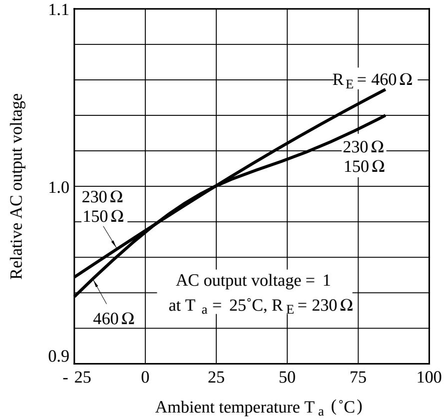
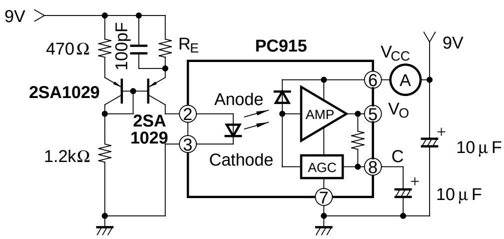


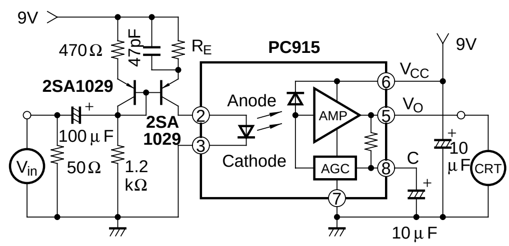
Fig. 8-a Relative AC Output Voltage 1 vs. Ambient Temperature



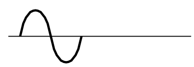
Test Circuit of Supply Current



Test Circuit of Relative AC Output Voltage1 vs. Ambient Temperatue

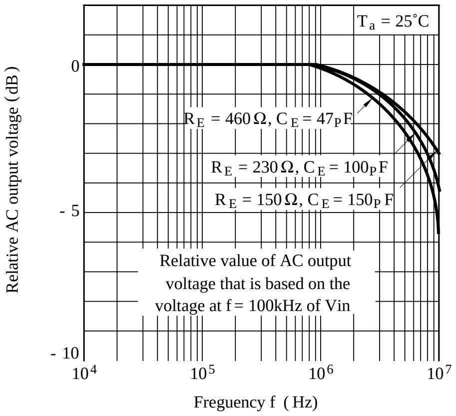


Vin Input Waveform



1VP - P, f= 15kHz
Sine wave

Fig. 8-b Relative AC Output Voltage 2 vs. Frequency (1)



Test Circuit of Relative AC Output Voltage 2 vs. Frequency (1)

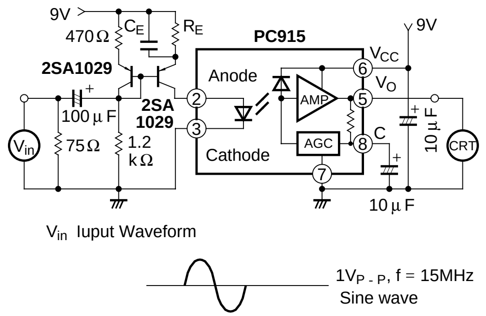
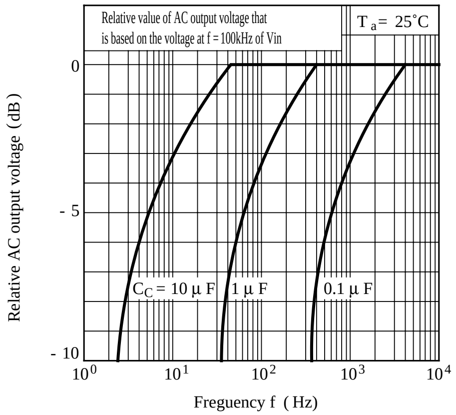


Fig. 8-c Relative AC Output Voltage 2 vs. Frequency (2)



Test Circuit of Relative AC Output Voltage 2 vs. Frequency (2)

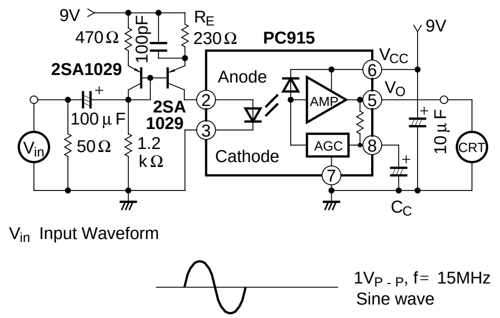


Fig. 9 Differential Gain vs. R_E

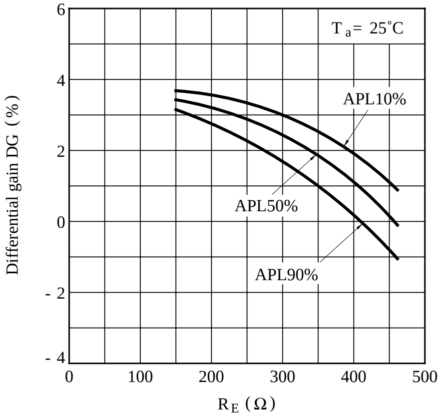
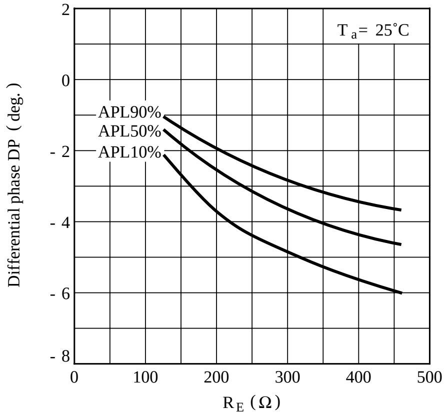
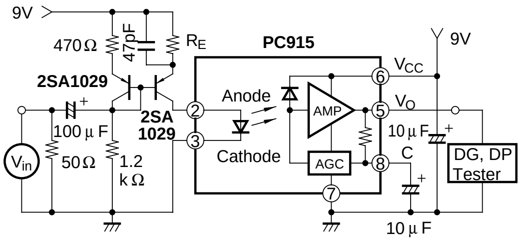
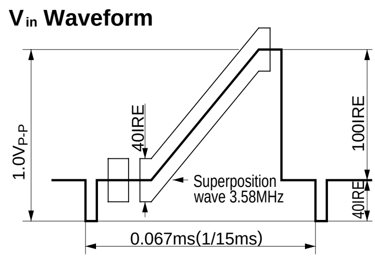


Fig.10 Differential Phase vs. R_E



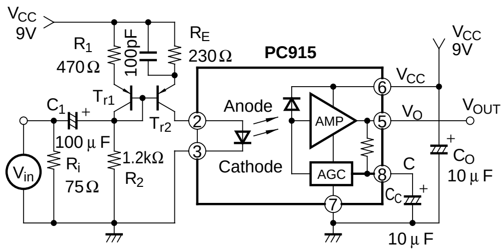
Test Circuit of Differential Gain vs. R_E and Differential Phase vs. R_E





APL: Average Picture Level

■ Application Example



T_{r1}, T_{r2} : 2SA1029 or other same rank products

$$V_{OUT} = 2.3\frac{i_S}{I_B} = 2.3\frac{V_{in}}{V_{CC} - V_E}$$

I_B : DC flowed to infrared LED
i_S : AC flowed to infrared LED
V_E : Emitter voltage of T_{r2} (Between emitter and GND)

< Example of Circuit Setting >

(1) Set for Gain

Gain is represented by the following formula ;

$G = 2.3/(V_{CC} - V_E)$

When using on condition that Gain = 1, set V_{CC}-V_E on 2.3V. So that R_1 and R_2 is determined.

(2) Set for Input Resistance

Set Ri on output impedance (usually 75Ω) of a mounting equipment.

(3) Set for R_E

When there is no signal (input signal : 0), set I_{LED} flowed into infrared LED on 10 mA.

(4) Set for Low Cut-off Frequency

Low cut-off frequency with C terminal capacitance, C_C, is represented by the following formula;

$f_C = 100/C_C$ (Hz) (C_C : μ F value)

Then set Ci with input impedance of by-pass diode on as much value as possible on condition that $f_C > 1/(2\pi \, CiR)$ [$R = R_1R_2/(R_1 + R_2)$]

■ Precautions for Use

(1) It is recommended that a by-pass capacitor of more than 0.01 μ F is added between V_{CC} and GND near the device in order to stabilize power supply line.

(2) Handle this product the same as with other integrated circuits against static electricity.

(3) As for other general cautions, refer to the chapter "Precautions for Use"

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— Telecommunication equipment [terminal]
— Test and measurement equipment
— Industrial control
— Audio visual equipment
— Consumer electronics

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— Traffic signals
— Gas leakage sensor breakers
— Alarm equipment
— Various safety devices, etc.

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— Telecommunication equipment [trunk lines]
— Nuclear power control equipment
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