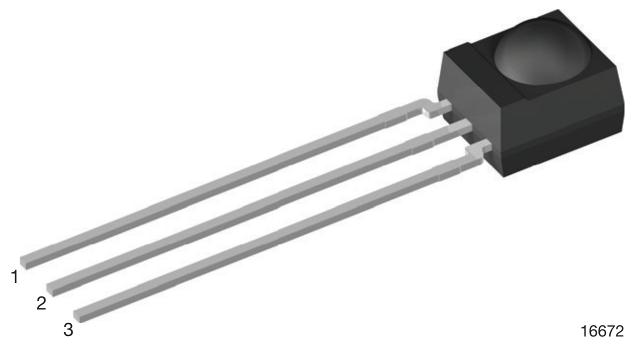
IR Receiver Modules for Remote Control Systems



LINKS TO ADDITIONAL RESOURCES

Product Page | 3D Models | Calculators | Marking | Packages | Holders | Bends and Cuts

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 TSOP121.., TSOP123.., TSOP125.., TSOP141.., TSOP143.., and TSOP145.. series devices are designed to receive short burst codes (6 or more carrier cycles per burst). The third digit designates the AGC level (AGC1, AGC3, or AGC5) 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. AGC1 provides basic noise suppression, AGC3 provides enhanced noise suppression and AGC5 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.

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

MECHANICAL DATA

Pinning for TSOP14...:

1 = OUT, 2 = GND, 3 = V_S

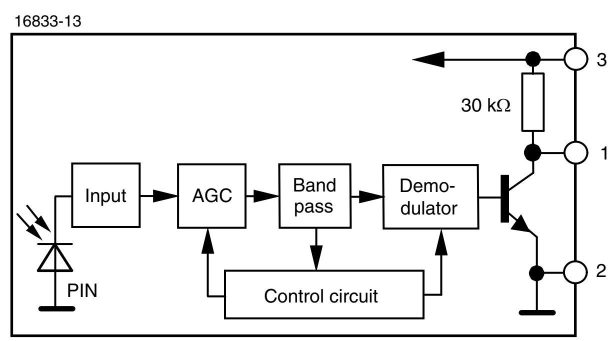
Pinning for TSOP12...:

1 = OUT, 2 = V_S, 3 = GND

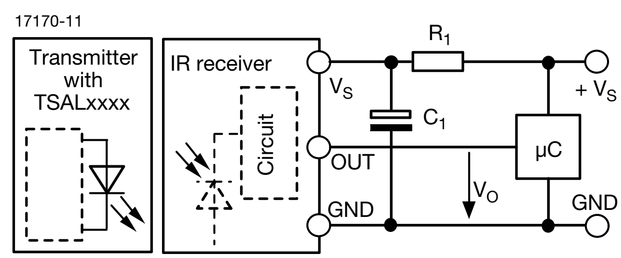
ORDERING CODE

TSOP12..., TSOP14... - 2160 pieces in tubes

BLOCK DIAGRAM



APPLICATION CIRCUIT



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

PARTS TABLE							
AGC		**BASIC NOISE SUPPRESSION (AGC1)**		**ENHANCED NOISE SUPPRESSION (AGC3)**		**MAXIMIZED NOISE SUPPRESSION (AGC5)**	
Carrier frequency	30 kHz	TSOP14130	TSOP12130	TSOP14330	TSOP12330	TSOP14530	TSOP12530
	33 kHz	TSOP14133	TSOP12133	TSOP14333	TSOP12333	TSOP14533	TSOP12533
	36 kHz	TSOP14136	TSOP12136	TSOP14336 (1)	TSOP12336 (1)	TSOP14536	TSOP12536
	38 kHz	TSOP14138	TSOP12138	TSOP14338 (2)(4)	TSOP12338 (2)(4)	TSOP14538	TSOP12538
	40 kHz	TSOP14140	TSOP12140	TSOP14340	TSOP12340	TSOP14540	TSOP12540
	56 kHz	TSOP14156	TSOP12156	TSOP14356 (3)	TSOP12356 (3)	TSOP14556	TSOP12556
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) RCMM (2) RECS-80 Code (3) r-map (4) XMP-1, XMP-2					
Special options		• Narrow optical filter: www.vishay.com/doc?81590 • Wide optical filter: www.vishay.com/doc?82726					

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	$t \leq 10$ 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	0.7	0.9	mA
	$E_v = 40$ klx, sunlight	I_{SH}	-	0.8	-	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

ELECTRICAL AND OPTICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Minimum irradiance	Pulse width tolerance: t_{pi} - 3.0/f_0 < t_{po} < t_{pi} + 3.5/f_0, test signal see Fig. 1	$E_{e\ min.}$	-	0.08	0.15	mW/m²
Maximum irradiance	t_{pi} - 3.0/f_0 < t_{po} < t_{pi} + 3.5/f_0, test signal see Fig. 1	$E_{e\ max.}$	30	-	-	W/m²
Maximum long burst irradiance (AGC3, AGC5)	t_{pi} - 3.0/f_o < t_{po} < t_{pi} + 3.5/f_o, test signal see Fig. 1, dark ambient, burst length > 30 cycles	$E_{e\ max.}$	0.5	-	-	W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$	-	± 45	-	°

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

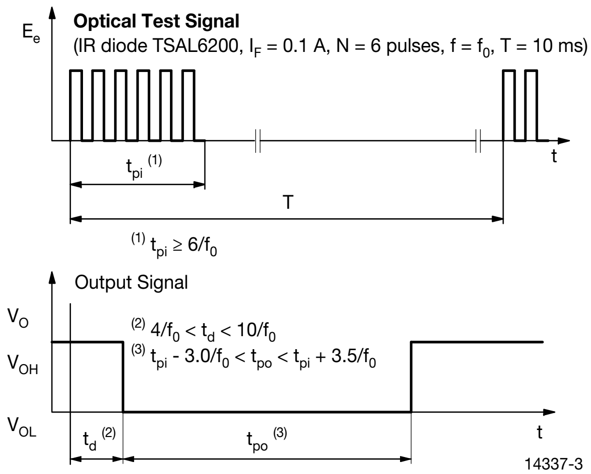


Fig. 1 - Output Delay and Pulse-Width

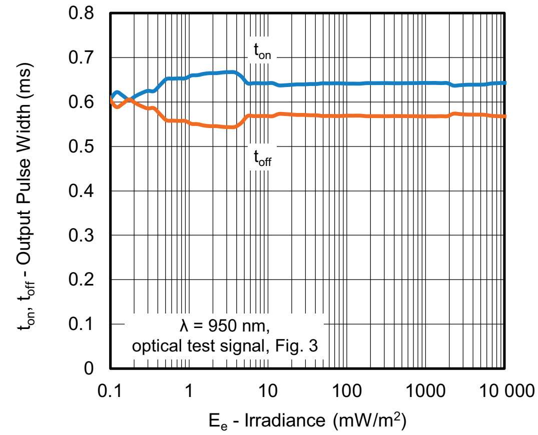


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

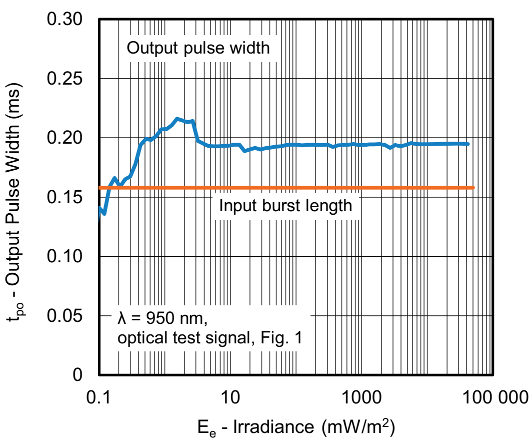


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

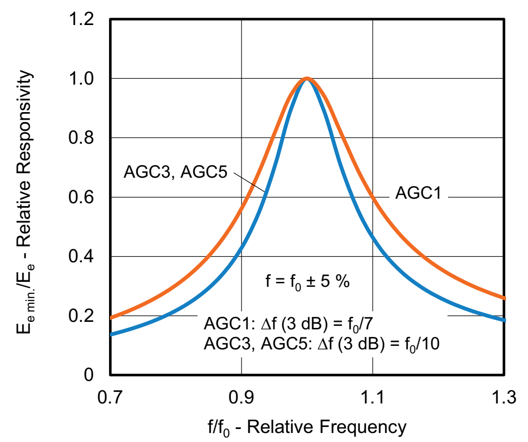


Fig. 5 - Frequency Dependence of Responsivity

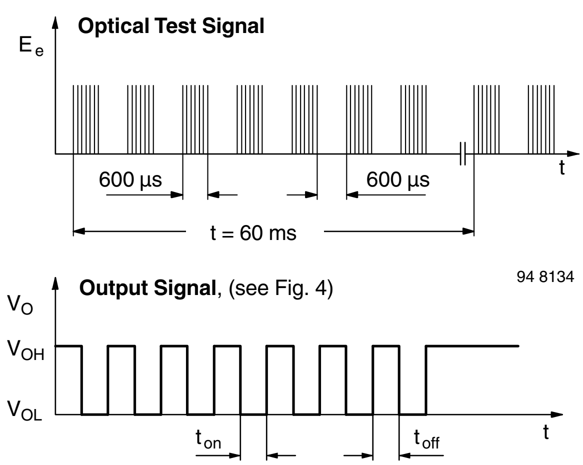


Fig. 3 - Test Signal

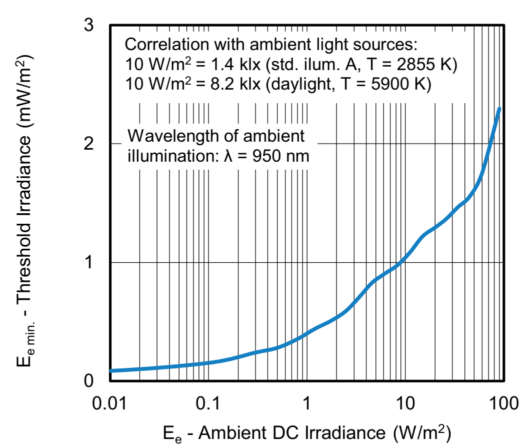


Fig. 6 - Sensitivity in Bright Ambient

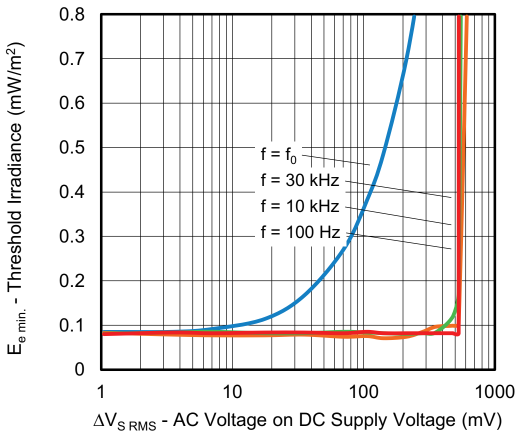


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

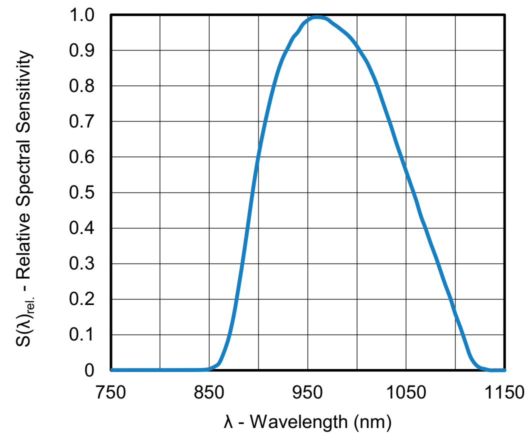


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

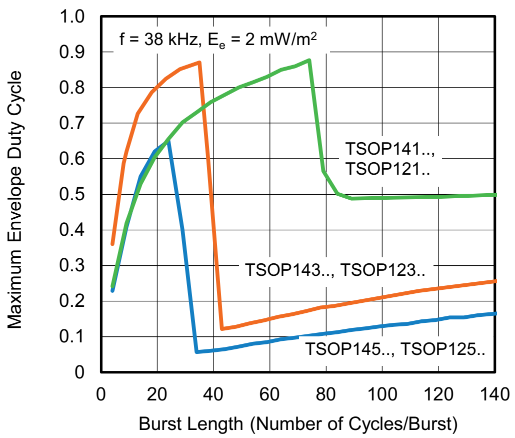


Fig. 8 - Maximum Envelope Duty Cycle vs. Burst Length

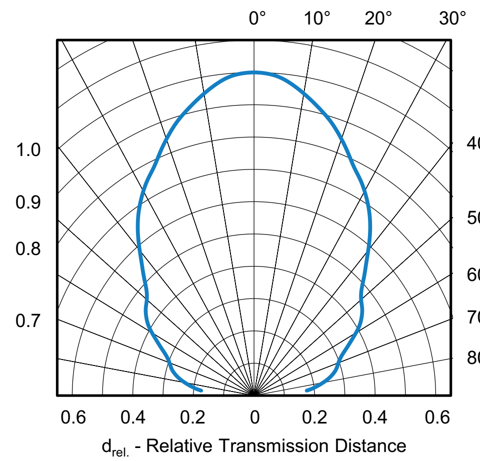


Fig. 11 - Directivity

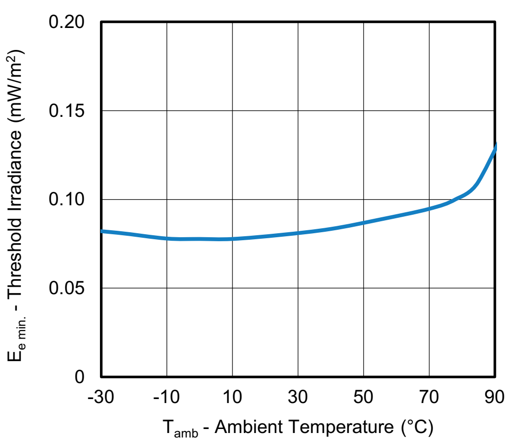


Fig. 9 - Sensitivity vs. Ambient Temperature

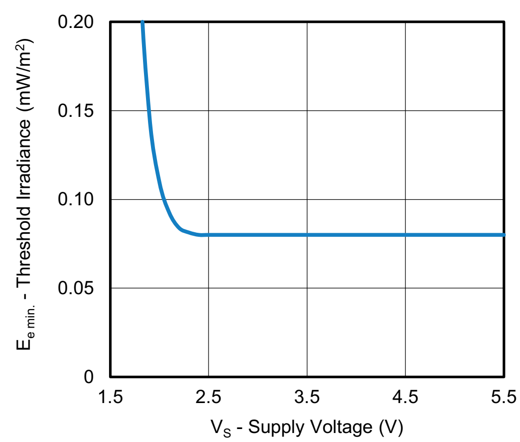


Fig. 12 - Sensitivity vs. Supply Voltage

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

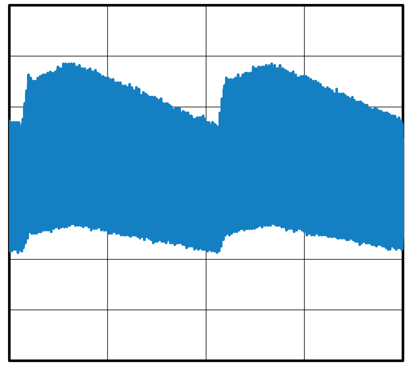


Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation

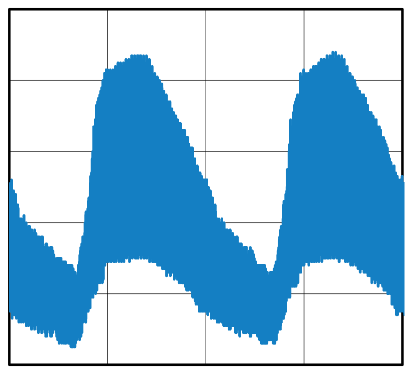


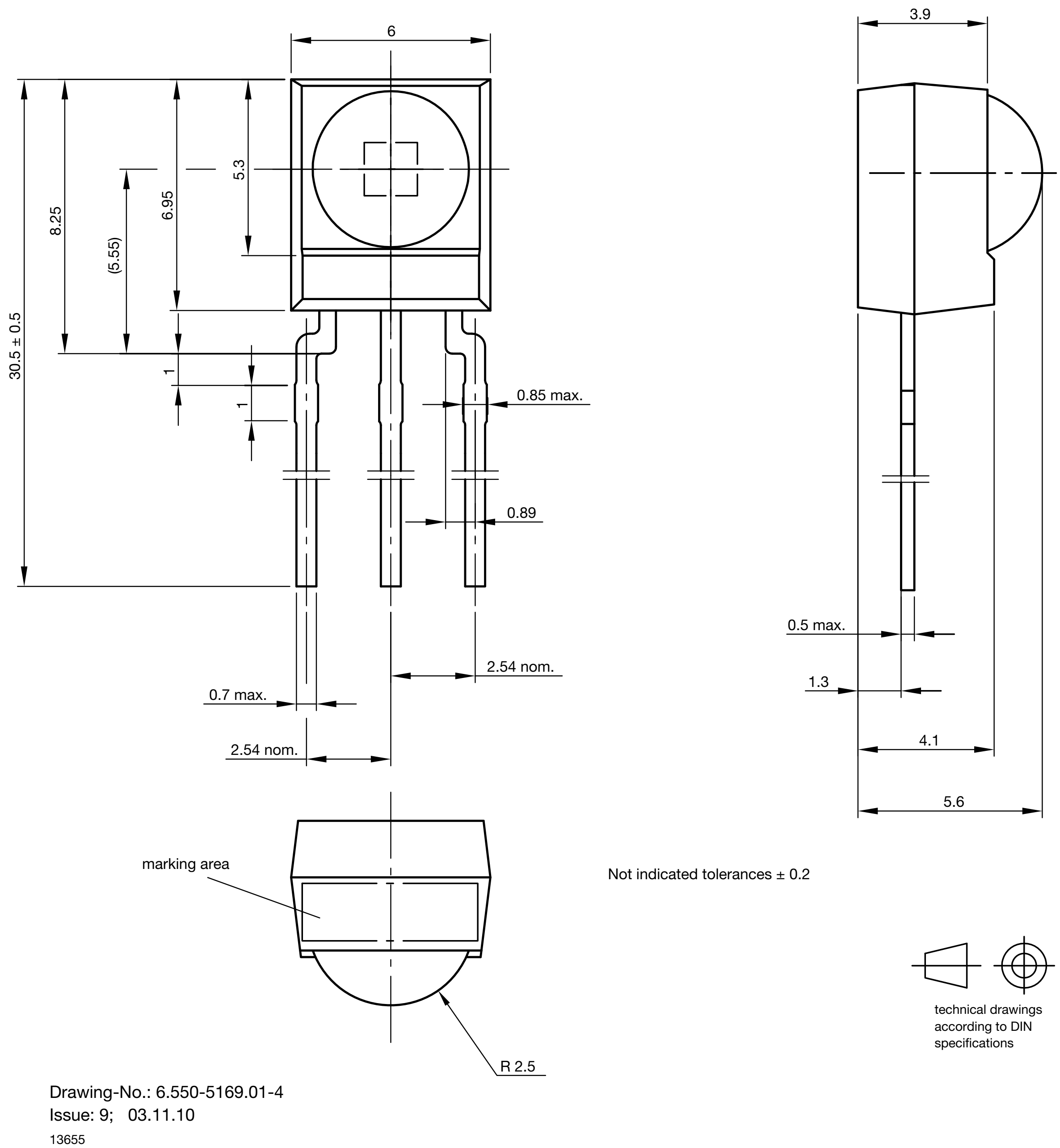
Fig. 14 - IR Emission from Fluorescent Lamp With High Modulation

	TSOP121.., TSOP141..	TSOP123.., TSOP143..	TSOP125.., TSOP145..
Minimum burst length	6 cycles/burst	6 cycles/burst	6 cycles/burst
After each burst of length A gap time is required of	6 to 70 cycles ≥ 10 cycles	6 to 35 cycles ≥ 10 cycles	6 to 24 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 1 x burst length	35 cycles > 6 x burst length	24 cycles > 25 ms
Maximum number of continuous short bursts/second	1800	2800	1800
RCMM code	Yes	Preferred	Yes
XMP-1 code	Yes	Preferred	Yes
r-map code	Yes	Preferred	Yes
Suppression of interference from fluorescent lamps	Fig. 13	Fig. 13 and Fig. 14	Fig. 13 and Fig. 14

Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP122.., TSOP124.., TSOP126.., TSOP142.., TSOP144.., TSOP146..

PACKAGE DIMENSIONS in millimeters



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