

GENERAL INFORMATION

HOW TO USE INVISIBLE PRODUCTS

SOLDERING:

1. Soldering Bath — $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ within 5 seconds. (Dip depth should under 1/16 inch below seating plane)
2. Soldering Iron Under 40W within 3 seconds. (Tip temperature: $380^{\circ} \pm 5^{\circ}\text{C}$)
3. The neutrality flux be used before soldering

CLEANING:

1. Do not use unspecified chemical liquid to clean invisible product. They could harm the invisible product. If cleaning is necessary, wipe the pin out with alcohol. Freon TE or Chlorosen at normal temperature for less Than 1 minute. Or wipe the surface with alcohol. When other chemical solutions not specified is used. It may cause crack or haze on the surface of the Invisible product

PREVENTING OVER CURRENT:

1. Be not over current.
2. In order to operate BRIGHT INVISIBLE PRODUCTS under stable conditions. Put protective resistors in series. Resistor values can be determined by supplying voltage or current is in the invisible product. Recommended current is in the range of forward current 50mA
3. Circuit must be designed so that over voltage (over current) is not applied to the invisible product during on/off switching. Transient or pulse current will damage the junction of invisible product die.

BRIGHTNESS:

1. For obtaining even brightness. Each segment should be at the same current. So the best circuit design is to supply constant current for each segment
2. To increase brightness. Increase current. But do not over maximum rating.
3. To check the appearance defect of invisible product. The viewing distance should be 15cm minimum.
4. For obtaining more uniform brightness on SIDE LOOK and INTERRUPTER. The supplying forward current should be over 20mA , but do not be over rating.

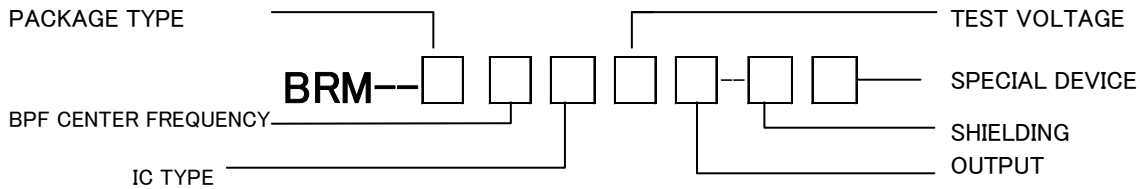
QUALITY CONTROL AND ASSURANCE

RELIABILITY TESTS

CLASSIFICATION	TEST ITEM	DESCRIPTION AND TEST CONDITION	REFERENCE STANDARD
ENDURANCE TEST	OPERATION LIFE	Ta: $25^{\circ}\text{C} + -5^{\circ}\text{C}$ Side look : IR:IF=20mA ; End look : IR:IF=50mA ; Vce =5v Time:1000hr	MIL-STD-883E:1016
	HIGH TEMPERATURE HIGH HUMIDITY STORAGE	Ta: $65^{\circ}\text{C} + -5^{\circ}\text{C}$ RH:90% - 95% Time: 240hrs	MIL-STD-883E:1004.7 MIL-STD-202F:103B
	HIGH TEMPERATURE STORAGE	Ta: $125^{\circ}\text{C} + -5^{\circ}\text{C}$ Time: 240hrs	MIL-STD-883E:1008. 2
	LOW TEMPERATURE STORAGE	Ta: $-55^{\circ}\text{C} + 5^{\circ}\text{C}$ Time: 240s+- 2hrs	JIS-C-7021:B-12
ENVIRONMENTAL TEST	TEMPERATURE CYCLING	Ta: $-55^{\circ}\text{C} + -5^{\circ}\text{C}$ (30min)~ $25^{\circ}\text{C} + 5^{\circ}\text{C}$ (5min)~ $85^{\circ}\text{C} + 5^{\circ}\text{C}$ (30min)~ $25^{\circ}\text{C} + 5^{\circ}\text{C}$ (5min)10cycle	MIL-STD-883E:1010.7
	THERMAL SHOCK	Ta: $-55^{\circ}\text{C} + 5^{\circ}\text{C}$ (10min)~ $125^{\circ}\text{C} + 5^{\circ}\text{C}$ (10min)15cycle	MIL-STD-883E:1011.9 MIL-STD-202F:107G
	SOLDER RESISTANCE	To evaluate resistance of thermal stress caused by soldering Ta: $260^{\circ}\text{C} + -5^{\circ}\text{C}$ Time:10+ - 2 sec	MIL-STD-202F:210B
	SOLDERABILITY	To evaluate solder ability on leads of device Ta: $245^{\circ}\text{C} + -5^{\circ}\text{C}$ Time:5+ - 0.5 sec	MIL-STD-883E:2003.7 MIL-STD-202F:208F1

RECEIVER MODULE SERIES

SELECTION GUIDE (PART NO. SYSTEM)



PACKAGE TYPE:

- 1 : Small size standard side view (Molding type)
- 4 : Standard view (Encapsulate type)
- 5 : Large size Encapsulate type
- 6 : Mini size SMD type

BPF CENTER FREQUENCY:

- 0 : 38.0KHz
- 1 : 32.7KHz
- 2 : 40.0KHz
- 3 : 56.0KHz
- 4 : 3.67KHz

Ic Type

Supply Voltage:

- 0 : $V_{cc}=5.0V$
- 1 : $V_{cc}=3.0V$
- 2 : $V_{cc}=2.4V$

PIN FUNCTIONS

SHIELDING TYPE

SPECIAL DEVICE

- FBxx : Forming Bent from stopper
- LCxx : Short feet

INFRARED RECEIVER MODULE

● Description

1. The BRM-1040 is miniaturized infrared receivers for remote control and other applications requiring improved ambient light rejection.
2. The separate PIN diode and preamplifier IC are assembled on a single leadframe.
3. The epoxy package contains a special IR filter.
4. This module has excellent performance even in disturbed ambient light applications and provides protection against uncontrolled output pulses.

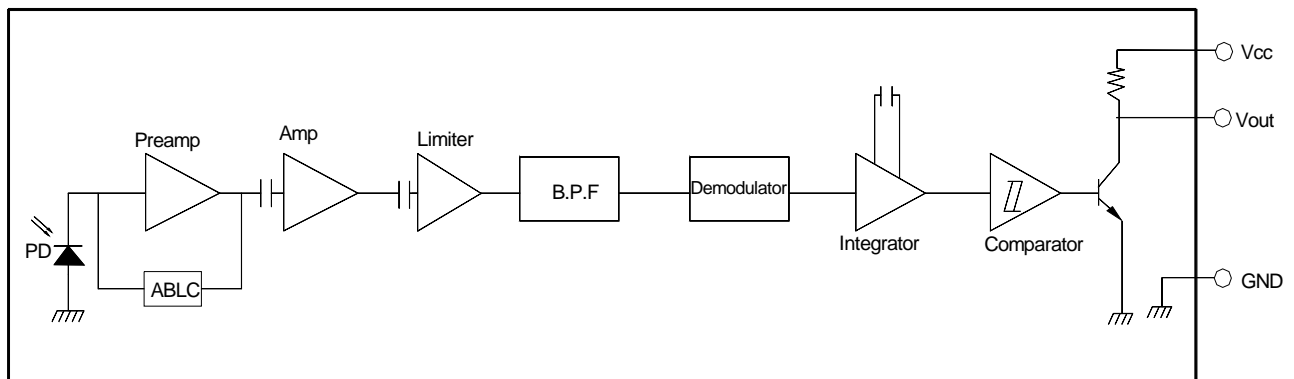
● Features

1. Photo detector and preamplifier in one package .
2. Internal filter for PCM frequency.
3. High immunity against ambient light.
4. Improved shielding against electric field disturbance.
5. 5.0V supply voltage; low power consumption.
6. TTL and CMOS compatibility.
7. Suitable transmission code:NEC code,RC5 code.

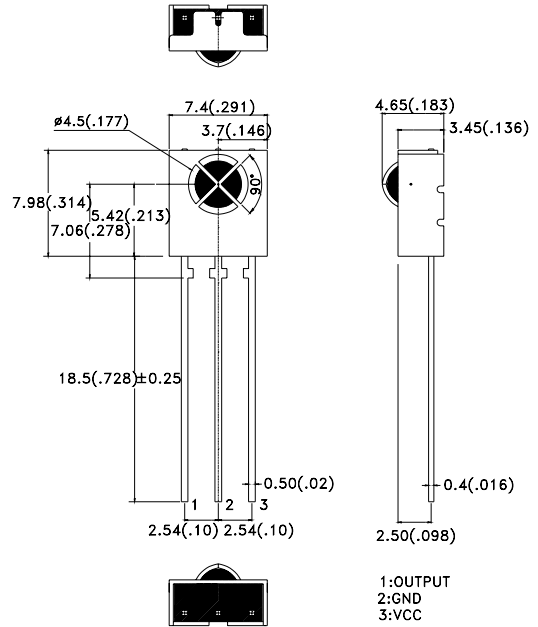
● Applications:

1. It can be used for TVs 、 VTRs 、 audio equipment air conditioners 、 car stereo radio 、 toys 、 home computers and all other equipment requiring remote control.

● BLOCK DIAGRAM



● Package Dimensions:



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is $\pm 0.10\text{mm}$ (0.004") unless otherwise specified.
3. Specifications are subject to change without notice.

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

Parameter	Symbol	Ratings	Unit	Notice
Supply Voltage	Vcc	4.5 ~ 5.5	V	—
Operating Temperature	Topr	-30~+65	$^{\circ}\text{C}$	—
Storage Temperature	Tstg	-40~+85	$^{\circ}\text{C}$	—
Soldering Temperature	Tsol	260	$^{\circ}\text{C}$	4mm from mold body less than 5 sec

● **Electrical And Optical Characteristics**($T_a=25^{\circ}\text{C}$)

Parameter	Symbol	Condition	Ratings			Unit
			Min.	Typ.	Max.	
Supply Voltage	Vcc	DC voltage	4.5	5.0	5.5	V
Supply Current	Icc	No signal input	—	—	1.5	mA
Reception Distance	L	At the ray axis	12	—	—	m
		In the range of 45°cone	6	—	—	
B.P.F Center Frequency	fo	—	—	38	—	KHz
Peak Wavelength	λ_p	—	—	940	—	nm
Half Angle	θ	—	—	45	—	deg
High Level Pulse Width	T_H	Specified by the output T_H period within a range from 10cm to the arrival distance (average value of 50 pulses)	400	—	800	μS
Low Level Pulse Width	T_L	Specified by the output T_L period within a range from 10cm to the arrival distance (average value of 50 pulses)	400	—	800	(S
High Level Output Voltage	VH	10cm over the ray axis	4.5	—	—	V
Low Level Output Voltage	VL	10cm over the ray axis	—	—	0.5	V

● Application Circuit

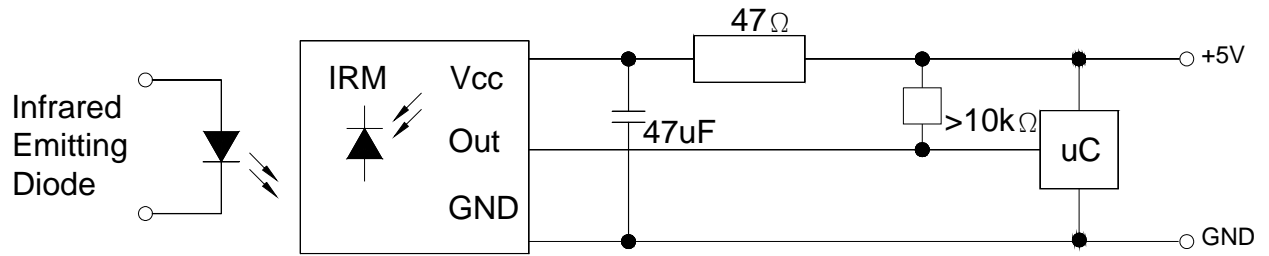


Fig.1 Transmitter Wave Form

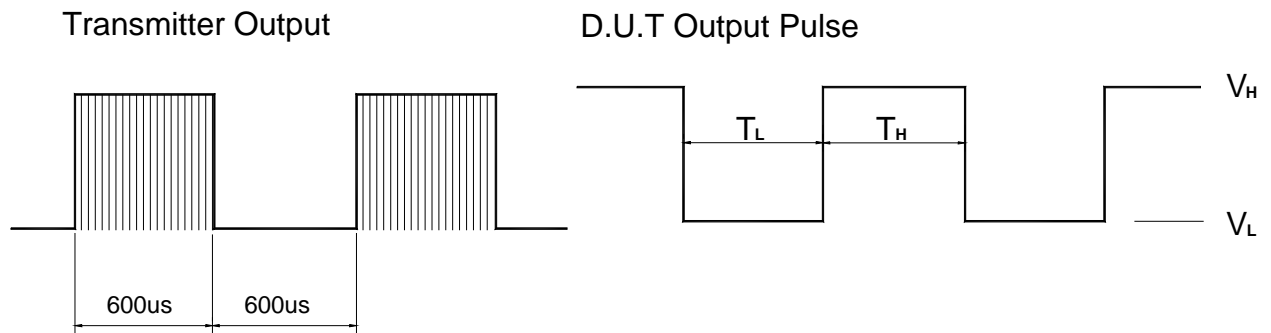


Fig.2 Measuring Method

Measuring Method

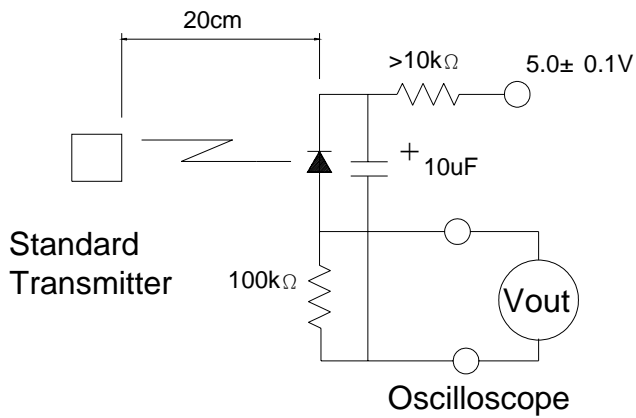
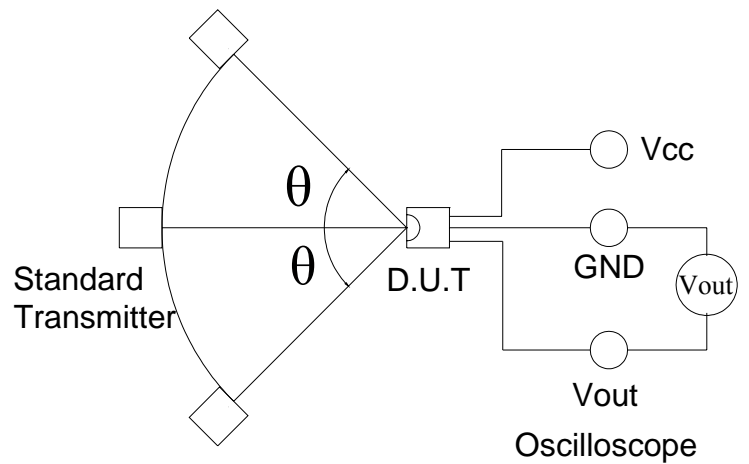


Fig.3 Measuring System



● Electrical And Optical Curves(Ta=25°C)

Fig.4 Relative Spectral Sensitivity vs. Wavelength

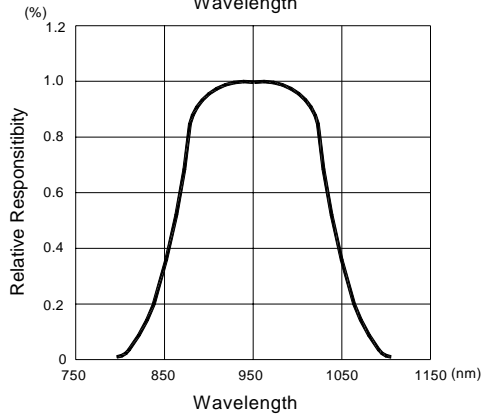


Fig.5 Relative Transmission Distance vs. Direction

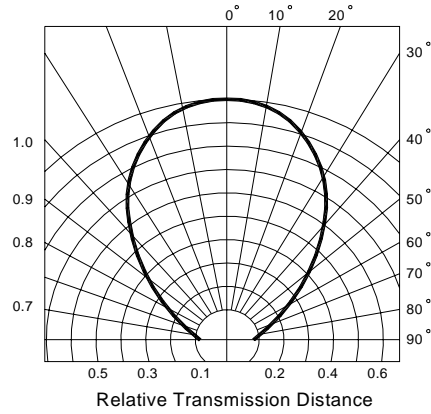


Fig.6 Output Pulse Diagram

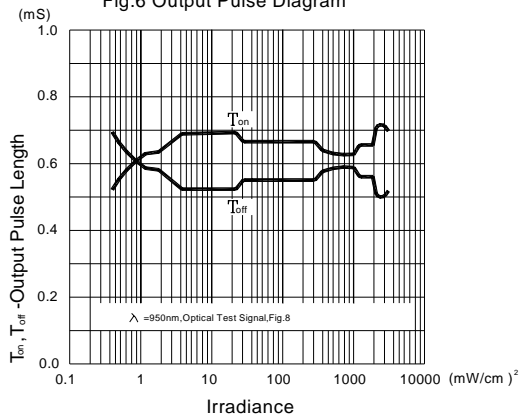


Fig.7 Supply Current vs. Ambient Temperature

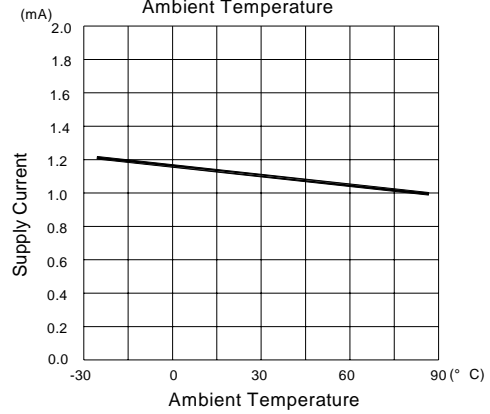


Fig.8 Frequency Dependence of Responsivity

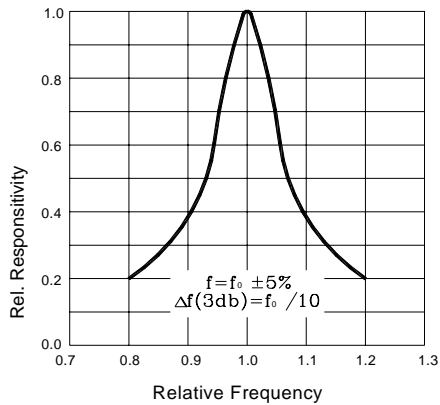
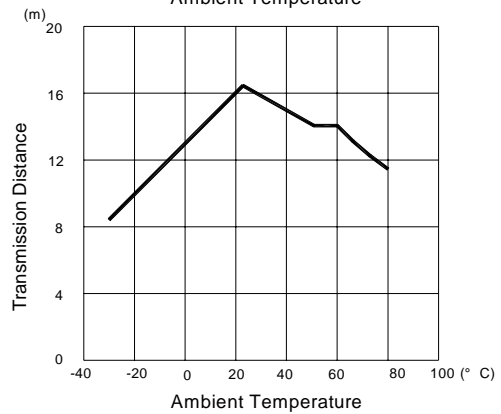


Fig.9 Arrival Distance Vs. Ambient Temperature



INFRARED RECEIVER MODULE

● Description

1. The BRM-1080-NS is miniaturized infrared receivers for remote control and other applications requiring improved ambient light rejection.
2. The separate PIN diode and preamplifier IC are assembled on a single leadframe.
3. The epoxy package contains a special IR filter.
4. This module has excellent performance even in disturbed ambient light applications and provides protection against uncontrolled output pulses.

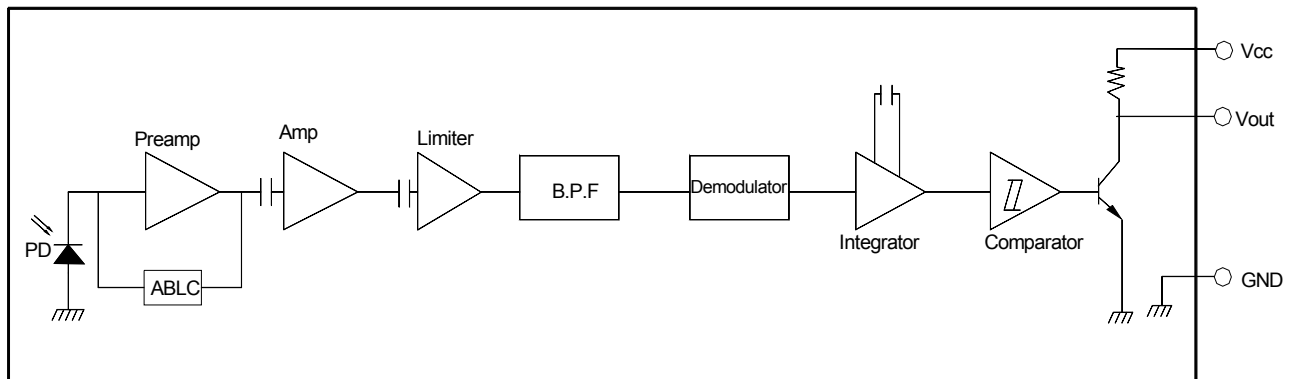
● Features

1. Photo detector and preamplifier in one package .
2. Internal filter for PCM frequency.
3. High immunity against ambient light.
4. Improved shielding against electric field disturbance.
5. 3.0V or 5.0V supply voltage; low power consumption.
6. TTL and CMOS compatibility.
7. Suitable transmission code:NEC code,RC5 code.
8. This product doesn't contain restriction substance, comply ROHS standard

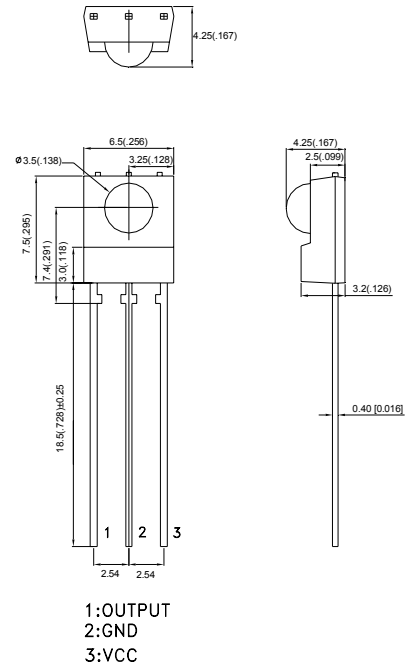
● Applications:

1. It can be used for TVs 、VTRs 、 audio equipment air conditioners 、 car stereo radio 、 toys 、 home computers and all other equipment requiring remote control.

● BLOCK DIAGRAM



● Package Dimensions:



NOTES:

- 1.All dimensions are in millimeters (inches).
- 2.Tolerance is $\pm 0.10\text{mm}$ (0.004") unless otherwise specified.
- 3.Specifications are subject to change without notice.

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

Parameter	Symbol	Ratings	Unit	Notice
Supply Voltage	Vcc	2.7 ~ 5.5	V	—
Operating Temperature	Topr	-25~+70	$^{\circ}\text{C}$	—
Storage Temperature	Tstg	-40~+85	$^{\circ}\text{C}$	—
Soldering Temperature	Tsol	260	$^{\circ}\text{C}$	4mm from mold body less than 5 sec

● **Electrical And Optical Characteristics**($T_a=25^{\circ}\text{C}$)

Parameter	Symbol	Condition	Ratings			Unit
			Min.	Typ.	Max.	
Supply Voltage	Vcc	DC voltage	2.7	5.0	5.5	V
Supply Current	Icc	No signal input	—	—	1.5	mA
Reception Distance	L	At the ray axis	12	—	—	m
		In the range of 45°cone	6	—	—	
B.P.F Center Frequency	fo	—	—	38	—	KHz
Peak Wavelength	λ_p	—	—	940	—	nm
Half Angle	θ	—	—	45	—	deg
High Level Pulse Width	T_H	Specified by the output T_H period within a range from 10cm to the arrival distance (average value of 50 pulses)	400	—	800	μS
Low Level Pulse Width	T_L	Specified by the output T_L period within a range from 10cm to the arrival distance (average value of 50 pulses)	400	—	800	(S
High Level Output Voltage	VH	10cm over the ray axis	4.5	—	—	V
Low Level Output Voltage	VL	10cm over the ray axis	—	—	0.5	V

● Application Circuit

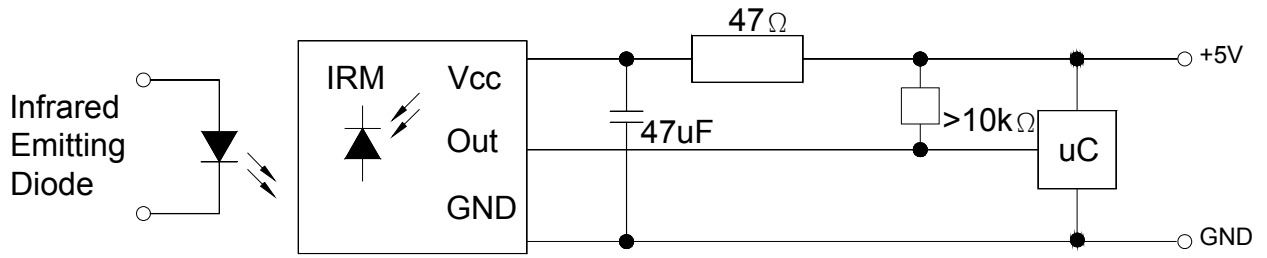


Fig.1 Transmitter Wave Form

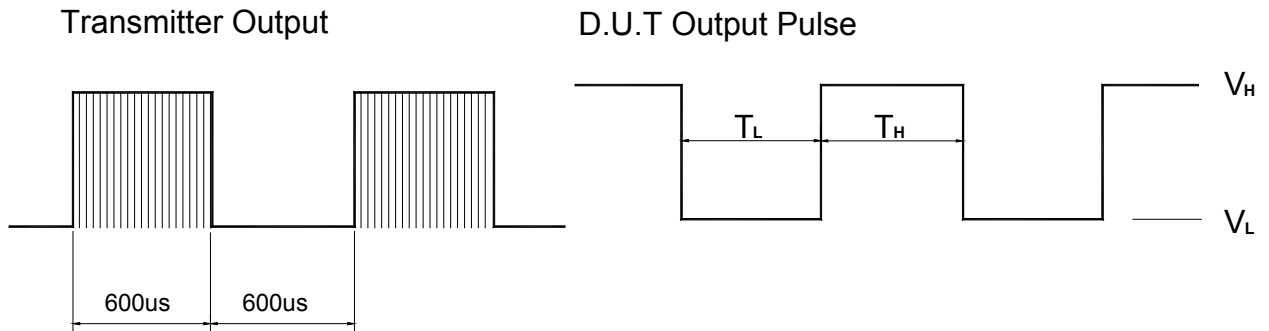


Fig.2 Measuring Method

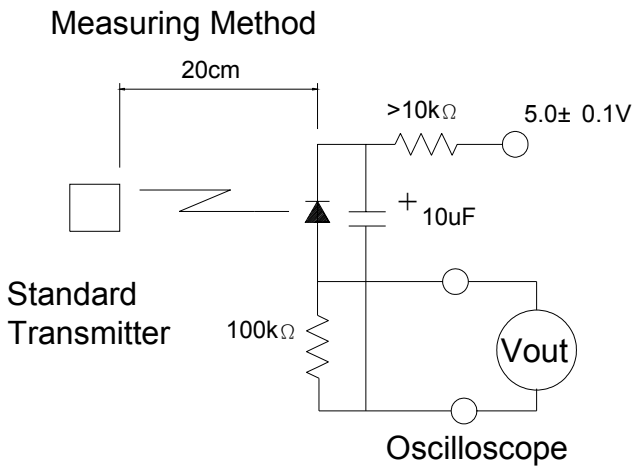
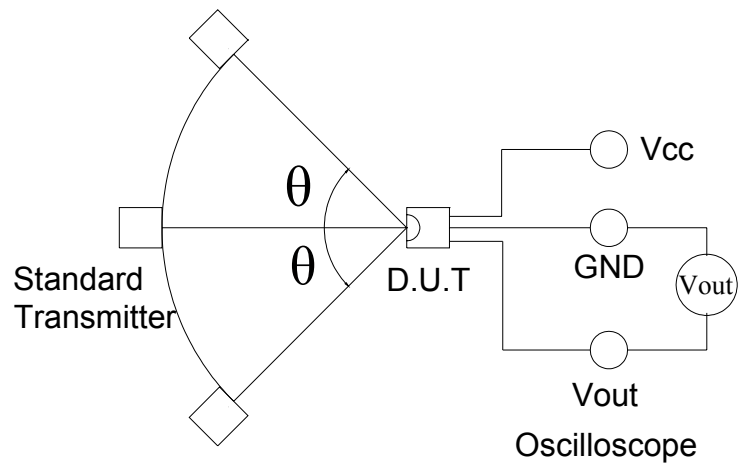


Fig.3 Measuring System



● Electrical And Optical Curves(Ta=25°C)

Fig.4 Relative Spectral Sensitivity vs. Wavelength

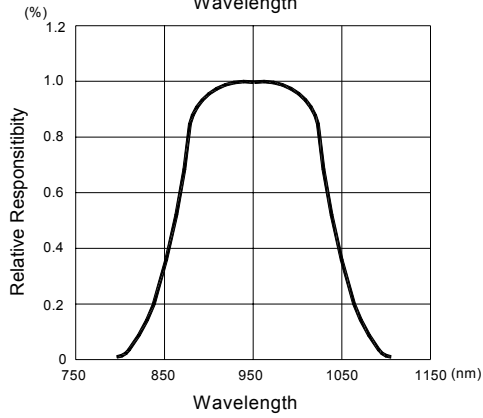


Fig.5 Relative Transmission Distance vs. Direction

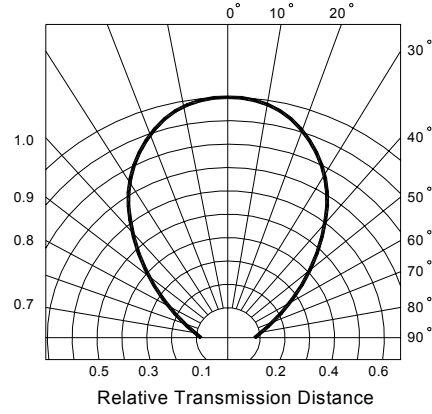


Fig.6 Output Pulse Diagram

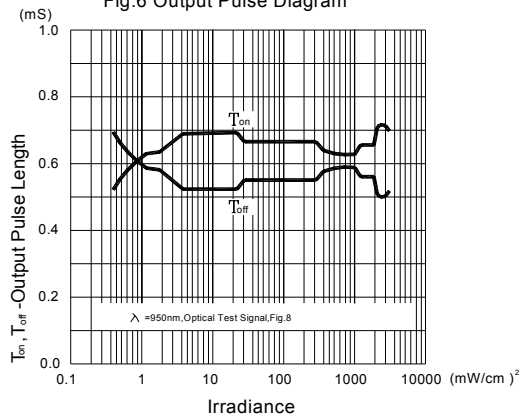


Fig.7 Supply Current vs. Ambient Temperature

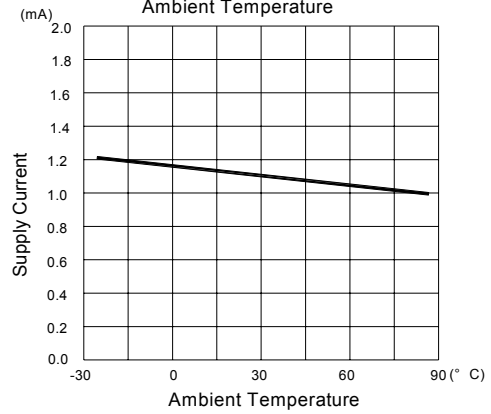


Fig.8 Frequency Dependence of Responsivity

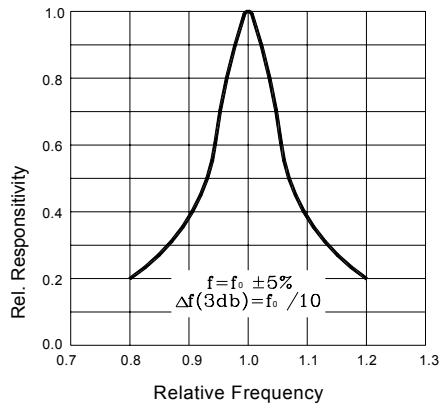
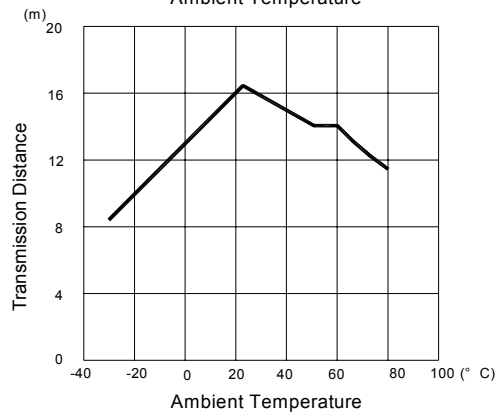


Fig.9 Arrival Distance Vs. Ambient Temperature



INFRARED RECEIVER MODULE

● Description

1. The BRM-1080 is miniaturized infrared receivers for remote control and other applications requiring improved ambient light rejection.
2. The separate PIN diode and preamplifier IC are assembled on a single lead frame.
3. The epoxy package contains a special IR filter.
4. This module has excellent performance even in disturbed ambient light applications and provides protection against uncontrolled output pulses.

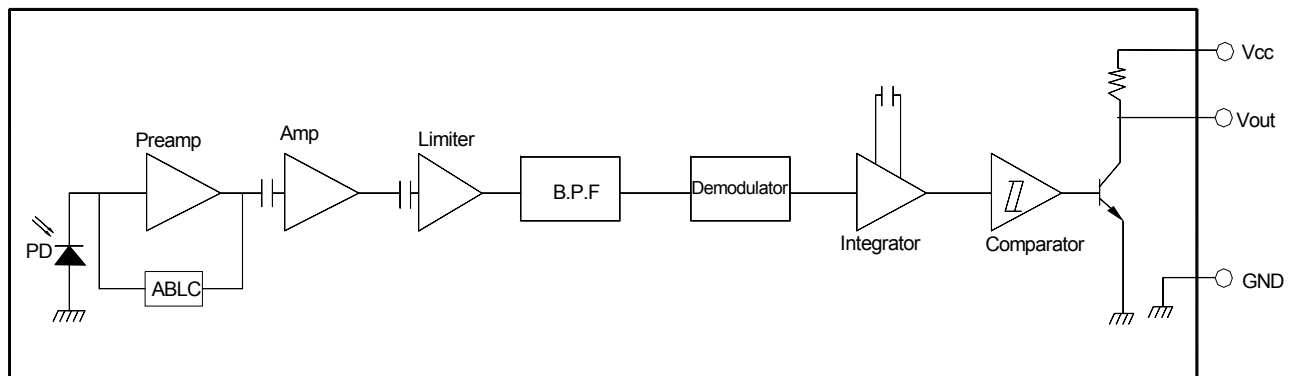
● Features

1. Photo detector and preamplifier in one package .
2. Internal filter for PCM frequency.
3. High immunity against ambient light.
4. Improved shielding against electric field disturbance.
5. 5.0V supply voltage; low power consumption.
6. TTL and CMOS compatibility.
7. Suitable transmission code:NEC code,RC5 code.
8. This product doesn't contain restriction substance, comply ROHS standard

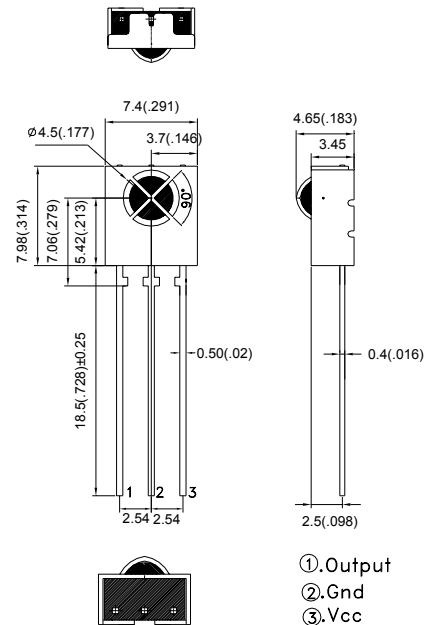
● Applications:

1. It can be used for TVs 、VTRs 、 audio equipment air conditioners 、 car stereo radio 、 toys 、 home computers and all other equipment requiring remote control.

● BLOCK DIAGRAM



● Package Dimensions:



NOTES:

- 1.All dimensions are in millimeters (inches).
- 2.Tolerance is $\pm 0.10\text{mm}$ ($0.004''$) unless otherwise specified.
- 3.Specifications are subject to change without notice.

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

Parameter	Symbol	Ratings	Unit	Notice
Supply Voltage	Vcc	4.5~ 5.5	V	—
Operating Temperature	Topr	-25~+70	$^{\circ}\text{C}$	—
Storage Temperature	Tstg	-40~+85	$^{\circ}\text{C}$	—
Soldering Temperature	Tsol	260	$^{\circ}\text{C}$	4mm from mold body less than 5 sec

● **Electrical And Optical Characteristics**($T_a=25^{\circ}\text{C}$)

Parameter	Symbol	Condition	Ratings			Unit
			Min.	Typ.	Max.	
Supply Voltage	Vcc	DC voltage	4.5	5.0	5.5	V
Supply Current	Icc	No signal input	—	—	1.5	mA
Reception Distance	L	At the ray axis	12	—	—	m
		In the range of 45°cone	6	—	—	
B.P.F Center Frequency	fo	—	—	38	—	KHz
Peak Wavelength	λ_p	—	—	940	—	nm
Half Angle	θ	—	—	45	—	deg
High Level Pulse Width	T_H	Specified by the output T_H period within a range from 10cm to the arrival distance (average value of 50 pulses)	400	—	800	μS
Low Level Pulse Width	T_L	Specified by the output T_L period within a range from 10cm to the arrival distance (average value of 50 pulses)	400	—	800	μS
High Level Output Voltage	VH	10cm over the ray axis	4.5	—	—	V
Low Level Output Voltage	VL	10cm over the ray axis	—	—	0.5	V

● Application Circuit

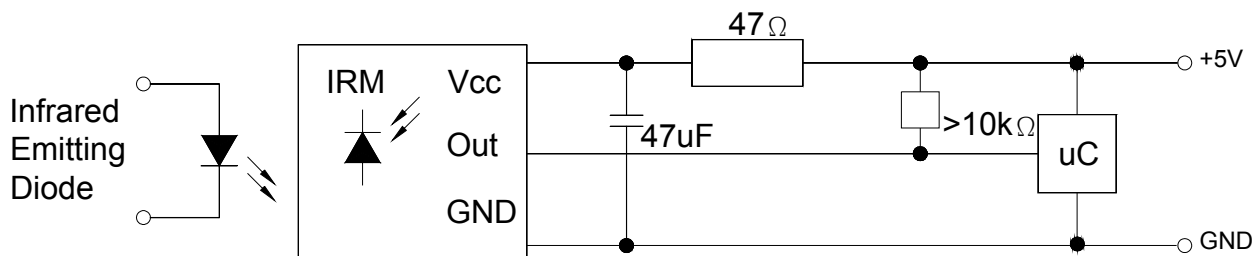


Fig.1 Transmitter Wave Form

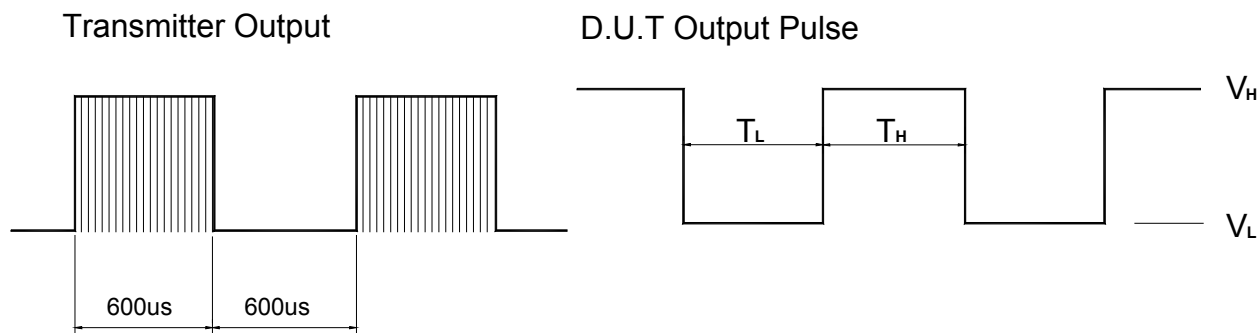


Fig.2 Measuring Method

Measuring Method

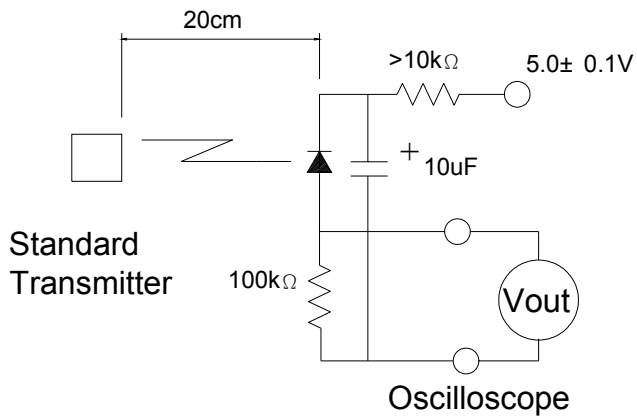
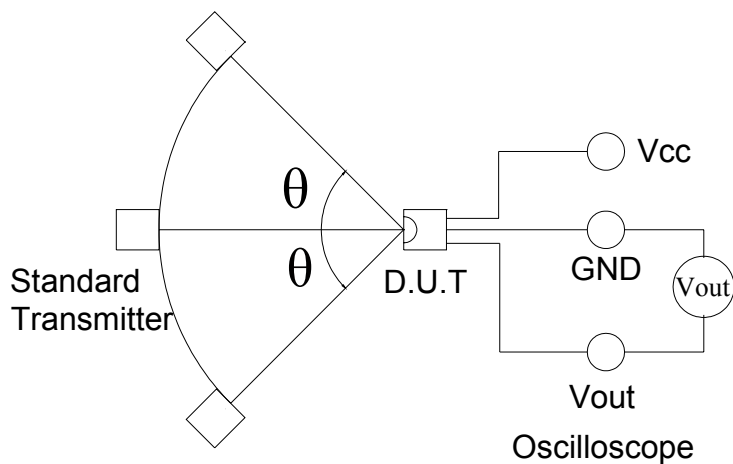


Fig.3 Measuring System



● Electrical And Optical Curves(Ta=25°C)

Fig.4 Relative Spectral Sensitivity vs. Wavelength

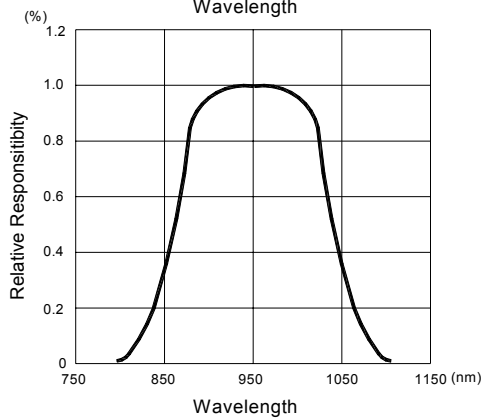


Fig.5 Relative Transmission Distance vs. Direction

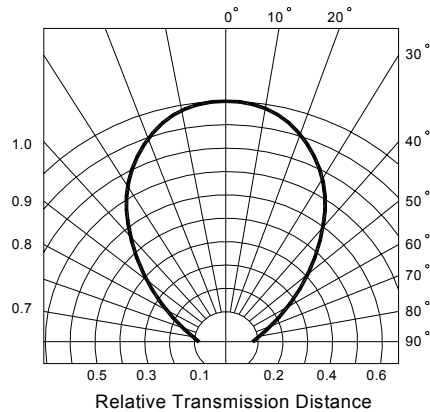


Fig.6 Output Pulse Diagram

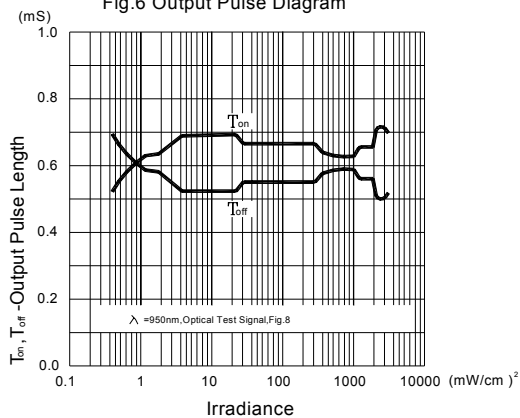


Fig.7 Supply Current vs. Ambient Temperature

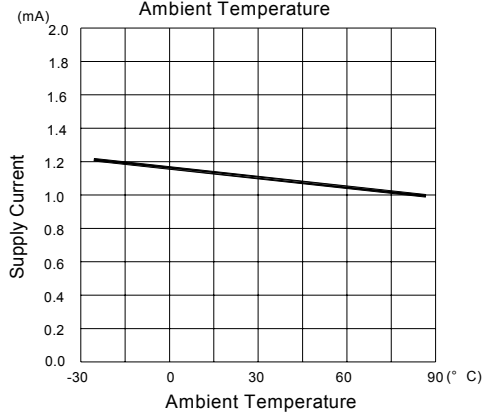


Fig.8 Frequency Dependence of Responsivity

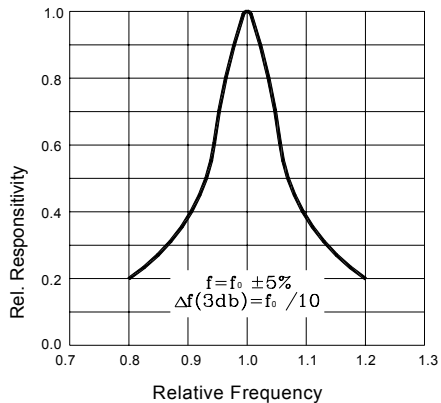
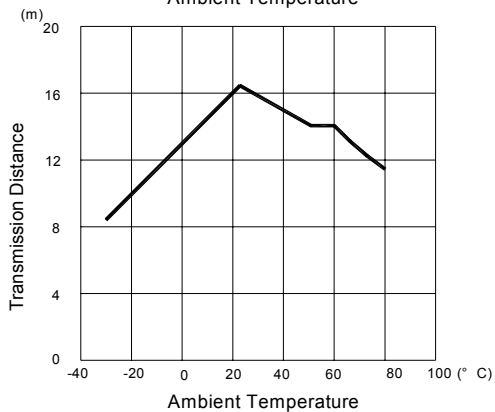


Fig.9 Arrival Distance Vs. Ambient Temperature



INFRARED RECEIVER MODULE

● Description

1. The BRM-1070-NS is miniaturized infrared receiver for remote control and other applications requiring improved ambient light rejection.
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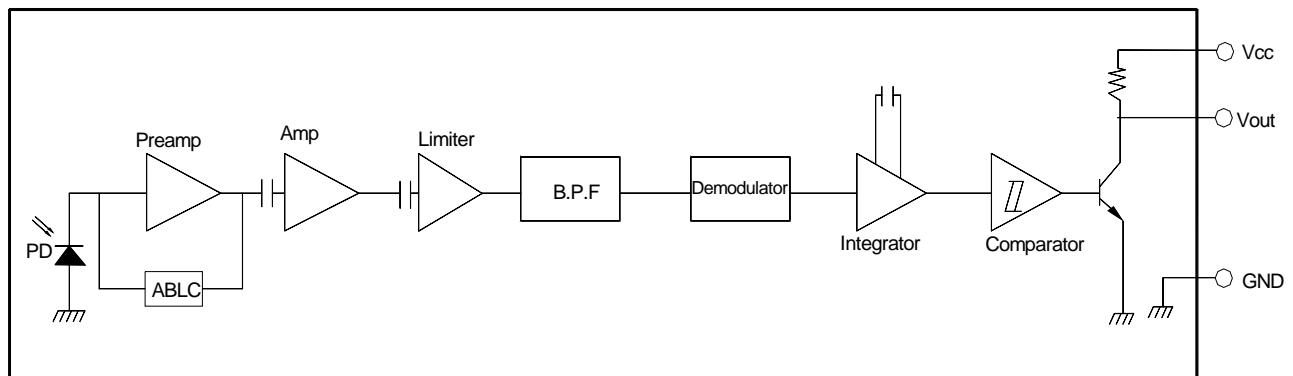
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2. Internal filter for PCM frequency.
3. High immunity against ambient light.
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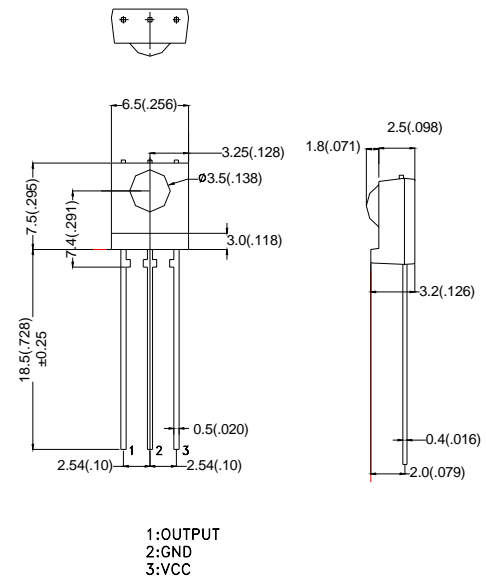
● Applications:

1. It can be used for TVs 、 VTRs 、 audio equipment air conditioners 、 car stereo radio 、 toys 、 home computers and all other equipment requiring remote control.

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● Package Dimensions:



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Soldering Temperature	T _{sol}	260	°C	4mm from mold body less than 5 sec

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Supply Current	I _{cc}	No signal input	—	—	1.5	mA
Reception Distance	L	At the ray axis	12	—	—	m
		In the range of 45°cone	6	—	—	
B.P.F Center Frequency	f _o	—	—	38	—	KHz
Peak Wavelength	λ _p	—	—	940	—	nm
Half Angle	θ	—	—	45	—	deg
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Low Level Pulse Width	T _L	Specified by the output T _L period within a range from 10cm to the arrival distance (average value of 50 pulses)	400	—	800	μS
High Level Output Voltage	V _H	10cm over the ray axis	4.5	—	—	V
Low Level Output Voltage	V _L	10cm over the ray axis	—	—	0.5	V

● Application Circuit

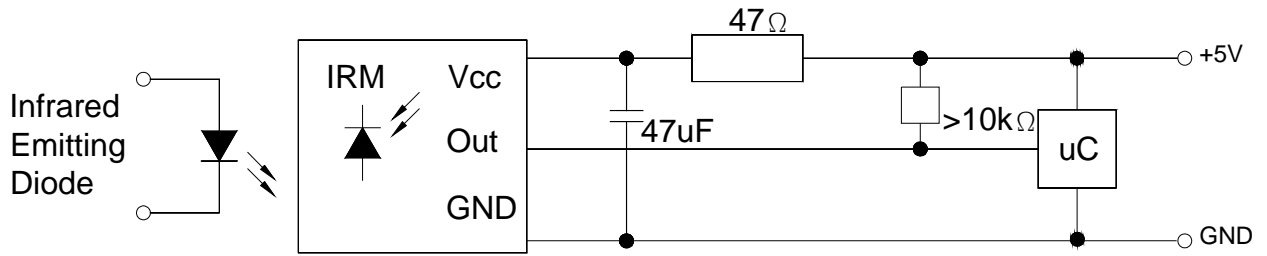


Fig.1 Transmitter Wave Form

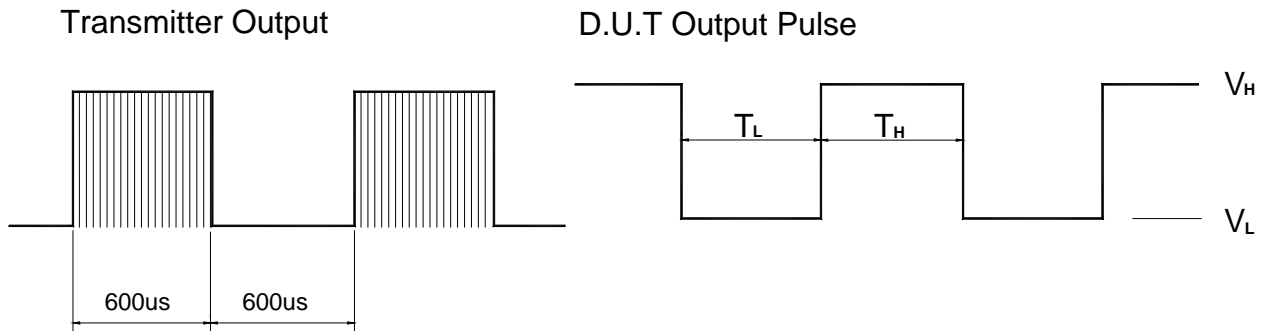


Fig.2 Measuring Method

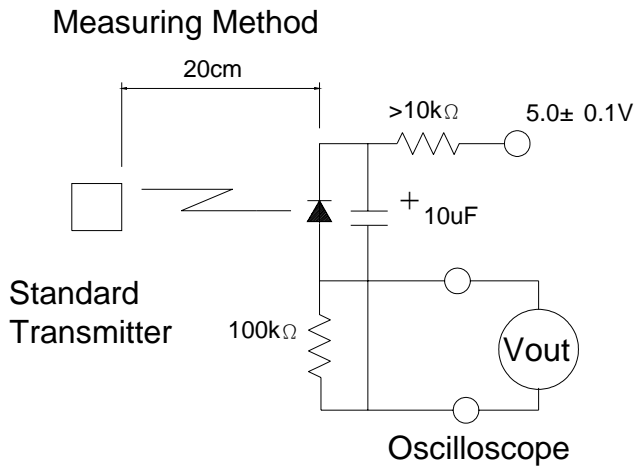
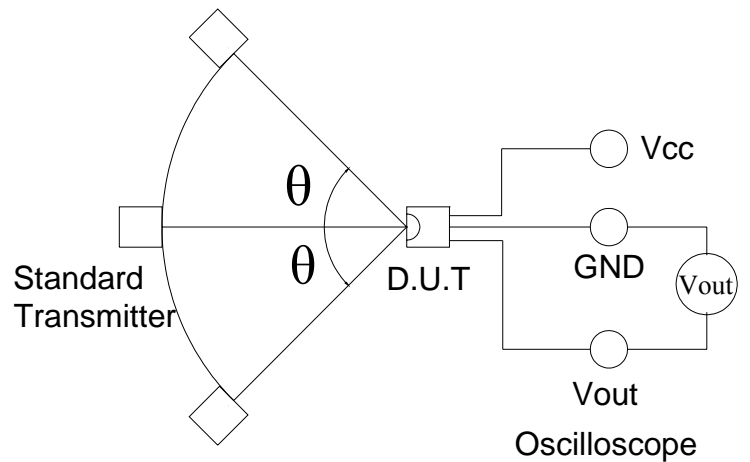


Fig.3 Measuring System



● Electrical And Optical Curves(Ta=25°C)

Fig.4 Relative Spectral Sensitivity vs. Wavelength

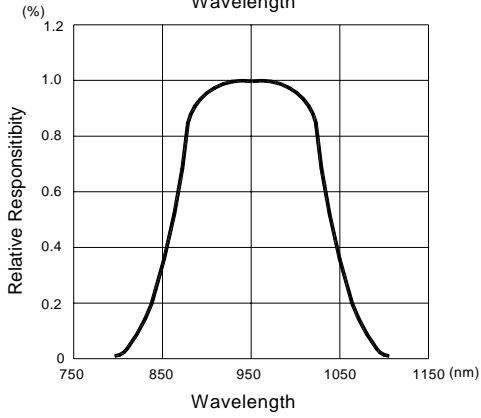


Fig.5 Relative Transmission Distance vs. Direction

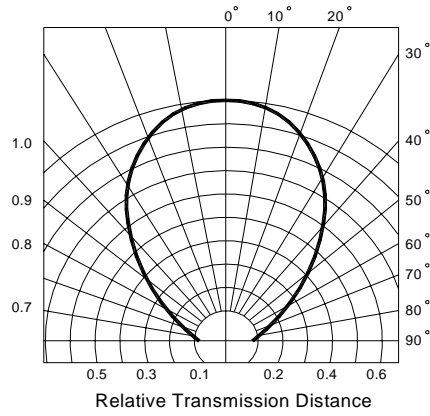


Fig.6 Output Pulse Diagram

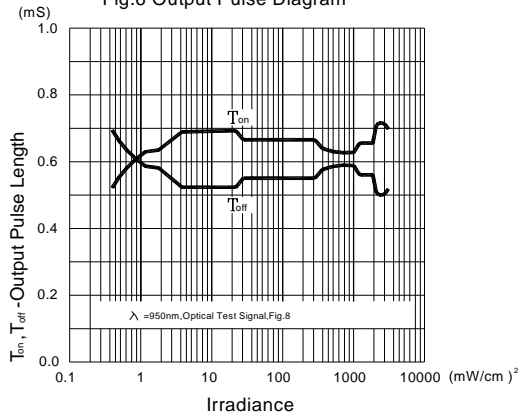


Fig.7 Supply Current vs. Ambient Temperature

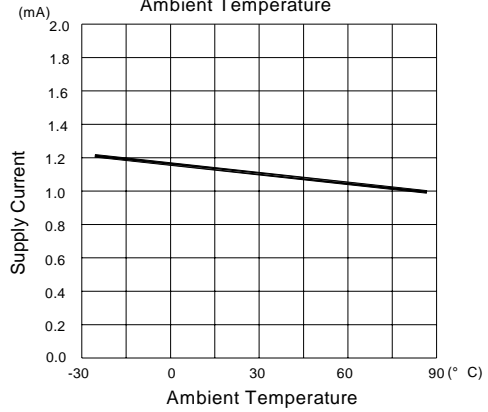


Fig.8 Frequency Dependence of Responsivity

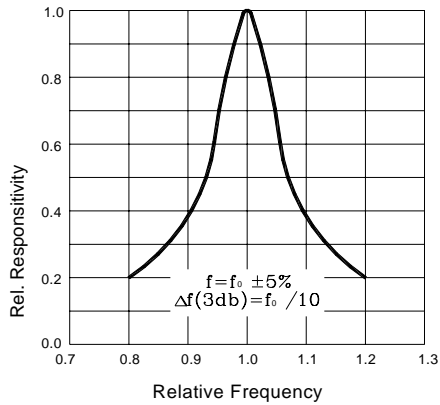
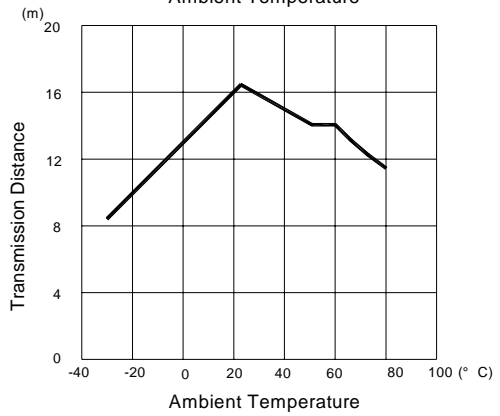


Fig.9 Arrival Distance Vs. Ambient Temperature



INFRARED RECEIVER MODULE

● Description

1. The BRM-1070 is miniaturized infrared receivers for remote control and other applications requiring improved ambient light rejection.
2. The separate PIN diode and preamplifier IC are assembled on a single leadframe.
3. The epoxy package contains a special IR filter.
4. This module has excellent performance even in disturbed ambient light applications and provides protection against uncontrolled output pulses.

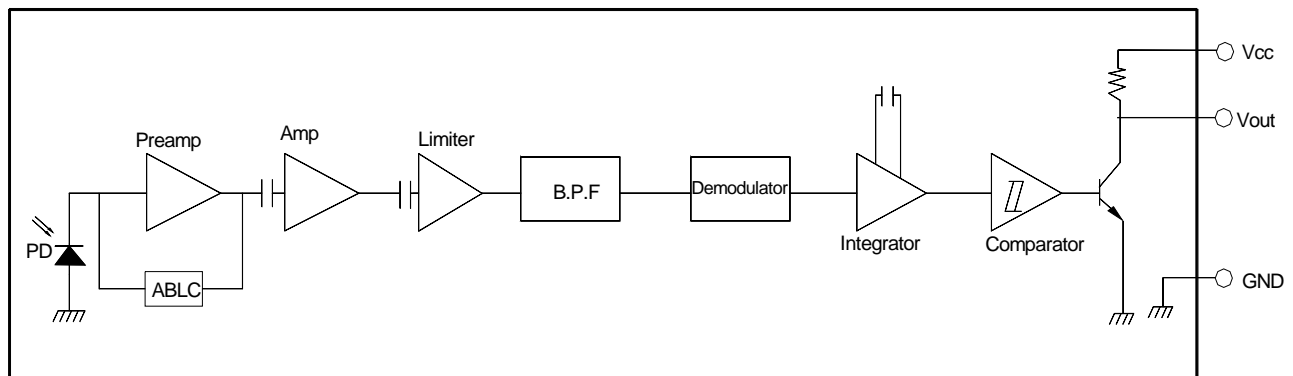
● Features

1. Photo detector and preamplifier in one package .
2. Internal filter for PCM frequency.
3. High immunity against ambient light.
4. Improved shielding against electric field disturbance.
5. 3.0V or 5.0V supply voltage; low power consumption.
6. TTL and CMOS compatibility.
7. Suitable transmission code:NEC code,RC5 code.

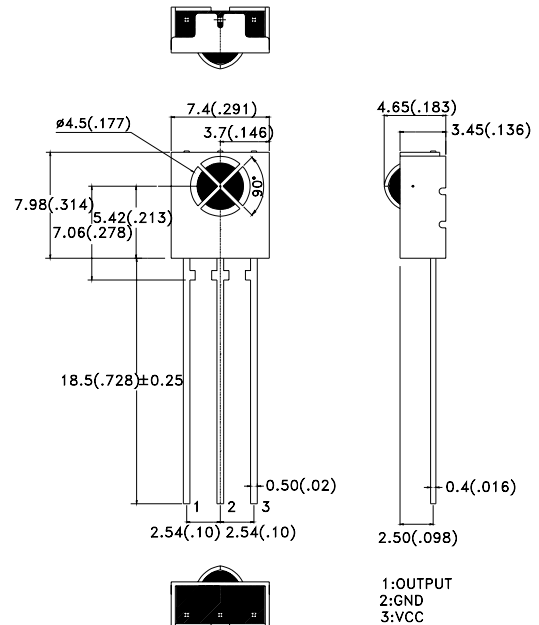
● Applications:

1. It can be used for TVs 、 VTRs 、 audio equipment air conditioners 、 car stereo radio 、 toys 、 home computers and all other equipment requiring remote control.

● BLOCK DIAGRAM



● Package Dimensions:



NOTES:

- 1.All dimensions are in millimeters (inches).
- 2.Tolerance is $\pm 0.10\text{mm}$ (0.004") unless otherwise specified.
- 3.Specifications are subject to change without notice.

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

Parameter	Symbol	Ratings	Unit	Notice
Supply Voltage	V _{cc}	2.7~5.5	V	—
Operating Temperature	T _{opr}	-30~+65	°C	—
Storage Temperature	T _{stg}	-40~+85	°C	—
Soldering Temperature	T _{sol}	260	°C	4mm from mold body less than 5 sec

● **Electrical And Optical Characteristics**($T_a=25^{\circ}\text{C}$)

Parameter	Symbol	Condition	Ratings			Unit
			Min.	Typ.	Max.	
Supply Voltage	V _{cc}	DC voltage	2.7	—	5.5	V
Supply Current	I _{cc}	No signal input	—	—	1.5	mA
Reception Distance	L	At the ray axis	12	—	—	m
		In the range of 45°cone	6	—	—	
B.P.F Center Frequency	f _o	—	—	38	—	KHz
Peak Wavelength	λ _p	—	—	940	—	nm
Half Angle	θ	—	—	45	—	deg
High Level Pulse Width	T _H	Specified by the output T _H period within a range from 10cm to the arrival distance (average value of 50 pulses)	400	—	800	μS
Low Level Pulse Width	T _L	Specified by the output T _L period within a range from 10cm to the arrival distance (average value of 50 pulses)	400	—	800	μS
High Level Output Voltage	V _H	10cm over the ray axis	4.5	—	—	V
Low Level Output Voltage	V _L	10cm over the ray axis	—	—	0.5	V

● Application Circuit

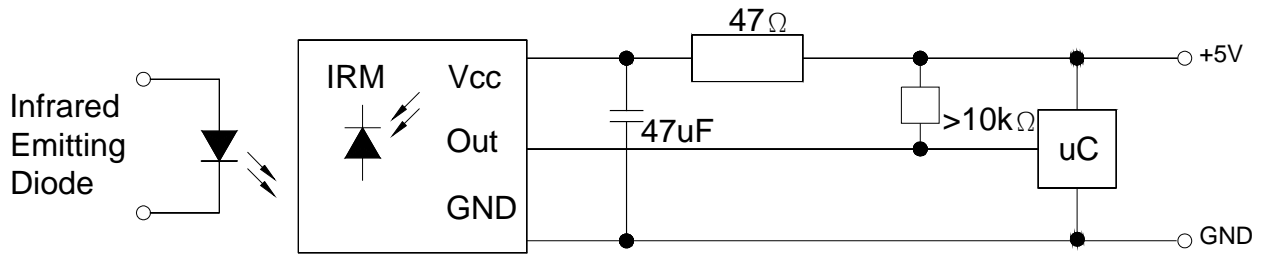


Fig.1 Transmitter Wave Form

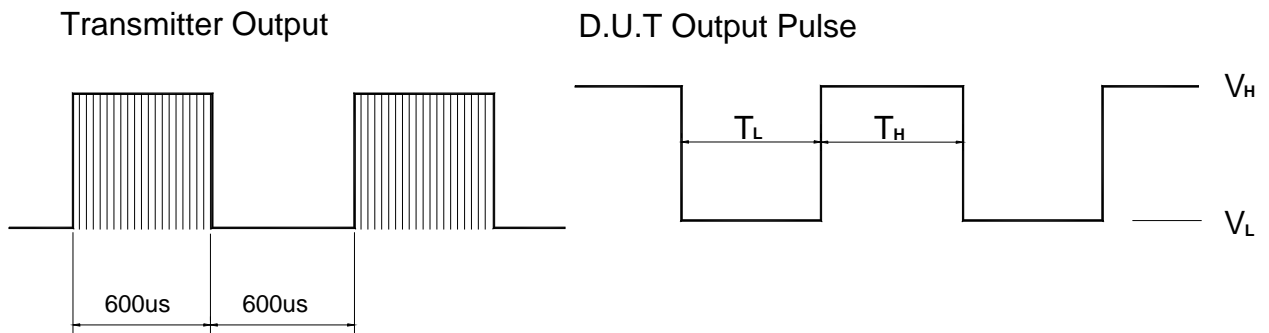


Fig.2 Measuring Method

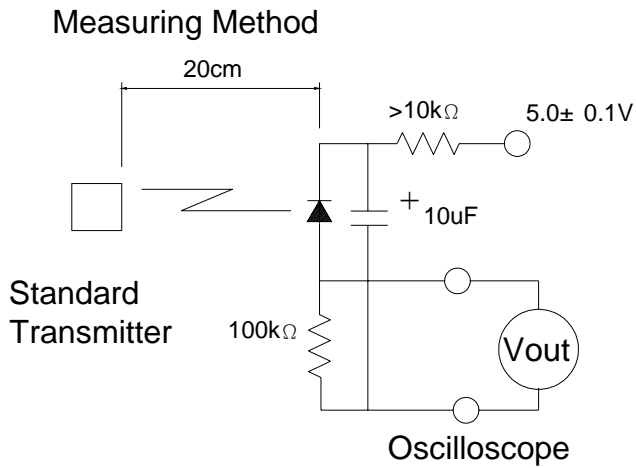
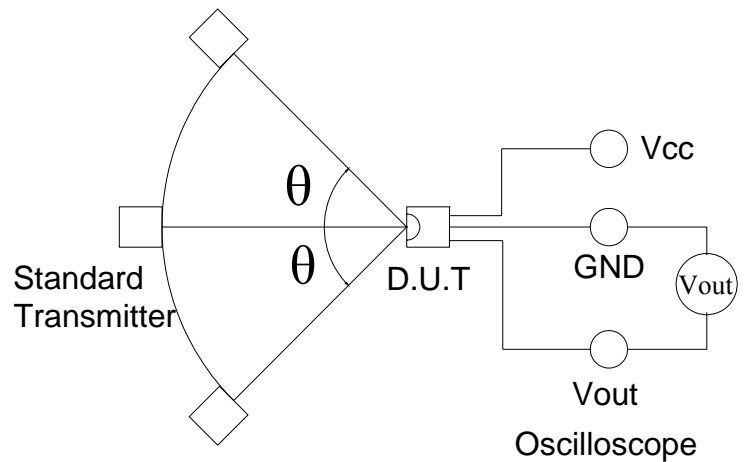


Fig.3 Measuring System



● Electrical And Optical Curves(Ta=25°C)

Fig.4 Relative Spectral Sensitivity vs. Wavelength

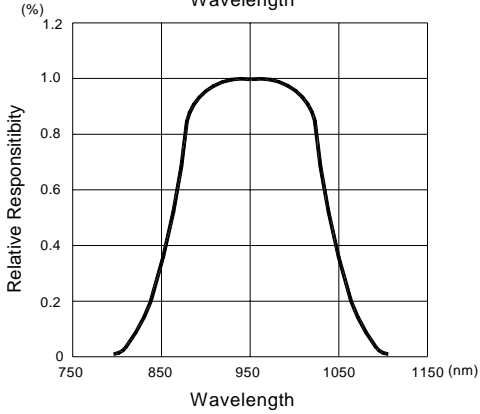


Fig.5 Relative Transmission Distance vs. Direction

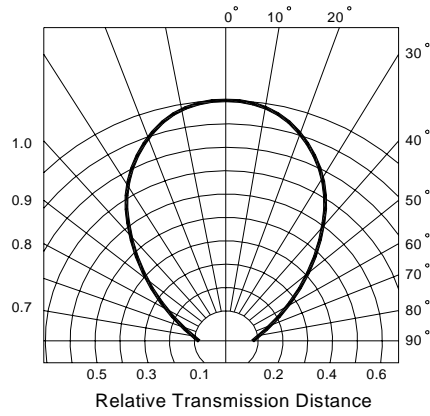


Fig.6 Output Pulse Diagram

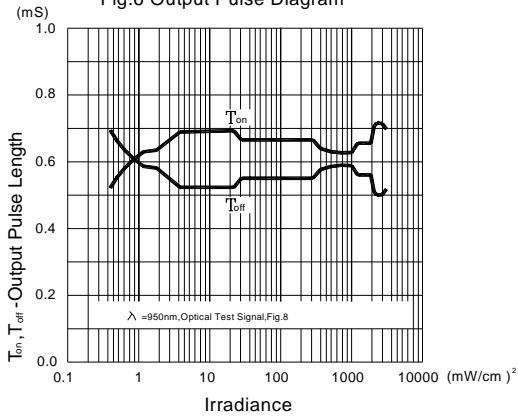


Fig.7 Supply Current vs. Ambient Temperature

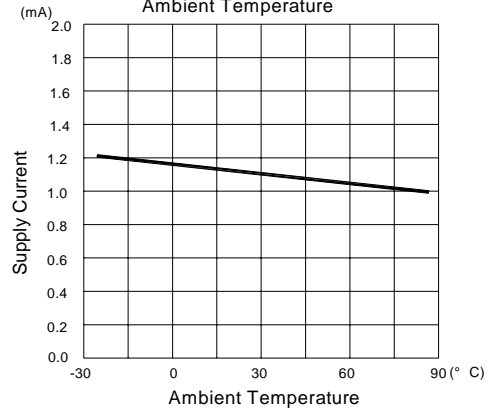


Fig.8 Frequency Dependence of Responsivity

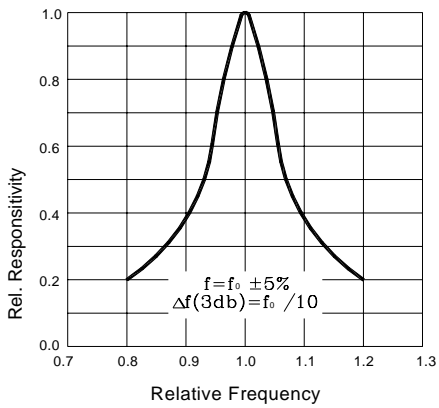
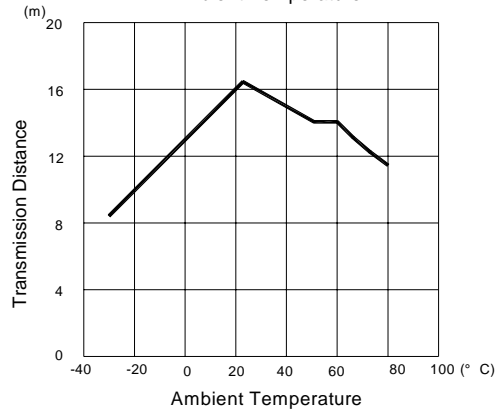


Fig.9 Arrival Distance Vs. Ambient Temperature



INFRARED RECEIVER MODULE

● Description

1. The BRM-1040-NS is miniaturized infrared receivers for remote control and other applications requiring improved ambient light rejection.
2. The separate PIN diode and preamplifier IC are assembled on a single leadframe.
3. The epoxy package contains a special IR filter.
4. This module has excellent performance even in disturbed ambient light applications and provides protection against uncontrolled output pulses.

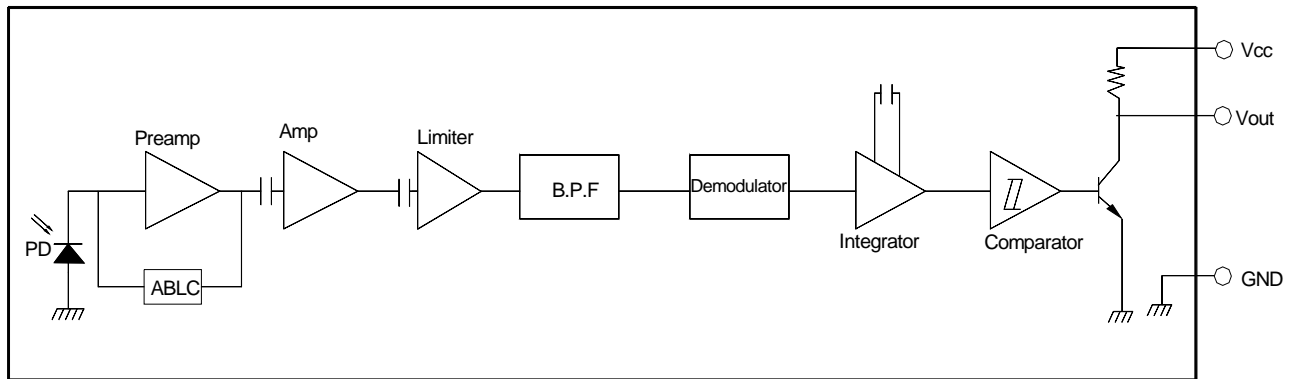
● Features

1. Photo detector and preamplifier in one package .
2. Internal filter for PCM frequency.
3. High immunity against ambient light.
4. Improved shielding against electric field disturbance.
5. 5.0V supply voltage; low power consumption.
6. TTL and CMOS compatibility.
7. Suitable transmission code:NEC code,RC5 code.

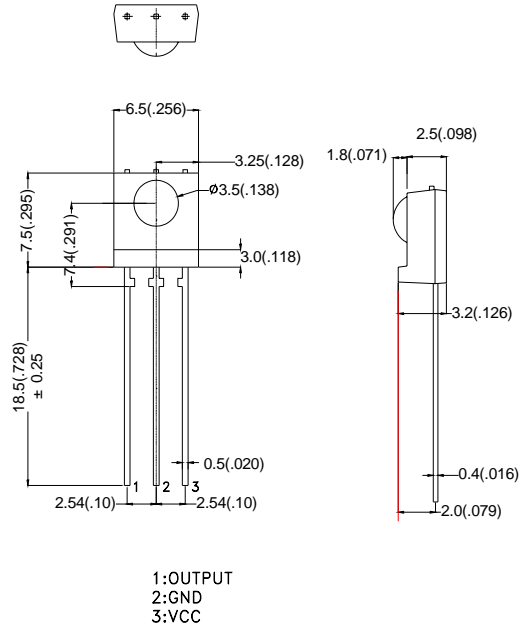
● Applications:

1. It can be used for TVs 、 VTRs 、 audio equipment air conditioners 、 car stereo radio 、 toys 、 home computers and all other equipment requiring remote control.

● BLOCK DIAGRAM



● Package Dimensions:



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is $\pm 0.10\text{mm}$ ($0.004''$) unless otherwise specified.
3. Specifications are subject to change without notice.

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

Parameter	Symbol	Ratings	Unit	Notice
Supply Voltage	Vcc	4.5 ~ 5.5	V	—
Operating Temperature	Topr	-30~+65	$^{\circ}\text{C}$	—
Storage Temperature	Tstg	-40~+85	$^{\circ}\text{C}$	—
Soldering Temperature	Tsol	260	$^{\circ}\text{C}$	4mm from mold body less than 5 sec

● **Electrical And Optical Characteristics**($T_a=25^{\circ}\text{C}$)

Parameter	Symbol	Condition	Ratings			Unit
			Min.	Typ.	Max.	
Supply Voltage	Vcc	DC voltage	4.5	5.0	5.5	V
Supply Current	Icc	No signal input	—	—	1.5	mA
Reception Distance	L	At the ray axis	12	—	—	m
		In the range of 45°cone	6	—	—	
B.P.F Center Frequency	fo	—	—	38	—	KHz
Peak Wavelength	λ_p	—	—	940	—	nm
Half Angle	θ	—	—	45	—	deg
High Level Pulse Width	T_H	Specified by the output T_H period within a range from 10cm to the arrival distance (average value of 50 pulses)	400	—	800	μS
Low Level Pulse Width	T_L	Specified by the output T_L period within a range from 10cm to the arrival distance (average value of 50 pulses)	400	—	800	μS
High Level Output Voltage	VH	10cm over the ray axis	4.5	—	—	V
Low Level Output Voltage	VL	10cm over the ray axis	—	—	0.5	V

● Application Circuit

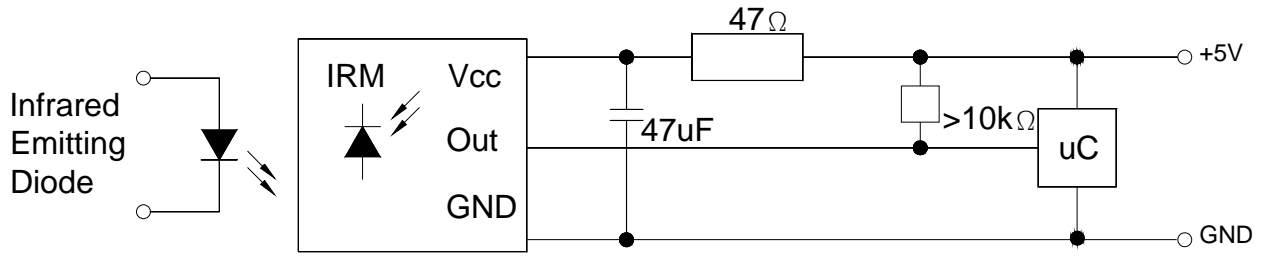


Fig.1 Transmitter Wave Form

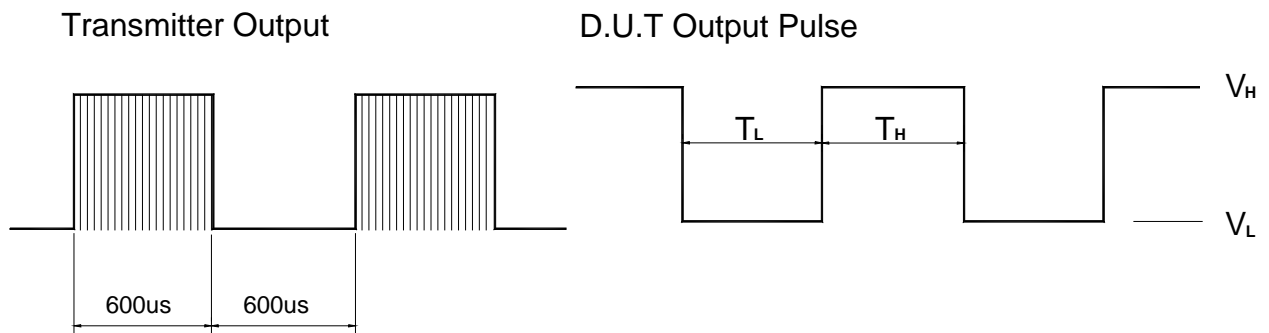


Fig.2 Measuring Method

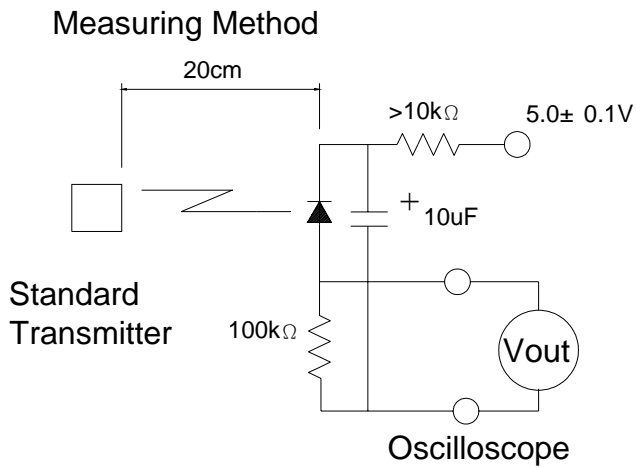
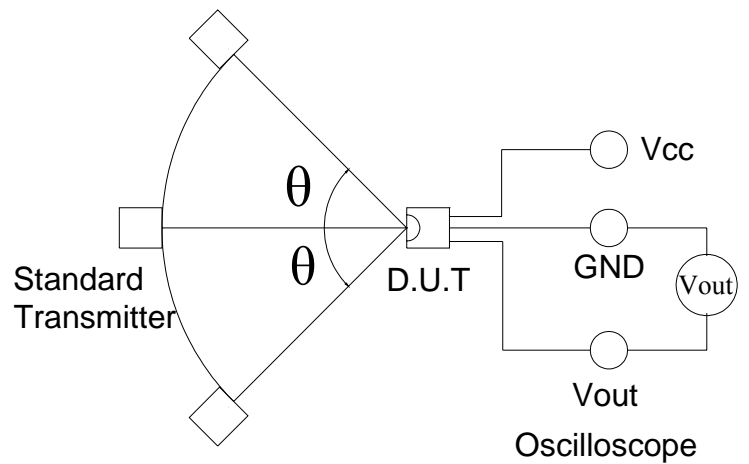


Fig.3 Measuring System



● Electrical And Optical Curves(Ta=25°C)

Fig.4 Relative Spectral Sensitivity vs. Wavelength

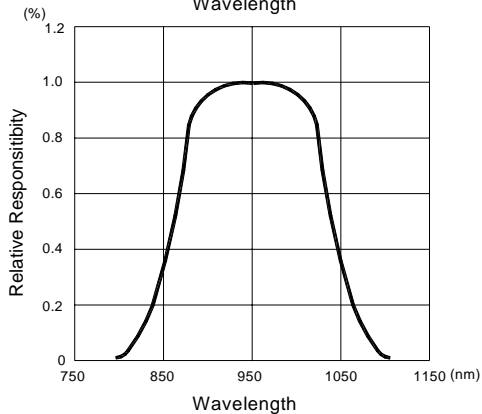


Fig.5 Relative Transmission Distance vs. Direction

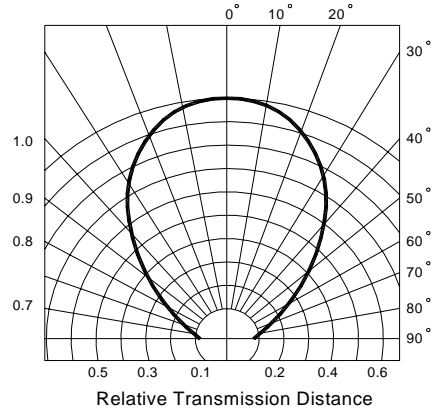


Fig.6 Output Pulse Diagram

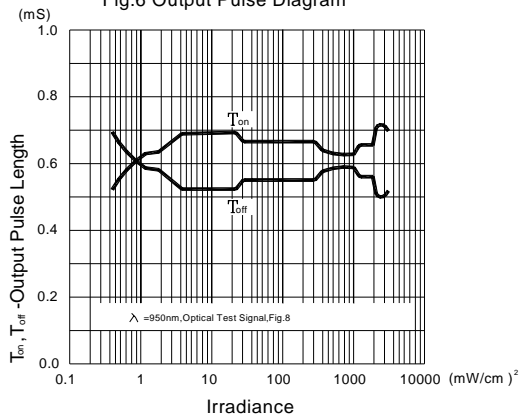


Fig.7 Supply Current vs. Ambient Temperature

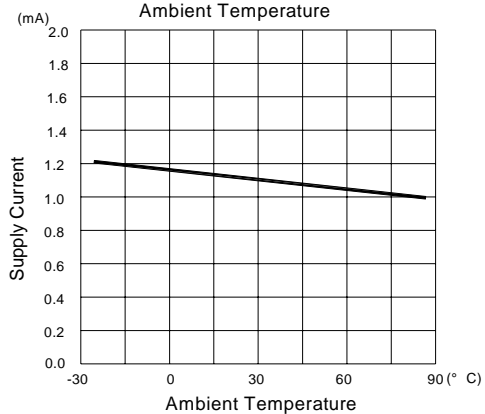


Fig.8 Frequency Dependence of Responsivity

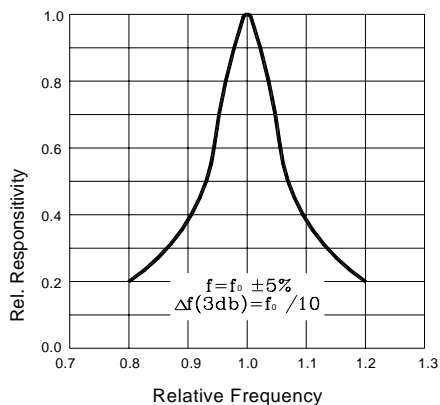


Fig.9 Arrival Distance Vs. Ambient Temperature

