
PRODUCT GUIDE

Photosensors

s e m i c o n d u c t o r

PHOTO SENSOR

Contents

1. Part No. Index	2	8. Application Examples	14
2. New Product Digest	3	8.1 Optical Remote Controls	14
3. Classification of Photosensors	4	8.2 Fax Machines	14
4. Services Provided by Photosensors	4	8.3 Inkjet Printers	14
5. Features of Photosensors	5	8.4 Page Printers	15
6. Selection Guide by Package	6	8.5 Copiers	15
7. Product List, and Visible LEDs for Sensor Light Sources	8	8.6 TV Monitors	15
7.1 Infrared LEDs, and Visible LEDs for Sensor Light Sources	8	8.7 Cellular Phones	16
7.2 Phototransistors	9	8.8 Image Scanners	16
7.3 Photodiodes	9	8.9 Digital Cameras	16
7.4 Photo-ICs (Digital Output)	10	8.10 Office Networks	17
7.5 Photo-ICs (Analog Output)	11	8.11 Audiovisual Hi-Fi Component Systems	17
7.6 Photointerrupters (Phototransistor Output)	12	8.12 Wireless Keyboards and Wireless Mice	17
7.7 Photointerrupters (Photo-IC Output)	13	8.13 Others	18
7.8 Photointerrupters (with Connectors)	13	9. End-of-Life Products	19

1 Part Number Index

Part Number	Page	Part Number	Page	Part Number	Page
TLN105B(F)	8	TPS610(F)	9	TPS853	11
TLN108(F)	8	TPS611(F)	9	TPS855(F)	11
TLN110(F)	8	TPS615(F)	9	TPS856	11
TLN115A(F)	8	TPS616(F)	9	TPS859	11
TLN117(F)	8	TPS622(F)	9	TLP830(F)	12
TLN119(F)	8	TPS703(F)	9	TLP831(F)	12
TLN201(F)	8	TPS704(F)	9	TLP832(F)	12
TLN225(F)	8	TPS816(F)	10	TLP833(F)	12
TLN226(F)	8	TPS820(F)	11	TLP848	12
TLN227(F)	8	TPS841(F)	10	TLP1032(F)	13
TLN231(F)	8	TPS842A(F)	10	TLP1033A(F)	13
TLN233(F)	8	TPS843(F)	10	TLP1243(C8)	13
TLN238(F)	8	TPS844(F)	10	TLP1255(C8, Q)	13
TLOH9204	8	TPS851	11		
TPS601A(F)	9	TPS852	11		

PRODUCT GUIDE

2 New Product Digest

Surface-Mount Photo-IC for Ambient Light Sensor

NEW



TPS859

The TPS859 is photo-IC that incorporates a photodiode, a current amplifier and a luminous-efficiency correction function in a single chip. Employing a new filter technology, luminous-efficiency function has been improved and achieved an excellent responsivity that is close to the response of human eyes.

In addition, the TPS859 can be operated at lower voltage than the previous series and features a higher sensitivity and a reduced sensitivity variation. Further enhanced features of the TLP859 as a power saving device contributes to power saving in various display and automated devices.

- Small, thin surface-mount package: 1.6 mm × 1.6 mm × 0.55 mm (typ.)
- Low power supply voltage: $V_{CC} = 1.8$ to 5.5 V
- High sensitivity: Light current (I_L) = 160 to 320 μA @ $E_v = 100$ lx using fluorescent light

Auto Focus (AF) Assist Lamp for Digital Still Cameras

NEW



TLOH9204

With a high-intensity InGaAlP LED, the TLOH9204 is specifically designed as an AF assist lamp for digital still cameras. The optimized lens cast provides approximately 1.4 times the luminous intensity, compared with the previous product. This helps to bring a distant subject into focus and reduce camera's power consumption.

- Luminous intensity (on axis): $I_v = 21$ cd (typ.) @ $I_F = 20$ mA, $T_a = 25^\circ C$
- Low forward voltage: $V_F = 2$ V (typ.) @ $I_F = 20$ mA, $T_a = 25^\circ C$
- Half-angle value: $\theta_{\frac{1}{2}} = 14^\circ$ (typ.)
- Peak Emission wavelength: $\lambda_p = 612$ (typ.) @ $I_F = 20$ mA, $T_a = 25^\circ C$

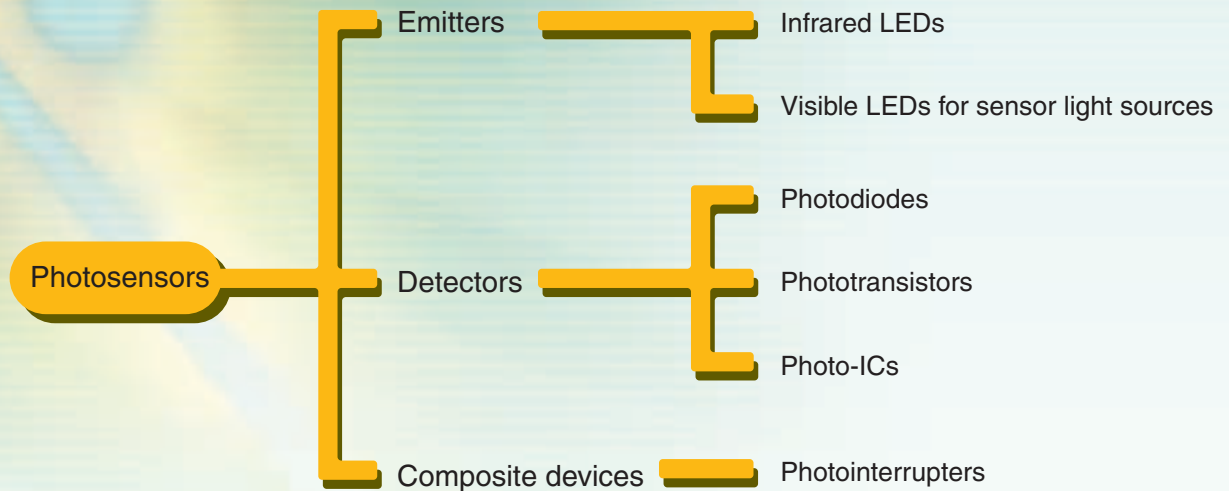
As of February 2007

■ Documents related to the products in this catalog are also available on the following website:

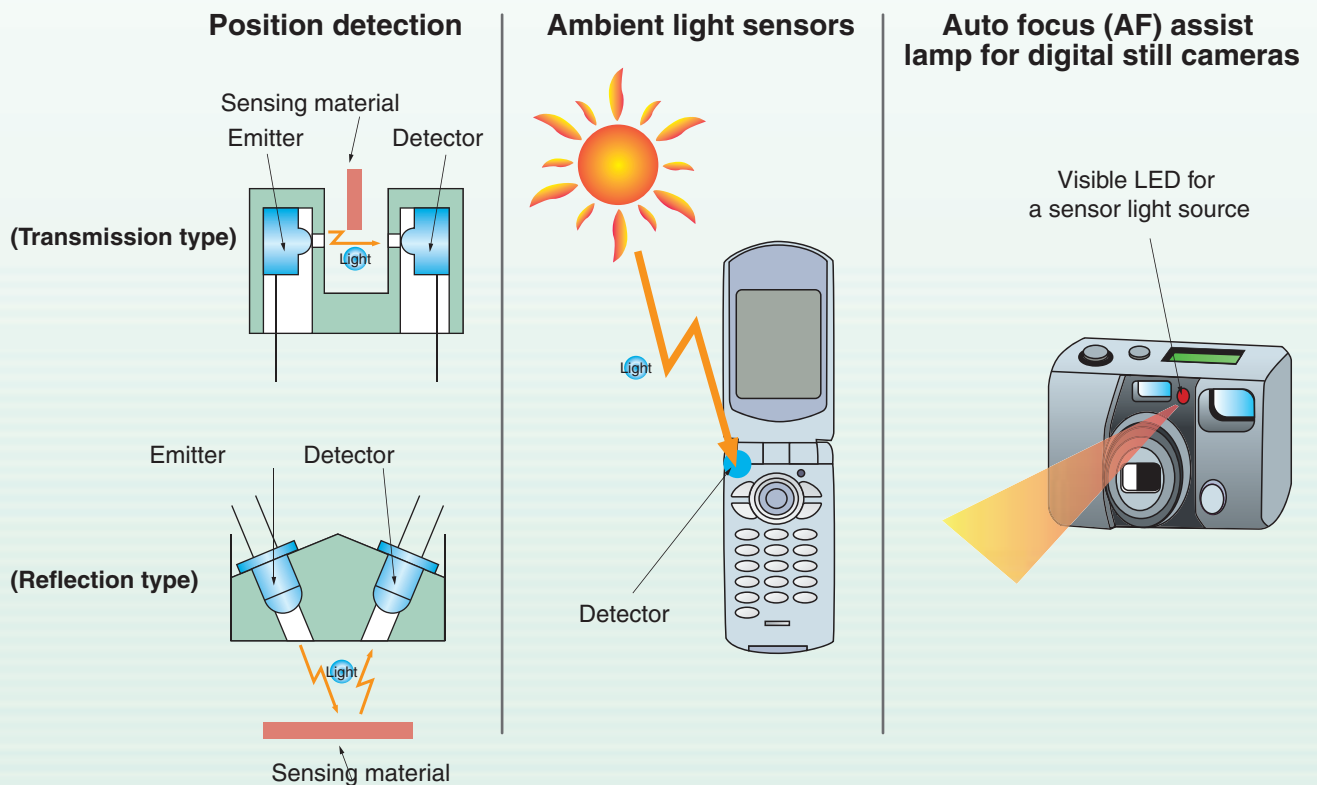
<http://www.semicon.toshiba.co.jp/eng/product/opto/index.html>

3 Classification of Photosensors

Photosensors are classified as follows:



4 Applications of Photosensors



5 Features of Photosensors

Infrared LEDs, and visible LEDs for sensor light sources

- TLN100 Series..... Infrared LEDs of λ_p (peak-emission wavelength) = 940 nm to 950 nm
The light output is greater than that of visible LEDs and is most suitable for light sources for optoelectronic switches.
- TLN200 Series..... Infrared LEDs of λ_p = 870 nm to 880 nm. The radiant power is greater than that of the TLN100 Series.
- TLOH9200 Series Visible (orange) LEDs for digital still camera's auto focus(AF) assist lamps

Photodiodes

- TPS700 Series High-speed response detectors best suited for optical remote controls and various analog detection

Phototransistors

- TPS600 Series Highly sensitive detectors suitable for optoelectronic switches

Photo-ICs













- TPS800 series Detectors incorporate a photodiode and various circuits in a single chip.
Digital output type: high-speed response and suitable for optoelectronic switches
Linear output type: suitable for ambient light sensors, optoelectronic switches

Photointerrupters

- TLP800 Series..... Phototransistor output
- TLP1000 Series..... Photo-IC output, which can be directly connected to a logic IC.
- TLP1200 Series..... Photointerrupters with connectors
Two output types are available: Phototransistor output and Photo-IC output.

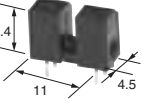
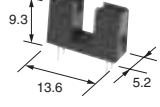
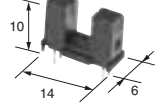
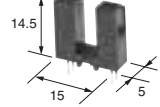
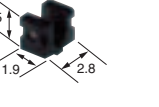
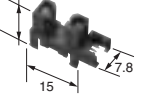
6 Selection Guide by Package

■ Emitters and Detectors

Package		TO-18CAN	φ3	φ5			Side-View Package				Surface-Mount Package		
External Appearance													
Detector	Infrared LED	TLN108(F) TLN201(F)	TLN119(F) TLN238(F)	TLN105B(F) TLN110(F) TLN115A(F) TLN231(F) TLN233(F)	TLN225(F) TLN226(F)	TLN227(F)	TLN117(F)						NEW TLOH9204 ^{*1}
	Photo-transistor	TPS601A(F)	TPS615(F) TPS616(F)	TPS610(F) TPS611(F)			TPS622(F)						
	Photodiode							TPS703(F) TPS704(F)					
	Photo-IC						TPS820(B, F) TPS841(F) TPS842A(F) TPS843(F) TPS844(F)		TPS816(F)	TPS855(F)	TPS851 TPS853	NEW TPS852 TPS856 TPS859	

*1: Visible LED for a sensor light source

■ Photointerrupters

Package		PWB Direct Mounting				Surface-Mount Package	Snap-In Mounting
External Appearance							
(mm)		7.4 11 4.5	9.3 13.6 5.2	10 14 6	14.5 15 5	2.5 1.9 2.8	11.4 15 7.8
Gap	(mm)	2	4.2	5	5	1.2	5
Slit Width	(mm)	0.15	0.5 ^{*2}	0.5	0.5	0.3	0.7
Output Type	Photo-transistor	TLP830(F)	TLP831(F)	TLP832(F)	TLP833(F)	TLP848	TLP1243(C8)
	Photo-IC			TLP1032(F) TLP1033A(F)			TLP1255(C8, Q)

*2: Horizontal slit

7 Product List

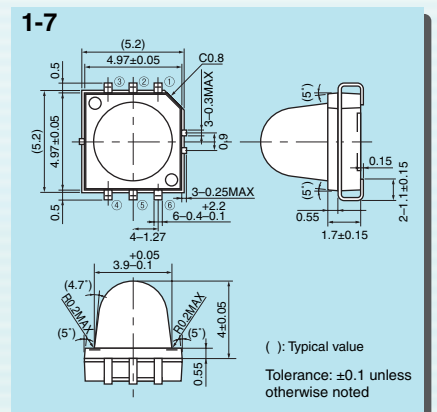
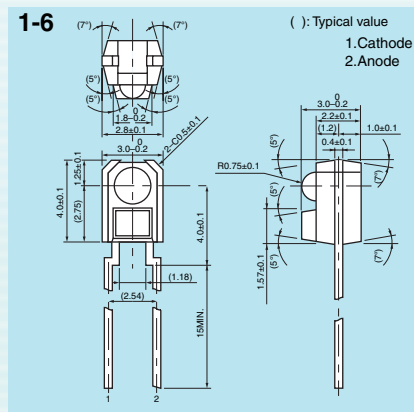
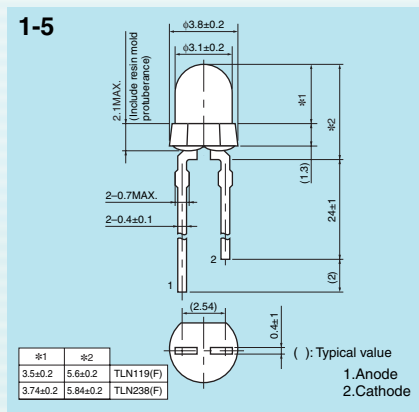
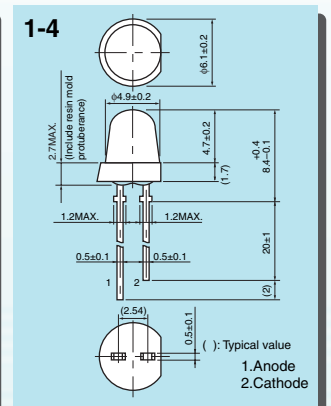
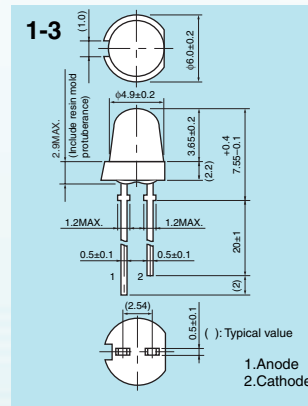
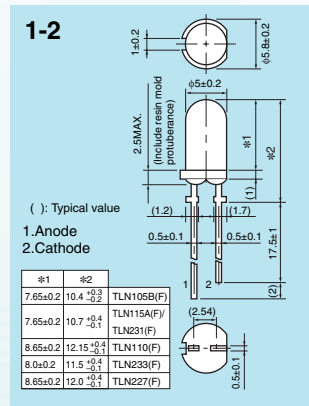
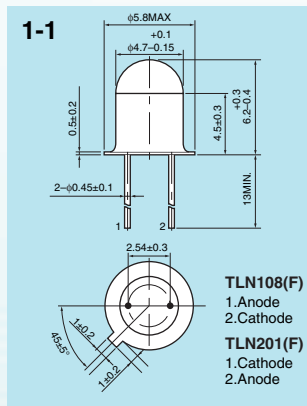
7.1 Infrared LEDs, and Visible LEDs for Sensor Light Sources

Part No.	Package	Electrical and Optical Characteristics (Ta = 25 °C)									Package No.	Applications
		Radiant intensity (mW/sr)				Radiant power (mW)			Peak-emission wavelength (nm)	Half-angle value (°)		
		Part number with rank	Min	Max	If (mA)	Min	Max	If (mA)				
TLN108(F)	TO-18CAN with lens	—	10	—	50	—	—	—	940	±8	1-1	Optoelectronic switches
TLN201(F)		—	20	—	50	—	—	—	880	±7		
TLN105B(F)	φ5	—	12	—	50	—	—	—	950	±23.5	1-2	Remote controls
TLN110(F)	φ5	—	15	—	50	—	—	—	940	±8		Optoelectronic switches
TLN115A(F)	φ5	—	15	—	50	—	—	—	950	±21		Remote controls
		TLN115A(B, F)	19	—								
TLN227(F)	φ5	—	—	—	—	14	—	50	870	±5		Fiberless optical transmissions
TLN231(F)	φ5	—	35	—	50	—	—	—	870	±16		Fiberless optical transmissions
TLN233(F)	φ5	—	46	—	50	—	—	—	870	±13	Optoelectronic switches	
TLN225(F)	φ4.9	—	—	—	—	14	—	50	870	±21	1-3	Fiberless optical transmissions
TLN226(F)	φ4.9	—	—	—	—	14	—	50	870	±13	1-4	
TLN238(F)	φ3	—	40	—	50	—	—	—	870	±18	1-5	
TLN119(F)	φ3	—	2.5	10	20	—	—	—	945	±30		Optoelectronic switches
		TLN119(B, F)	4.2	10								
TLN117(F)	Small side-view package	—	2	—	20	—	—	—	940	±15	1-6	
		TLN117(B, F)	2	7.5								
		TLN117(C, F)	5	18.7								
TLOH9204 *	6-pin SMD	—	15◆	21◆	20	—	—	—	612	±4	1-7	Designed for digital still camera use

* New product ♦ Intensity(in cd)

Note: If = forward current

Unit: mm



7.2 Phototransistors

Part No.	Package	Electrical and Optical Characteristics (Ta = 25 °C)								Package No.	Applications
		Light current (μA)			Dark current (μA)		Peak-sensitivity wavelength (nm)	Half-angle value (°)	Visible light cut		
		Part number with rank	Min	Max	E(mW/cm²)	Max				VCE(V)	
TPS601A(F)	TO-18 CAN with lens	—	100	—	0.1	0.2	30	800	±10	—	2-1
		TPS601A(A)	100	300							
		TPS601A(B)	200	600							
		TPS601A(C)	400	1200							
TPS610(F)	φ5	—	100	—	0.1	0.1	24	800	±8	—	2-2
TPS611(F)	φ5	—	30	—	0.1	0.1	24	900	±8	Y	
TPS615(F)	φ3	—	20	150	0.1	0.1	24	800	±30	—	2-3
		TPS615(A, F)	20	50							
		TPS615(B, F)	34	85							
		TPS615(C, F)	60	150							
		TPS615(AB, F)	20	85							
		TPS615(BC, F)	34	150							
TPS616(F)	φ3	—	10	75	0.1	0.1	24	900	±30	Y	2-4
		TPS616(A, F)	10	25							
		TPS616(B, F)	17	42.5							
		TPS616(C, F)	30	75							
		TPS616(AB, F)	10	42.5							
		TPS616(BC, F)	17	75							
TPS622(F)	Small side-view	—	27	—	0.1	0.1	24	870	±15	Y	2-4
		TPS622(A, F)	27	80							
		TPS622(B, F)	55	165							

Note: E = radiant incident, VCE = collector-emitter voltage

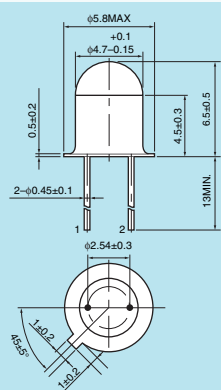
7.3 Photodiodes

Part No.	Package	Electrical and Optical Characteristics (Ta = 25 °C)							Package No.	Applications
		Short-circuit current (μA)		Dark current (nA)		Peak-sensitivity wavelength (nm)	Half-angle value (°)	Visible light cut		
		Min	E (mW/cm ²)	Max	VR (V)					
TPS703(F)	Side-view	0.9	0.1	30	10	960	±65	Y	3-1	Remote controls
TPS704(F)		0.5	0.1	30	10	1000	±65	Y		

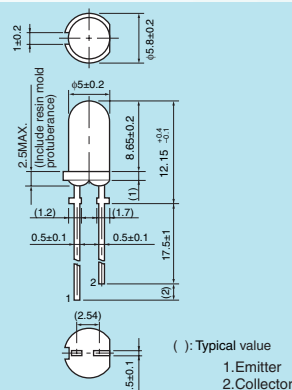
Note: E = radiant incident, VR = reverse voltage

Unit: mm

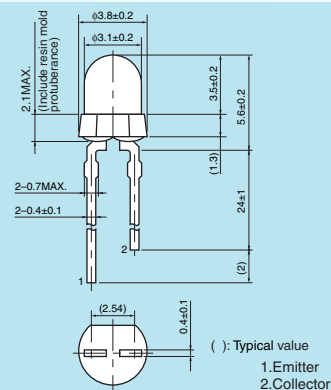
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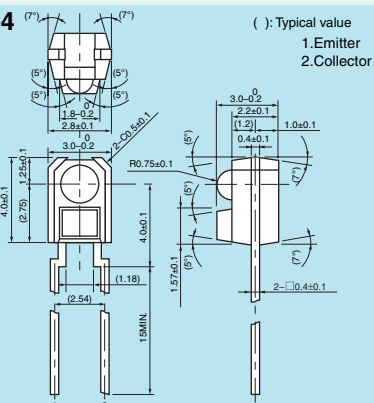
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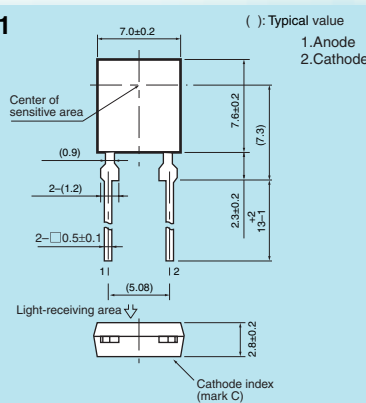
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2-4



3-1



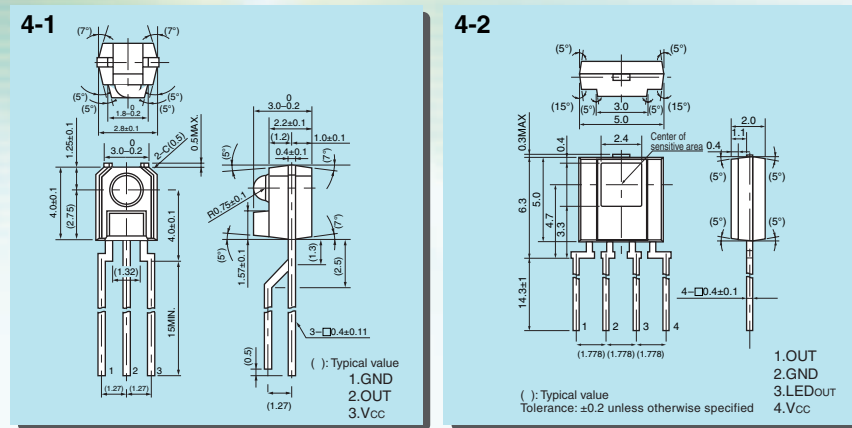
7 Product List

7.4 Photo-ICs (Digital Output)

Part No.	Package and Features	Electrical and Optical Characteristics (Ta = 25 °C)								Package No.	Applications
		Output type		Threshold radiant incidence (mW/cm ²)		Peak-sensitivity wavelength (nm)	Half-angle value (°)	Visible light cut			
		With resistor	Open-collector	L→H Max	H→L Max				Vcc(V)		
TPS841(F)	Small side-view package	—	Y	0.3	—	2.7 to 15	900	±15	Y	4-1	Optoelectronic switches
TPS842A(F)		—	Y	—	0.3	2.7 to 15	900	±15	Y		
TPS843(F)		Y	—	0.3	—	2.7 to 15	900	±15	Y		
TPS844(F)		Y	—	—	0.3	2.7 to 15	900	±15	Y		
TPS816(F)	Side-view, optical modulation	Y	—	0.08	0.1	5	900	±65	Y	4-2	

Note: V_{cc} = supply voltage, L = transmission range, fo = carrier frequency

Unit: mm



Recommended Matched Pairs of Emitters and Detectors

Applications	Emitters	Detectors
Optical remote controls	TLN105B(F), TLN115A(F)	TPS703(F), TPS704(F)
Optoelectronic switches	TLN108(F), TLN201(F)	TPS601A(F)
	TLN119(F), TLN238(F)	TPS615(F), TPS616(F)
	TLN110(F), TLN231(F), TLN233(F)	TPS610(F), TPS611(F)
	TLN117(F)	TPS816(F)
Photointerrupters	TLN117(F)	TPS622(F), TPS820(B, F), TPS841(F) TPS842A(F), TPS843(F), TPS844(F)
Fiberless optical transmissions	TLN231(F), TLN233(F), TLN225(F) TLN226(F), TLN227(F)	TPS703(F), TPS704(F)

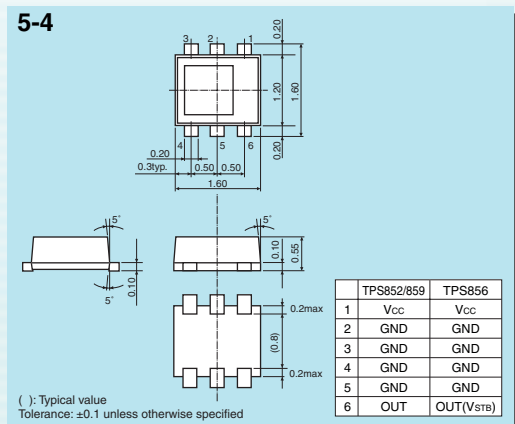
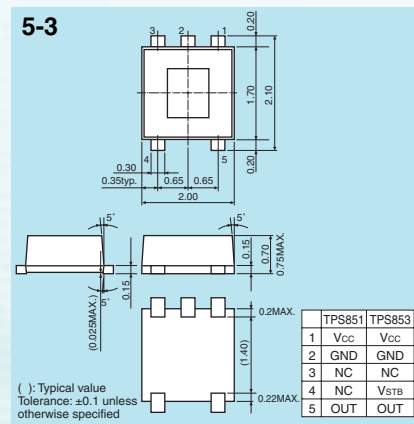
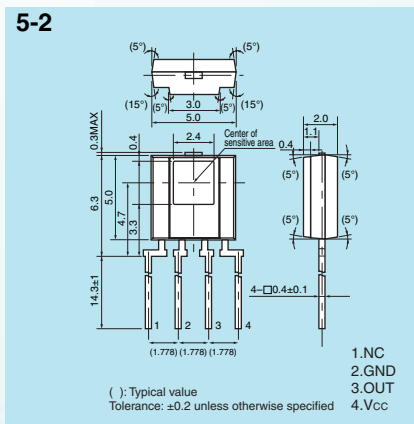
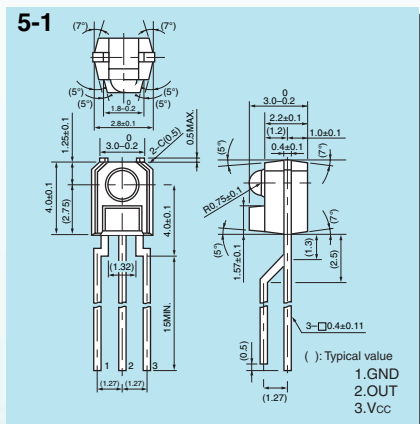
7.5 Photo-ICs (Analog Output)

Part No.	Package	Electrical and Optical Characteristics (Ta = 25 °C)										Package No.	Applications
		Part number with rank	Light current (μA)				Dark current (μA)		Peak-sensitivity wavelength (nm)	Half-angle value (°)	Visible light cut		
Min	Max		Ev(Ix)	Vcc(V)	Max	Vcc(V)							
TPS820(B, F)	Small side-view package	—	1500	6000	E = 0.1 mW/cm ²	5	0.5	5	870	±15	Y	5-1	Optoelectronic switches
TPS855(F)	Side-view package	—	210	350	100	5	0.5	5.5	640	±65	—	5-2	Ambient light sensors
TPS851	Chip type	—	37	74	100	3	0.17	3.3	600	±55	—	5-3	
		TPS851(A)	37	62									
TPS852		—	27	54	100	3	0.1	3.3	600	±55	—	5-4	
		TPS852(A)	30	50									
TPS853		—	37	74	100	3	0.17	3.3	600	±55	—	5-3	
		TPS851(A)	42	70									
TPS856		—	40	80	100	3	0.1	3	580	±55	—	5-4	
		TPS856(A)	44.1	73.7									
TPS859 *		—	160	320	100	3	0.3	3	580	±55	—	5-4	
		TPS859(A)	180	300									

Note: Vcc = supply voltage, Ev = illuminance, E = radiant incident

* New product

Unit: mm



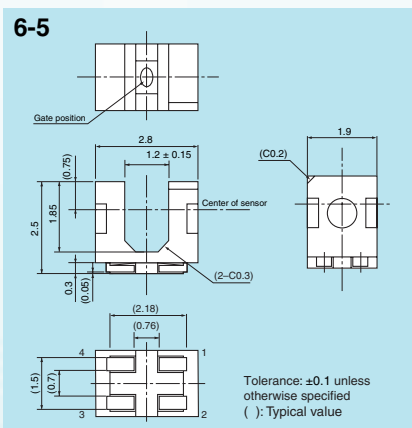
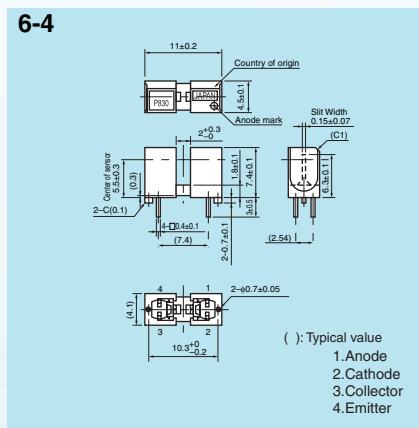
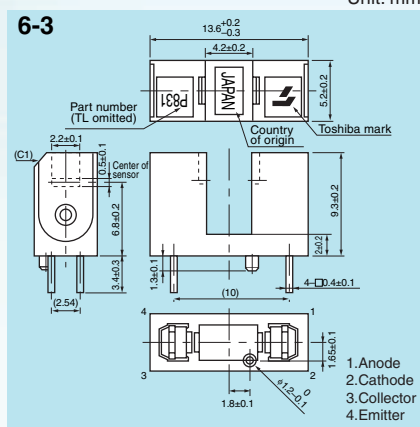
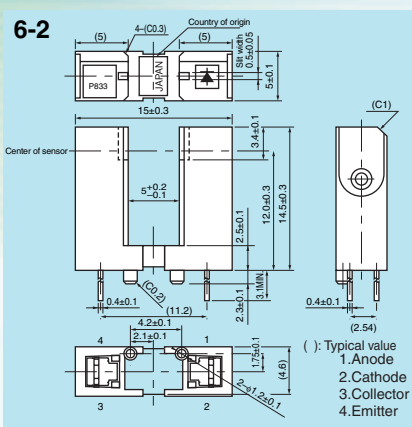
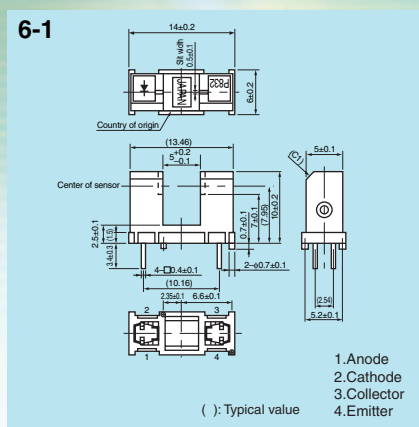
7 Product List

7.6 Photointerrupters (Phototransistor Output)

Part No.	Package	Gap (mm)	Slit Width (mm)	Electrical Characteristics (Ta = 25 °C)				Absolute Maximum Rating*	Package No.	Applications
				Current transfer ratio (%)				Collector-emitter voltage (V)		
				Min	Max	IF(mA)	VCE(V)			
TLP832(F)	PWB direct mounting	5	0.5	5	100	10	2	35	6-1	Printers, Fax machines
TLP833(F)		5	0.5	5	100	10	2	35	6-2	Copiers, Image scanners
TLP831(F)		4.2	0.5*	5	100	10	2	35	6-3	VCRs, Vending machines
TLP830(F)		2	0.15	3	20	10	2	35	6-4	Tape readers
TLP848	Ultra-compact surface-mount package	1.2	0.3	3	24	5	2	15	6-5	Cameras, Cellular phones
TLP848(R)				4	20					

★: Ta = 25 °C * : Horizontal slit Note: If: forward current, VCE: collector-emitter voltage, PWB: Printed wired board

Unit: mm

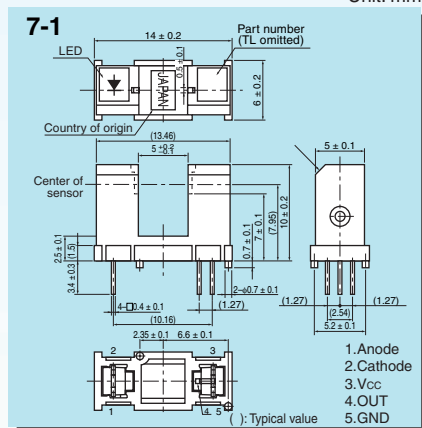


7.7 Photointerrupters (Photo-IC Output)

Part No.	Package	Gap (mm)	Slit Width (mm)	Electrical Characteristics (Ta = 25 °C)				Package No.	Applications
				Output Type	Threshold input current (mA)				
					L→H max	H→L max	Vcc(V)		
TLP1032(F)	PWB direct mounting	5	0.5	Open-collector	3	—	2.7 to 15	7-1	Printers, Fax machines Copiers, Image scanners VCRs, Vending machines Tape readers Amusement equipment
TLP1033A(F)					—	3	2.7 to 15		

Note: V_{cc}: Supply voltage, PWB: Printed wired board

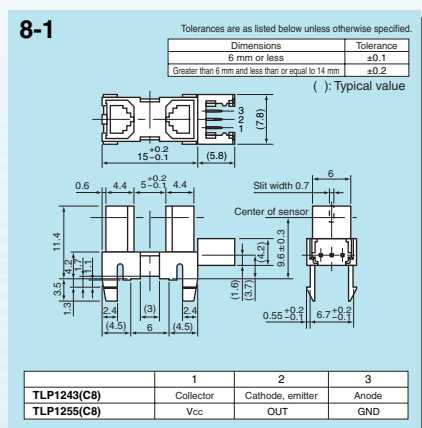
Unit: mm



7.8 Photointerrupters (with connectors)

Part No.	Package	Gap (mm)	Slit Width (mm)	Electrical Characteristics (Ta = 25 °C)			Package No.	Applications
				Operating power supply voltage (V)	Output	Connector manufacturer		
TLP1243(C8)	Snap-in mounting	5	0.7	V _{CE} ≤ 35 V	Phototransistor	Tyco Electronics AMP K.K.	8-1	Printers, Copiers, Fax machines Vending machines, FA equipment Amusement equipment
TLP1255(C8, Q)		5	0.7	2.97 to 5.5	Photo-IC	Tyco Electronics AMP K.K.	8-1	

Unit: mm



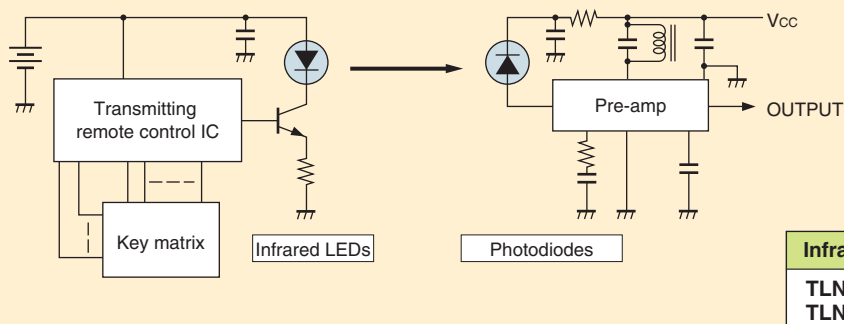
Connectors

Mini CT Connectors (Receptacle assembly / housing crimp) Manufactured by Tyco Electronics AMP K.K.

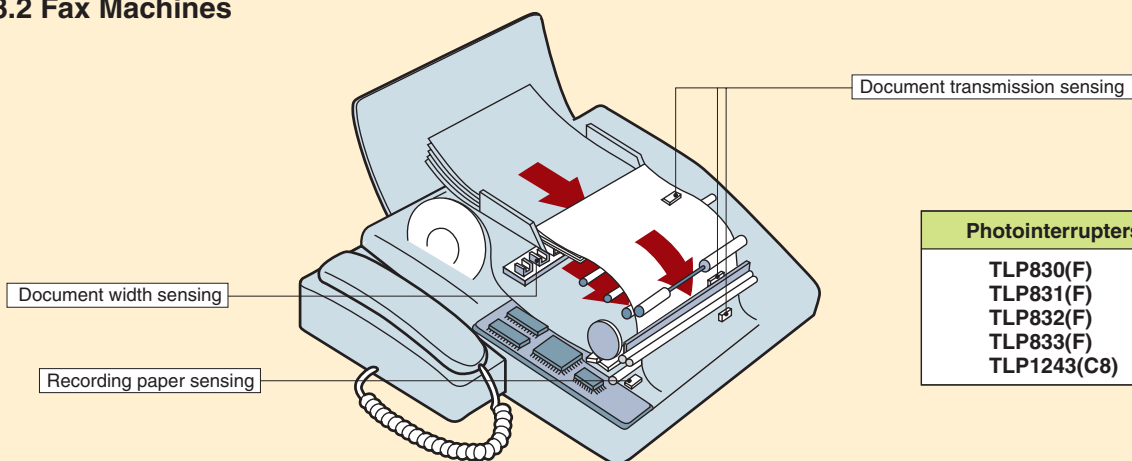
Connector with Housing Terminal	Model No.	Connector Type	Terminal Material	AWG Size	External Diameter of Insulation Coating	Toshiba Part No.
	353293-3	Receptacle assembly	Phosphor bronze	AWG26~28	0.85 to 0.95 mm	TLP1243(C8)
	353908-3	Housing crimp				TLP1255(C8, Q)

8 Application Examples

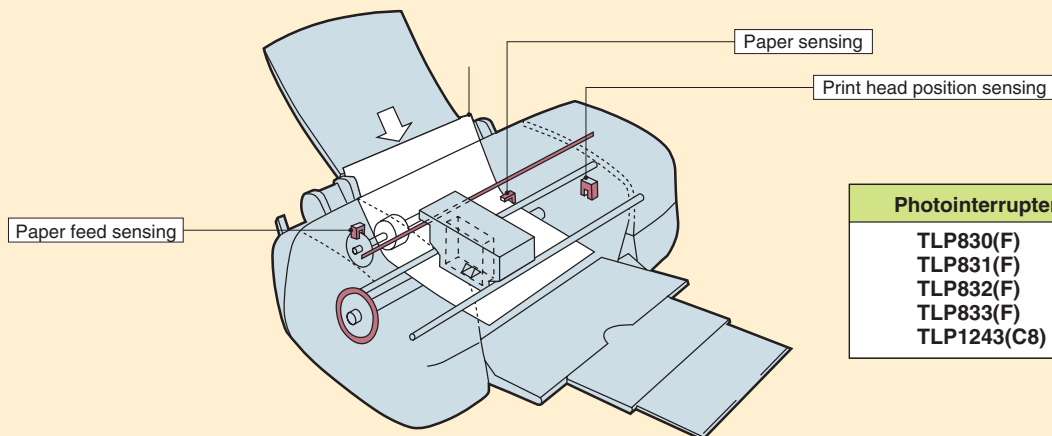
8.1 Optical Remote Controls



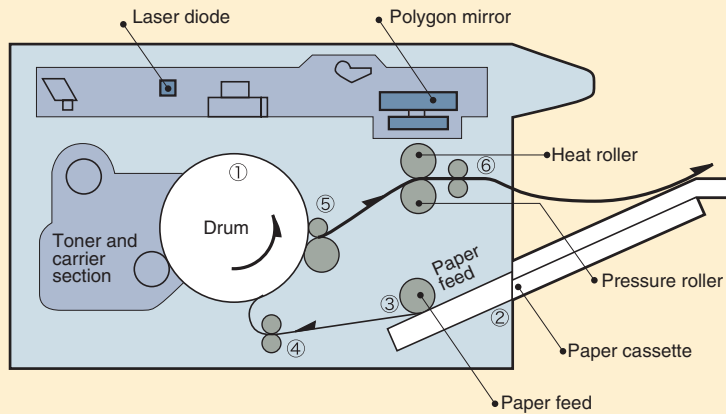
8.2 Fax Machines



8.3 Inkjet Printers



8.4 Page Printers



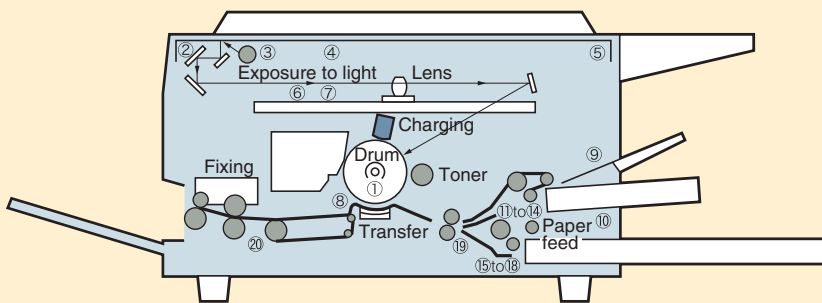
[Application examples]

- ① Drum revolution sensing
- ② Paper presence sensing
- ③, ④ Paper transport sensing
- ⑤ Paper separation sensing
- ⑥ Paper ejection sensing

Photointerrupters

TLP832(F)
TLP833(F)
TLP1032(F)
TLP1033A(F)
TLP1243(C8)

8.5 Copiers



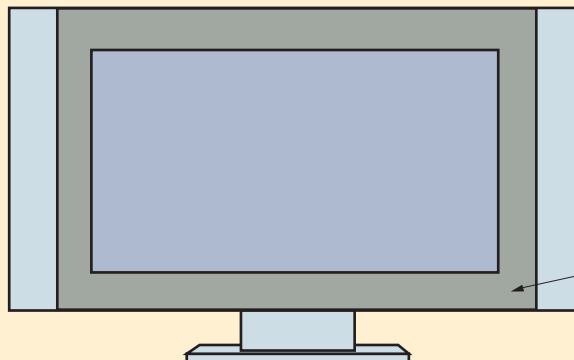
[Application examples]

- ① Drum position sensing
- ② to ⑤ Optics block position sensing
- ⑥, ⑦ Lens position sensing
- ⑧ Paper separation sensing
- ⑨, ⑩ Paper presence sensing
- ⑪ to ⑭ Upper cassette paper transport sensing
- ⑮ to ⑰ Lower cassette paper transport sensing
- ⑱, ⑲ Paper ejection and transport sensing

Photointerrupters

TLP1000 Series
TLP1200 Series

8.6 TV Monitors

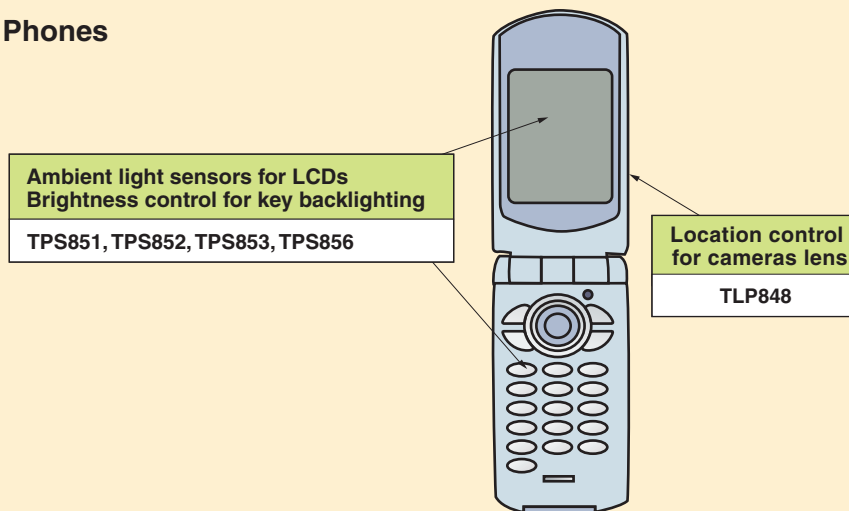


Luminous adjustment for screens

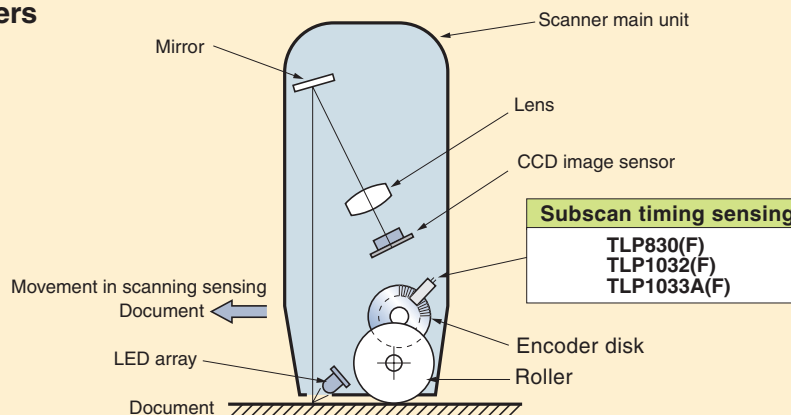
TPS851, TPS853
TPS859, TPS855(F)

8 Application Examples

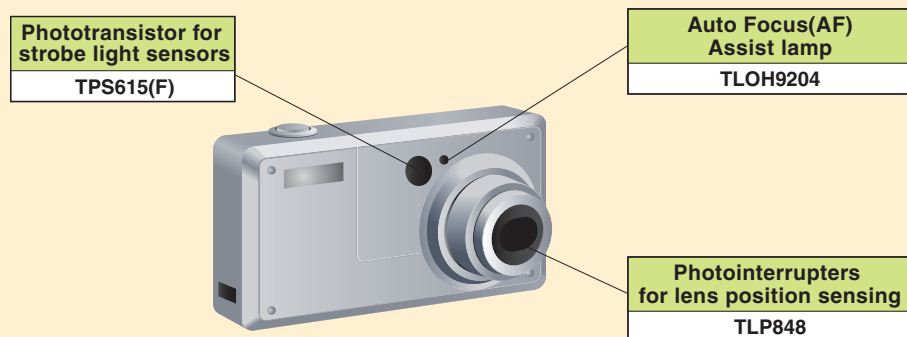
8.7 Cellular Phones



8.8 Image Scanners



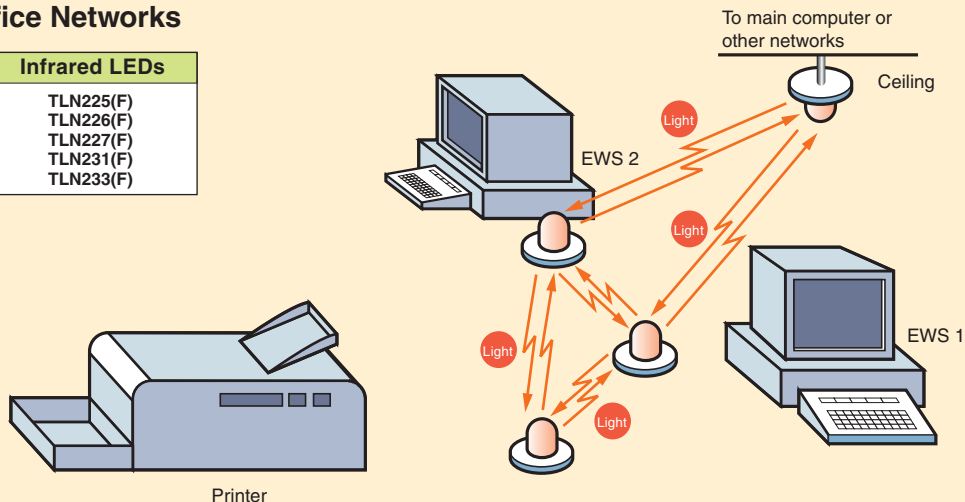
8.9 Digital Cameras



8.10 Office Networks

Infrared LEDs

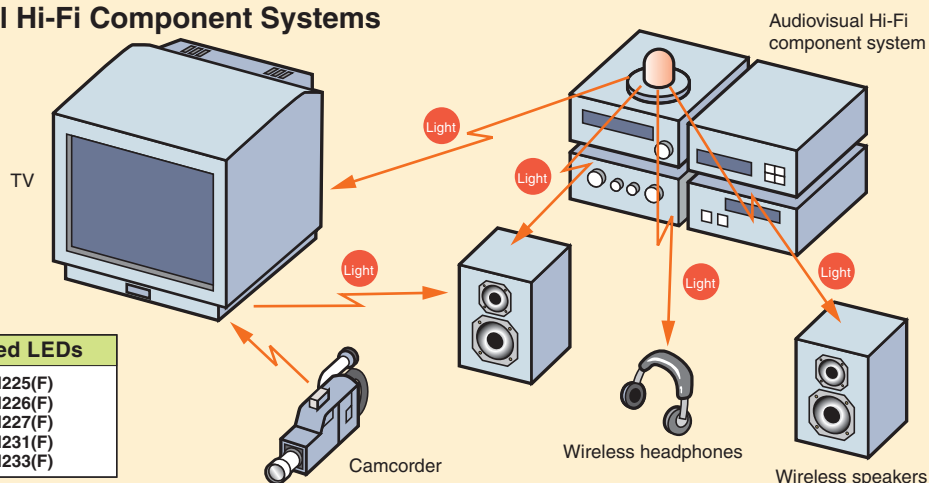
TLN225(F)
TLN226(F)
TLN227(F)
TLN231(F)
TLN233(F)



8.11 Audiovisual Hi-Fi Component Systems

Infrared LEDs

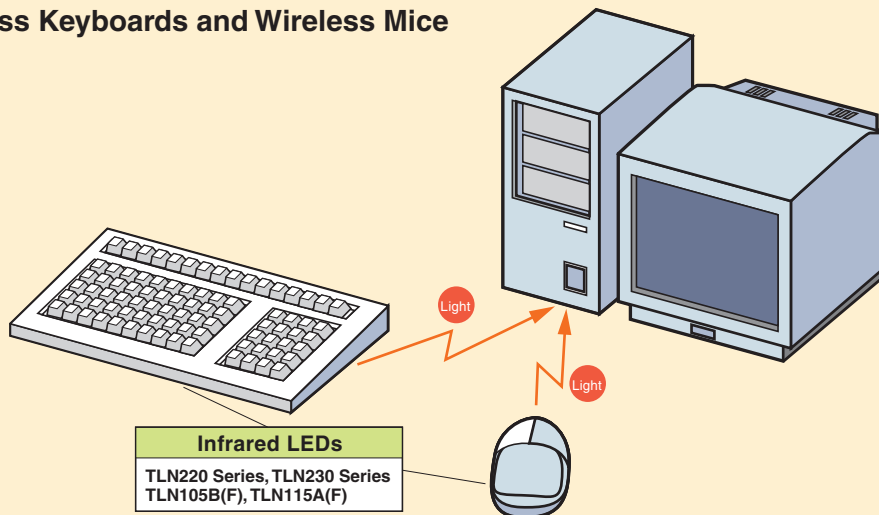
TLN225(F)
TLN226(F)
TLN227(F)
TLN231(F)
TLN233(F)



8.12 Wireless Keyboards and Wireless Mice

Infrared LEDs

**TLN220 Series, TLN230 Series
TLN105B(F), TLN115A(F)**



8 Application Examples

8.13 Others

Category	Appliances	Applications	Recommended Devices
AV equipment	Camcorders	Ambient light sensors for monitor screens	TPS851, TPS852, TPS853, TPS856
	Digital still cameras		
	DVD players	Home position sensing for pick-up heads	TLP848
Household appliances	Refrigerators	Icemaker internal position sensing	TLP800 Series
		Ambient light sensors	TPS851, TPS853, TPS859, TPS855(F)
	Microwave ovens	Sensing of height and number of cooked objects	TLN108(F) → TPS601A(F)
	Electric pots	Ambient light sensors	TPS851, TPS853, TPS859, TPS855(F)
	Air conditioners	Remote controls	TLN105B(F) TLN115A(F) } → TPS703(F)
		Ambient light sensors	TPS851, TPS853, TPS859, TPS855(F)
		Louver direction sensing	TLP1000 Series
	Automatic blinkers	Ambient light sensors	TPS851, TPS853, TPS859, TPS855(F)
	Washing machines	Sensing of degree of rinsing	TLN115A(F) → TPS611(F)
	Health equipment	Internal mechanism position sensing	Any photointerrupters
	Sewing machines	Needle up/down and cloth-feed sensing	Any photointerrupters
Control and Measurement	Optoelectronic switches	Emitters and detectors	TLN108(F) TLN201(F) TLN117(F) } → TPS601A(F) → TPS816(F)
	Automatic production machines	Internal mechanism position sensing	TLP1200 Series
	Industrial robots	Object sensing	TLN108(F) → TPS601A(F)
Information devices, Automatic vending machines and Office equipment	Copiers	Paper size sensing, toner quantity sensing and toner density sensing	TLN117(F) → TPS820(B, F)
	Printers	Paper size sensing, toner quantity sensing and toner density sensing	TLN117(F) → TPS820(B, F)
	Automatic vending machines	Coin sensing and product feed sensing	TLN108(F) → TPS601A(F)
		Ambient light sensors	TPS851, TPS853, TPS859, TPS855(F)
	PDA's	Ambient light sensors for monitor screens	TPS851, TPS852, TPS853, TPS856
	Notebook PCs	Ambient light sensors for screens	TPS851, TPS852, TPS853, TPS856
	PC monitors	Ambient light sensors for screens	TPS851, TPS853, TPS859, TPS855(F)
Communications Devices	Telephones	Hook sensors	TLP831(F)
	Optical telephones	Information transmission	TLN115A(F) → TPS704(F)
	Optical communications	Space transmission	TLN115A(F) TLN225(F) TLN226(F) TLN227(F) TLN231(F) TLN233(F)
Others	Gaming equipment (pachinko, computer games, etc.)	Coin sensing and sensing of position of internal mechanism	TLN108(F) → TPS601A(F) TLP1200 Series
	Toys (rifle games, remote controls, robots and game controls)	Remote controls	TLN115A(F) TLN231(F) TLN233(F) → TPS704(F)

9

End-of-Life Products

Note that the following products are end-of-life products and are not recommended for new designs. (As of Oct. 2007)

Infrared LEDs

Part No.	Recommended Alternative Products	Compatibility
TLN101A	TLN108(F)	II
TLN102	—	—
TLN103A	TLN119(F)	III
TLN104	—	—
TLN104(LB)	—	—
TLN107A	TLN117(F)	III
TLN113	TLN119(F)	III
TLN203	TLN238(F)	III
TLN208	—	—
TLN210	—	—
TLN212	—	—
TLN217	—	—
TLN235	TLN238(F)	III
TLN236	TLN238(F)	III
TLN237	TLN233(F)	III

Phototransistors

Part No.	Recommended Alternative Products	Compatibility
TPS603A	TPS615(F)	III
TPS604	—	—
TPS607A	—	—
TPS608A	—	—
TPS613	TPS615(F)	III
TPS614	—	—
TPS618	TPS622(F)	III

Photodiodes

Part No.	Recommended Alternative Products	Compatibility
TPS705	TPS703(F)	III
TPS706	TPS703(F)	III
TPS720	—	—
TPS721A	—	—
TPS723A	—	—

Photo-ICs

Part No.	Recommended Alternative Products	Compatibility
TPS805	TPS841(F)	III
TPS806	TPS842A(F)	III
TPS807	TPS843(F)	III
TPS808	TPS844(F)	III
TPS811	TPS841(F)	II
TPS812	TPS842A(F)	II
TPS813	TPS843(F)	II
TPS814	TPS844(F)	II
TPS818	TPS855(F)	III
TPS819	—	—
TPS850	TPS859	III

Reflective Photosensors

Part No.	Recommended Alternative Products	Compatibility
TLP907	—	—
TLP907(LB)	—	—
TLP908	—	—
TLP908(LB)	—	—
TLP909	—	—
TLP910	—	—
TLP921	—	—

■Description of the compatibility

I : Electrically equivalent or enhanced. The products do not require any changes to the peripheral circuits.

II : Electrically equivalent or enhanced. Part of the peripheral circuits should be modified.

III : Electrically equivalent or enhanced. Peripheral circuits should be modified since the pin configuration and package are different from those of the previous products.

Photointerrupters (case-type, ultra-compact package)

Part No.	Recommended Alternative Products	Compatibility
TLP507A	—	—
TLP810	—	—
TLP812	—	—
TLP814	—	—
TLP818	—	—
TLP822	TLP832(F)	III
TLP824	TLP832(F)	III
TLP828(F)	—	—
TLP842	—	—
TLP853	—	—
TLP862	—	—
TLP1002A	TLP1032(F)	III
TLP1004A	TLP1032(F)	III
TLP1005A	TLP1033A(F)	III
TLP1025	—	—
TLP1031A	TLP1033A(F)	—
TLP1037A	—	—

Photointerrupters with Connectors

Part No.	Recommended Alternative Products	Compatibility
TLP1214A	—	—
TLP1214A(C2)	—	—
TLP1217(C2)	—	—
TLP1230(C4)	TLP1243(C8)	III
TLP1231(C5)	TLP1243(C8)	III
TLP1241(C5)	TLP1243(C8)	III
TLP1242(C6)	TLP1243(C8)	III
TLP1251(C5)	—	—
TLP1252(C6)	—	—
TLP1253(C6)	—	—

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