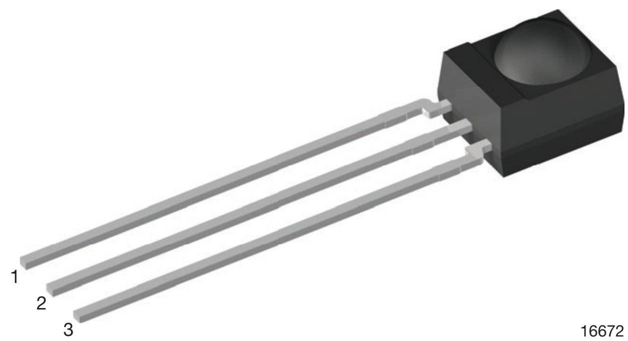
IR Receiver Modules for Remote Control Systems



ADDITIONAL RESOURCES

3D Models

FEATURES

- Improved dark sensitivity
- Improved immunity against optical noise
- Improved immunity against Wi-Fi noise
- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- Insensitive to supply voltage ripple and noise
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb Pb-free
e3
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

MECHANICAL DATA

Pinning for TSOP14...:

1 = OUT, 2 = GND, 3 = V_S

Pinning for TSOP12...:

1 = OUT, 2 = V_S, 3 = GND

DESCRIPTION

The TSOP12... and TSOP14... series devices are the latest generation miniaturized IR receiver modules for infrared remote control systems. These series provide improvements in sensitivity to remote control signals in dark ambient as well as in sensitivity in the presence of optical disturbances e.g. from CFLs. The robustness against spurious pulses originating from Wi-Fi signals has been enhanced.

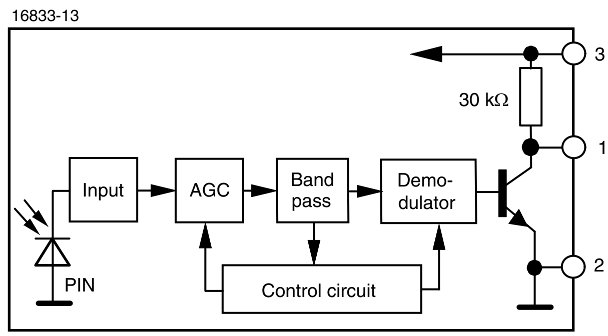
The devices contain a PIN diode and a preamplifier assembled on a lead frame. The epoxy package contains an IR filter. The demodulated output signal can be directly connected to a microprocessor for decoding.

The TSOP122.., TSOP124.., TSOP126.., TSOP142.., TSOP144.., and TSOP146.. series devices are designed to receive long burst codes (10 or more carrier cycles per burst). The third digit designates the AGC level (AGC2, AGC4, or AGC6) and the last two digits designate the band-pass frequency (see table below). The higher the AGC, the better noise is suppressed, but the lower the code compatibility. AGC2 provides basic noise suppression, AGC4 provides enhanced noise suppression and AGC6 provides maximized noise suppression. Generally, we advise to select the highest AGC that satisfactorily receives the desired remote code.

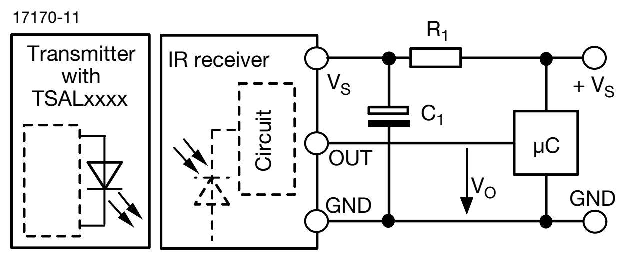
These components have not been qualified to automotive specifications.

PARTS TABLE							
AGC		**BASIC NOISE SUPPRESSION (AGC2)**		**ENHANCED NOISE SUPPRESSION (AGC4)**		**MAXIMIZED NOISE SUPPRESSION (AGC6)**	
Carrier frequency	30 kHz	TSOP14230	TSOP12230	TSOP14430	TSOP12430	TSOP14630	TSOP12630
	33 kHz	TSOP14233	TSOP12233	TSOP14433	TSOP12433	TSOP14633	TSOP12633
	36 kHz	TSOP14236	TSOP12236	TSOP14436 (2)(5)(7)	TSOP12436 (2)(5)(7)	TSOP14636 (6)	TSOP12636 (6)
	38 kHz	TSOP14238	TSOP12238	TSOP14438 (3)(4)(10)(11)	TSOP12438 (3)(4)(10)(11)	TSOP14638	TSOP12638
	40 kHz	TSOP14240 (12)	TSOP12240 (12)	TSOP14440	TSOP12440	TSOP14640	TSOP12640
	56 kHz	TSOP14256 (1)	TSOP12256 (1)	TSOP14456 (9)	TSOP12456 (9)	TSOP14656 (8)	TSOP12656 (8)
Package		Mold					
Pinning		1 = OUT, 2 = GND, 3 = V_S	1 = OUT, 2 = V_S, 3 = GND	1 = OUT, 2 = GND, 3 = V_S	1 = OUT, 2 = V_S, 3 = GND	1 = OUT, 2 = GND, 3 = V_S	1 = OUT, 2 = V_S, 3 = GND
Dimensions (mm)		6.0 W x 6.95 H x 5.6 D					
Mounting		Leaded					
Application		Remote control					
Best choice for		(1) Cisco (2) MCIR (3) Mitsubishi (4) NEC (5) Panasonic (6) RC-5 (7) RC-6 (8) RCA (9) r-step (10) Sejin 4PPM (11) Sharp (12) Sony					

BLOCK DIAGRAM



APPLICATION CIRCUIT



R_1 and C_1 recommended to reduce supply ripple for $V_S < 2.8$ V

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Supply voltage		V_S	-0.3 to +6	V
Supply current		I_S	3	mA
Output voltage		V_O	-0.3 to (V_S + 0.3)	V
Output current		I_O	5	mA
Junction temperature		T_j	100	°C
Storage temperature range		T_{stg}	-25 to +85	°C
Operating temperature range		T_{amb}	-25 to +85	°C
Power consumption	$T_{amb} \leq 85$ °C	P_{tot}	10	mW
Soldering temperature	t ≤ 10 s, 1 mm from case	T_{sd}	260	°C

Note

- Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect the device reliability

ELECTRICAL AND OPTICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply current	E_v = 0, V_S = 3.3 V	I_{SD}	0.55	0.70	0.90	mA
	E_v = 40 klx, sunlight	I_{SH}	-	0.80	-	mA
Supply voltage		V_S	2.5	-	5.5	V
Transmission distance	E_v = 0, test signal see Fig. 1, IR diode TSAL6200, I_F = 50 mA	d	-	30	-	m
Output voltage low	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m^2, test signal see Fig. 1	V_{OSL}	-	-	100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 3.5/f_0 < t_{po} < t_{pi} + 3.5/f_0$, test signal see Fig. 1	$E_{e\ min.}$	-	0.08	0.15	mW/m^2
Maximum irradiance	$t_{pi} - 3.5/f_0 < t_{po} < t_{pi} + 3.5/f_0$, test signal see Fig. 1	$E_{e\ max.}$	30	-	-	W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$	-	± 45	-	°

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

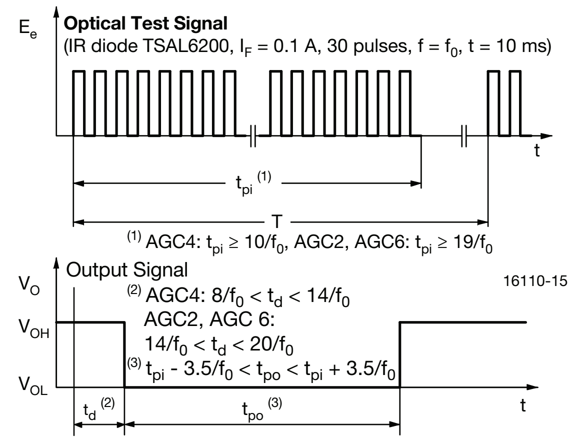


Fig. 1 - Output Delay and Pulse-Width

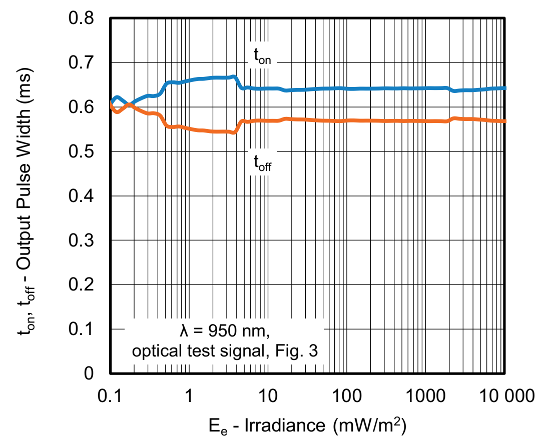


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

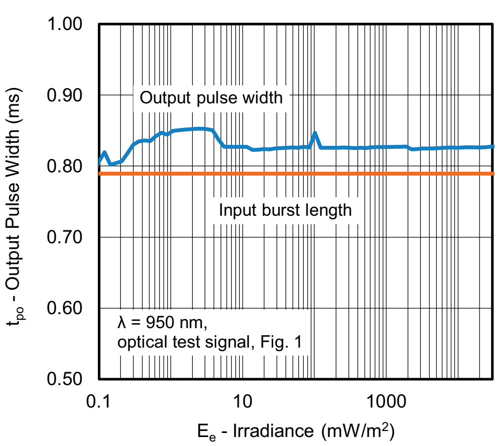


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

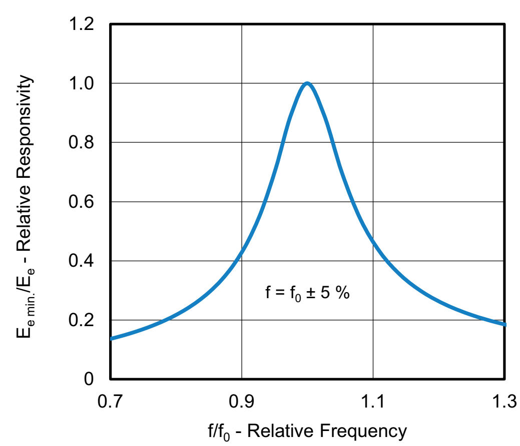


Fig. 5 - Frequency Dependence of Responsivity

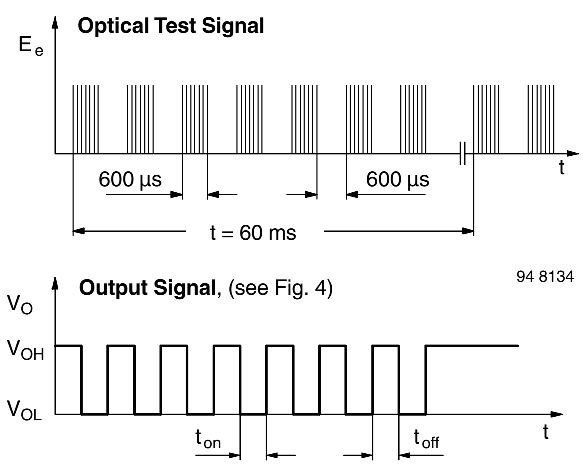


Fig. 3 - Test Signal

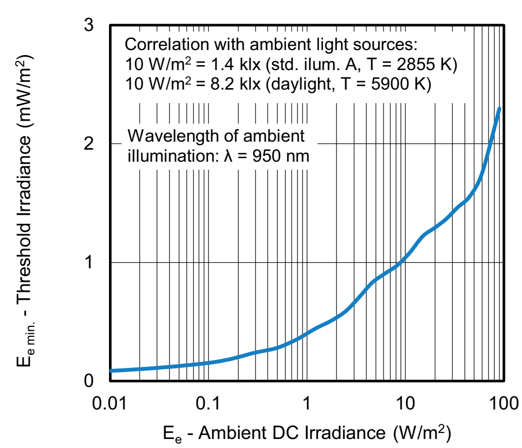


Fig. 6 - Sensitivity in Bright Ambient

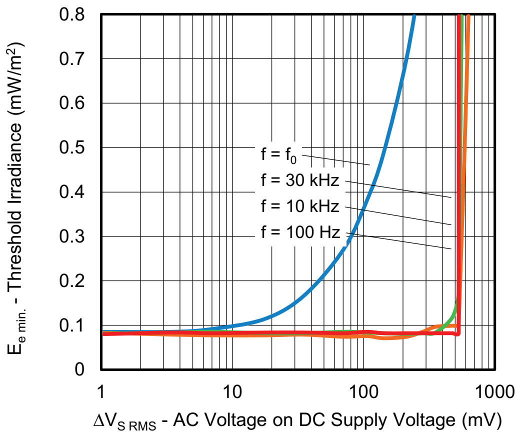


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

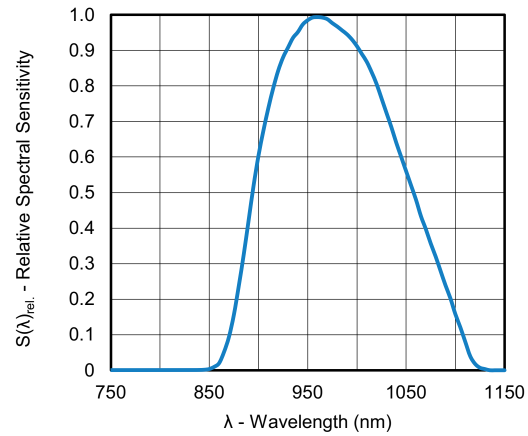


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

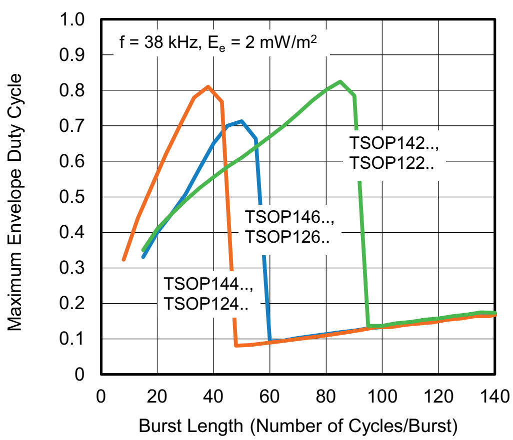


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

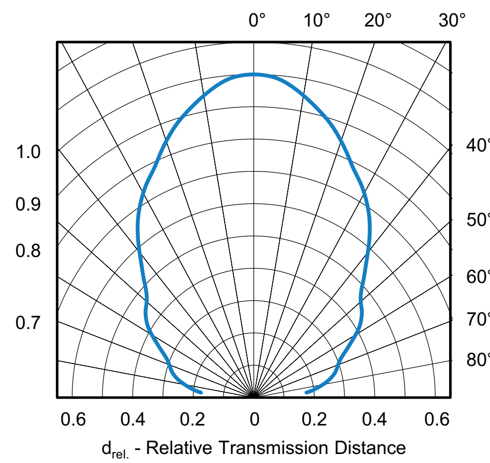


Fig. 11 - Directivity

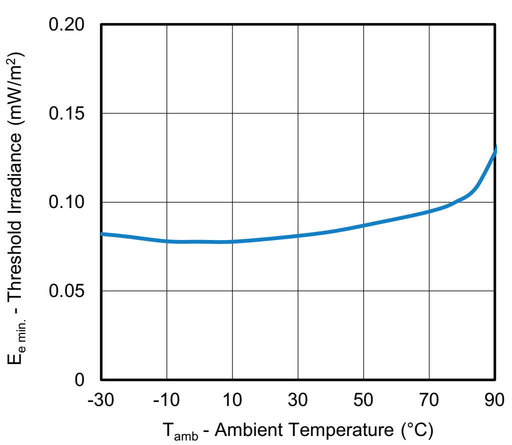


Fig. 9 - Sensitivity vs. Ambient Temperature

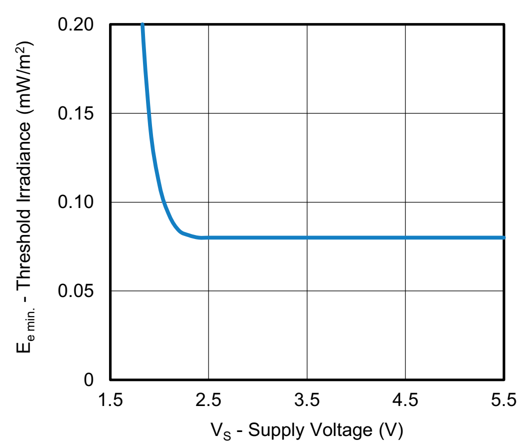


Fig. 12 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

This series is designed to suppress spurious output pulses due to noise or disturbance signals. The devices can distinguish data signals from noise due to differences in frequency, burst length, and envelope duty cycle. The data signal should be close to the device's band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the product in the presence of a disturbance, the sensitivity of the receiver is automatically reduced by the AGC to insure that no spurious pulses are present at the receiver's output. Some examples which are suppressed are:

- DC light (e.g. from tungsten bulbs sunlight)
- Continuous signals at any frequency
- Strongly or weakly modulated patterns from fluorescent lamps with electronic ballasts (see Fig. 13 or Fig. 14)
- 2.4 GHz and 5 GHz Wi-Fi

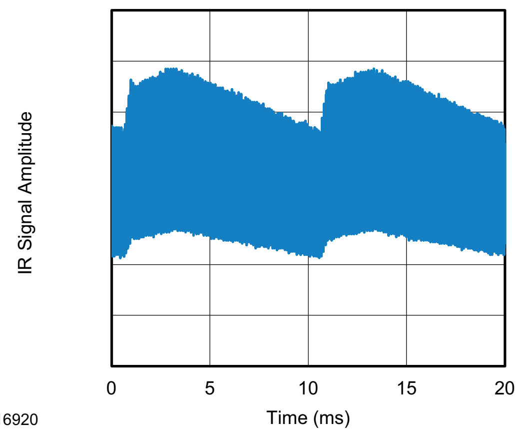


Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation

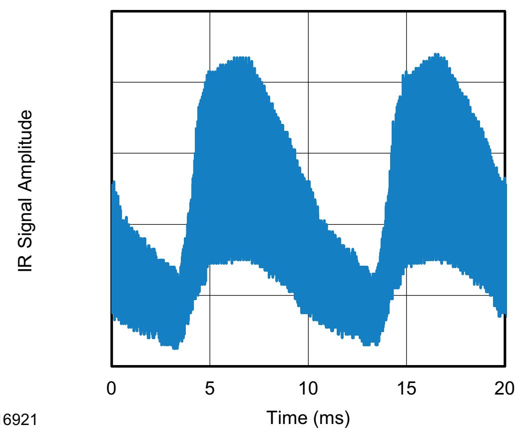


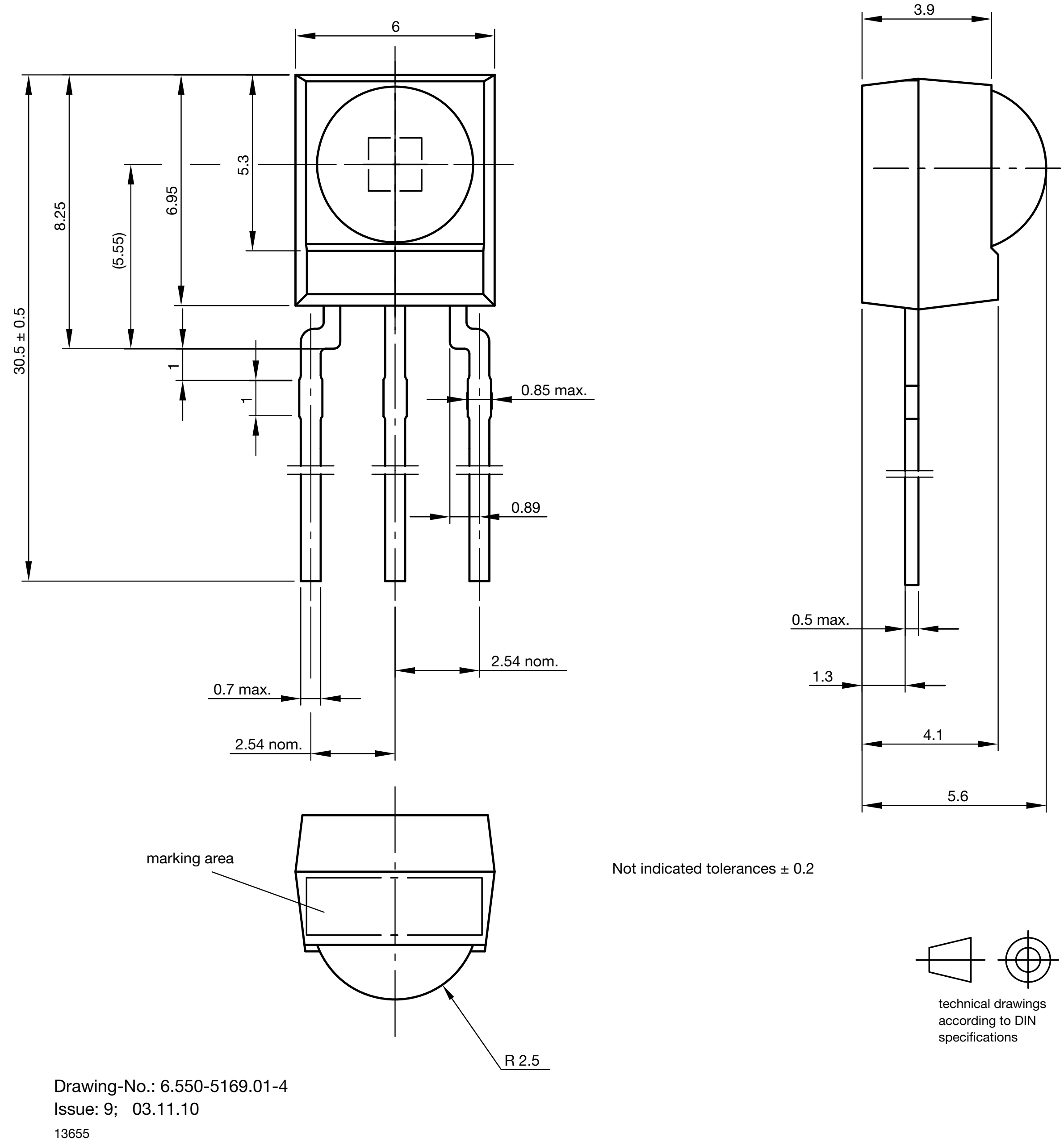
Fig. 14 - IR Emission from Fluorescent Lamp With High Modulation

	TSOP122.., TSOP142..	TSOP124.., TSOP144..	TSOP126.., TSOP146..
Minimum burst length	19 cycles/burst	10 cycles/burst	19 cycles/burst
After each burst of length a minimum gap time is required of	19 to 85 cycles ≥ 19 cycles	10 to 40 cycles ≥ 12 cycles	19 to 50 cycles ≥ 19 cycles
For bursts greater than a minimum gap time in the data stream is needed of	85 cycles > 6 x burst length	40 cycles > 10 x burst length	50 cycles > 10 x burst length
Maximum number of continuous short bursts/second	800	1300	800
RC-5 code	Yes	Preferred	Preferred
RC-6 code	Yes	Preferred	Yes
NEC code	Yes	Preferred	Yes
r-step code	Yes	Preferred	Yes
Sony code	Preferred	No	No
RCA 56 kHz code	Yes	Yes	Preferred
Suppression of interference from fluorescent lamps	Fig. 13	Fig. 13 and Fig. 14	Fig. 13 and Fig. 14

Note

- For data formats with short bursts please see the datasheet for TSOP121.., TSOP123.., TSOP125.., TSOP141.., TSOP143.., TSOP145..

PACKAGE DIMENSIONS in millimeters



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