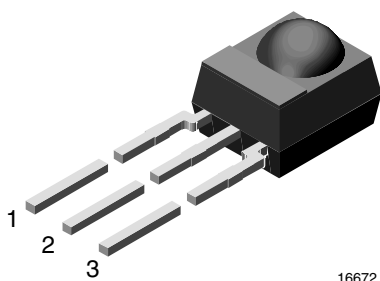




## IR Receiver Modules for Remote Control Systems



16672

## MECHANICAL DATA

## Pinning for TSOP44..., TSOP48...:

1 = OUT, 2 = GND, 3 =  $V_S$ 

## Pinning for TSOP22..., TSOP24...:

1 = OUT, 2 =  $V_S$ , 3 = GND

## FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Material categorization:

For definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
 COMPLIANT  
 HALOGEN  
**FREE**  
**GREEN**  
 (5-2008)

## DESCRIPTION

The TSOP22..., TSOP48..., TSOP24.. and TSOP44.. series are miniaturized IR receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on lead frame, the epoxy package contains an IR filter.

The demodulated output signal can be directly connected to a microprocessor for decoding.

The TSOP24..., TSOP44.. are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP24.. and TSOP44.. may suppress some data signals. The TSOP22..., TSOP48.. are legacy products for all common IR remote control data formats. Between these four receiver types, the TSOP24..., TSOP44.. are preferred. Customers should initially try the TSOP24..., TSOP44 in their design.

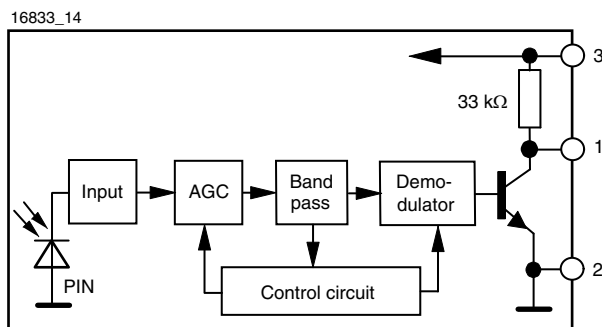
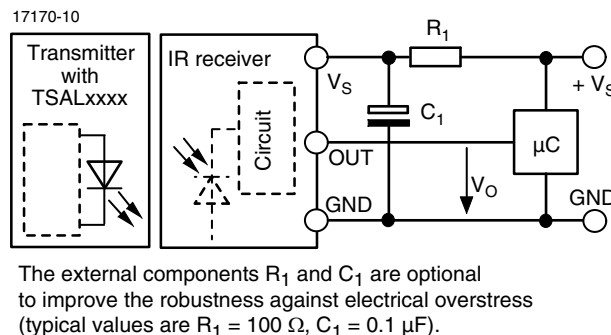
These components have not been qualified according to automotive specifications.

## PARTS TABLE

AGC		LEGACY, FOR LONG BURST REMOTE CONTROLS (AGC2)		RECOMMENDED FOR LONG BURST CODES (AGC4) <sup>(1)</sup>	
Carrier frequency	30 kHz	TSOP4830	TSOP2230	TSOP4430	TSOP2430
	33 kHz	TSOP4833	TSOP2233	TSOP4433	TSOP2433
	36 kHz	TSOP4836	TSOP2236	TSOP4436 <sup>(2)(3)(4)</sup>	TSOP2436 <sup>(2)(3)(4)</sup>
	38 kHz	TSOP4838	TSOP2238	TSOP4438 <sup>(5)(6)(7)</sup>	TSOP2438 <sup>(5)(6)(7)</sup>
	40 kHz	TSOP4840	TSOP2240	TSOP4440	TSOP2440
	56 kHz	TSOP4856	TSOP2256	TSOP4456 <sup>(7)(8)</sup>	TSOP2456 <sup>(7)(8)</sup>
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
Dimensions (mm)		6.0 W x 6.95 H x 5.6 D			
Mounting		Leaded			
Application		Remote control			
Best remote control code		<sup>(2)</sup> RC-5 <sup>(3)</sup> RC-6 <sup>(4)</sup> Panasonic <sup>(5)</sup> NEC <sup>(6)</sup> Sharp <sup>(7)</sup> r-step <sup>(8)</sup> Thomson RCA			

## Note

<sup>(1)</sup> We advise try AGC4 first if the burst length is unknown.

**BLOCK DIAGRAM****APPLICATION CIRCUIT****ABSOLUTE MAXIMUM RATINGS**

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage		$V_S$	-0.3 to +6	V
Supply current		$I_S$	5	mA
Output voltage		$V_O$	-0.3 to 5.5	V
Voltage at output to supply		$V_S - V_O$	-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	$T_{amb} \leq 85 \text{ °C}$	$P_{tot}$	10	mW
Soldering temperature	$t \leq 10 \text{ s}$ , 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** ( $T_{amb} = 25 \text{ °C}$ , unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current	$E_v = 0$ , $V_S = 5 \text{ V}$	$I_{SD}$	0.55	0.7	0.9	mA
	$E_v = 40 \text{ klx}$ , 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, $I_F = 200 \text{ mA}$	$d$		45		m
Output voltage low	$I_{OSL} = 0.5 \text{ mA}$ , $E_e = 0.7 \text{ mW/m}^2$ , test signal see fig. 1	$V_{OSL}$			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$ , test signal see fig. 1	$E_e \text{ min.}$		0.12	0.25	$\text{mW/m}^2$
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$ , test signal see fig. 1	$E_e \text{ max.}$	50			$\text{W/m}^2$
Directivity	Angle of half transmission distance	$\phi_{1/2}$		$\pm 45$		deg



## TYPICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

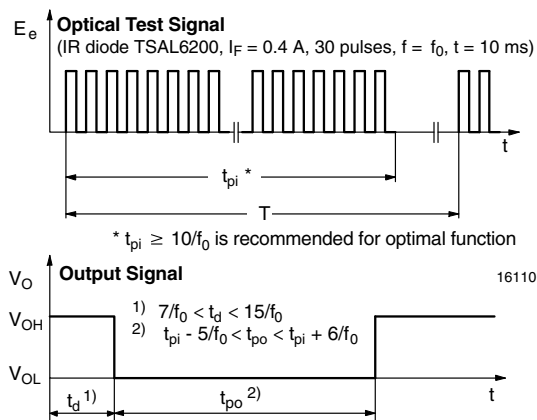


Fig. 1 - Output Active Low

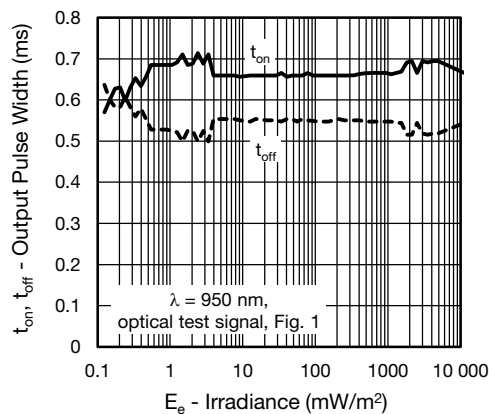


Fig. 4 - Output Pulse Diagram

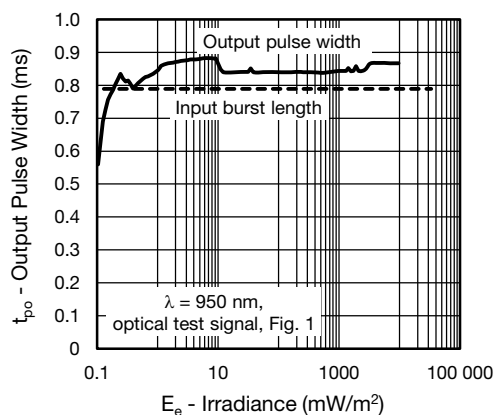


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

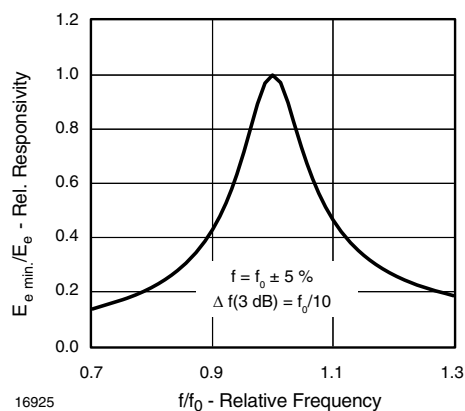


Fig. 5 - Frequency Dependence of Responsivity

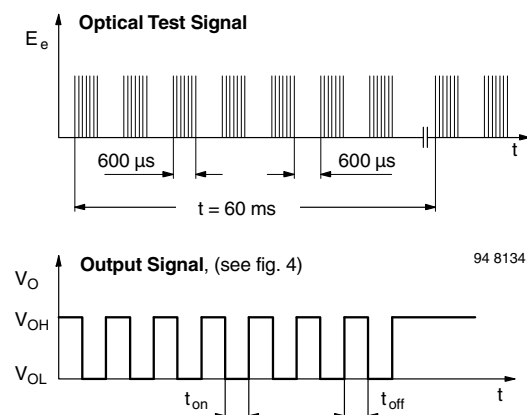


Fig. 3 - Output Function

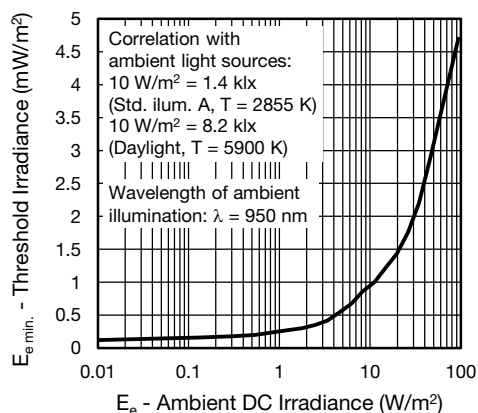


Fig. 6 - Sensitivity in Bright Ambient

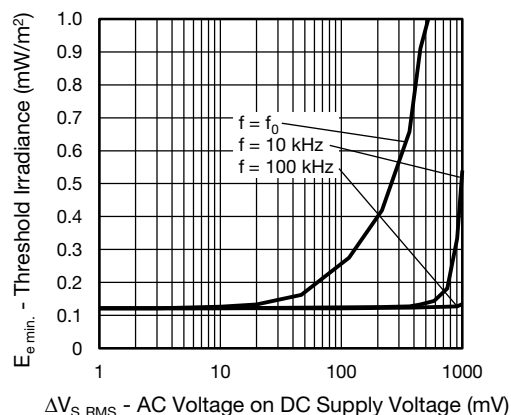


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

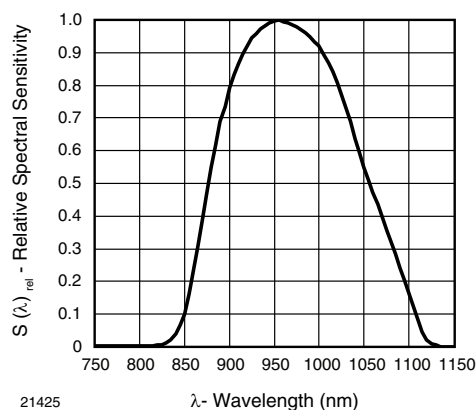


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

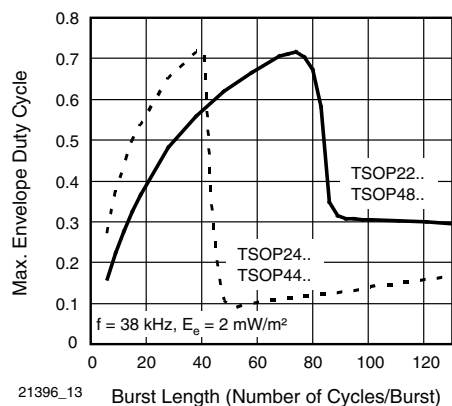


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

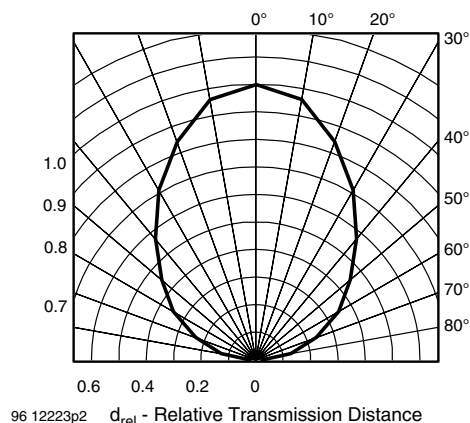


Fig. 11 - Horizontal Directivity

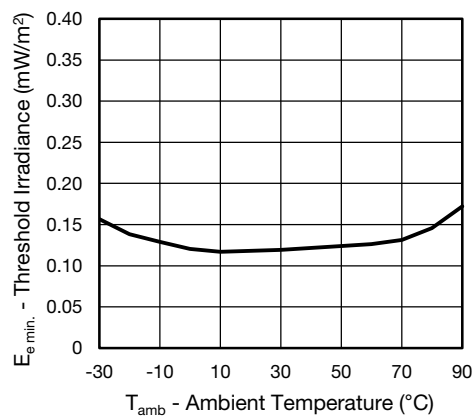


Fig. 9 - Sensitivity vs. Ambient Temperature

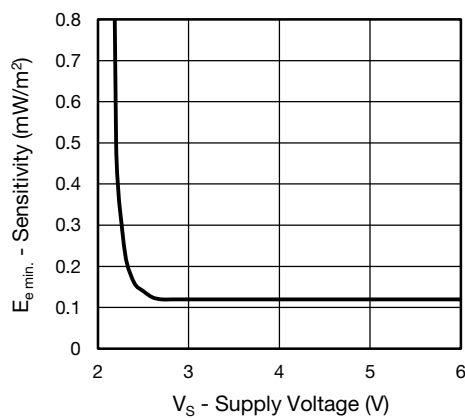


Fig. 12 - Sensitivity vs. Supply Voltage

## 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 figure 13 or figure 14).

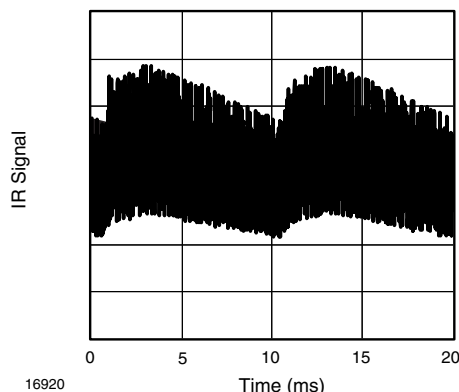


Fig. 13 - IR Disturbance from Fluorescent Lamp with Low Modulation

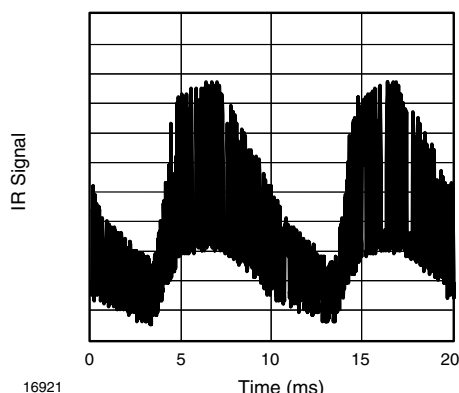


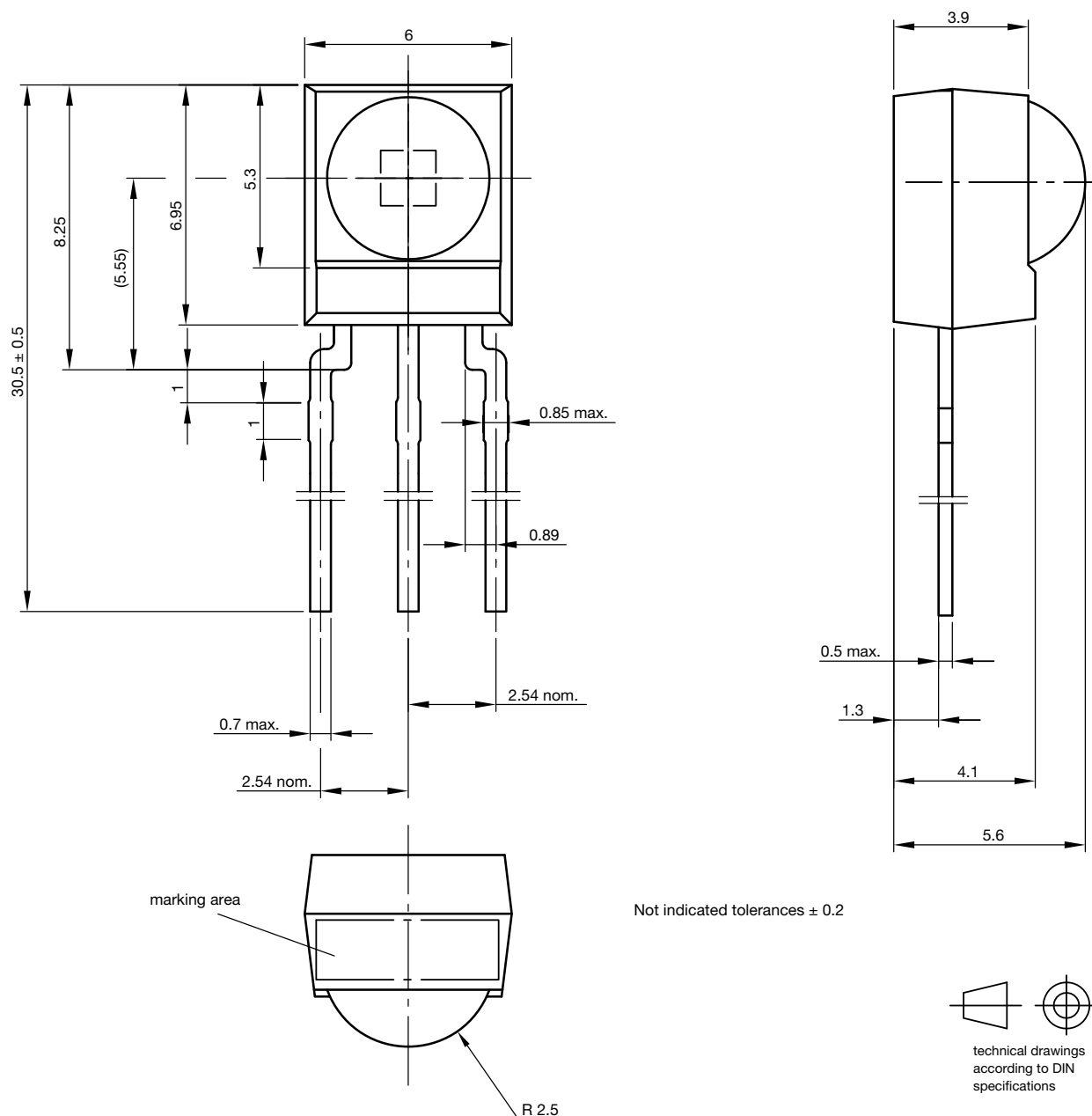
Fig. 14 - IR Disturbance from Fluorescent Lamp with High Modulation

	TSOP22..., TSOP48..	TSOP24..., TSOP44..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 12 cycles	10 to 35 cycles ≥ 12 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	800	1300
NEC code	yes	preferred
RC5/RC6 code	yes	preferred
Thomson 56 kHz code	yes	preferred
Sharp code	yes	preferred
Suppression of interference from fluorescent lamps	Most common disturbance patterns are suppressed	Even extreme disturbance patterns are suppressed

### Notes

- For data formats with short bursts please see the datasheet of TSOP23..., TSOP43..
- Best choice of AGC for some popular IR-codes:
  - TSOP4436, TSOP2436: RC-5, RC-6, Panasonic
  - TSOP4438, TSOP2438: NEC, Sharp, r-step
  - TSOP4456, TSOP2456: r-step, Thomson RCA
- For SIRCS 15 and 20 bit, Sony 12 bit IR-codes, please see the datasheet for TSOP4S40, TSOP2S40

### PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.550-5169.01-4

Issue: 9; 03.11.10

13655



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