

# PS7241-AT1, PS7241-AT5

PHOTO TRANSISTOR AND MOS FET OUTPUT TYPE  
8-PIN SOP 400 V BREAK DOWN VOLTAGE  
2-ch Optical Coupled MOS FET

## DESCRIPTION

The PS7241-AT1 and PS7241-AT5 are solid state relays containing GaAs LEDs on the light emitting side (input side) and MOS FETs (+ Photo transistor) on the output side.

They are suitable for analog signal control because of their low offset and high linearity.

## FEATURES

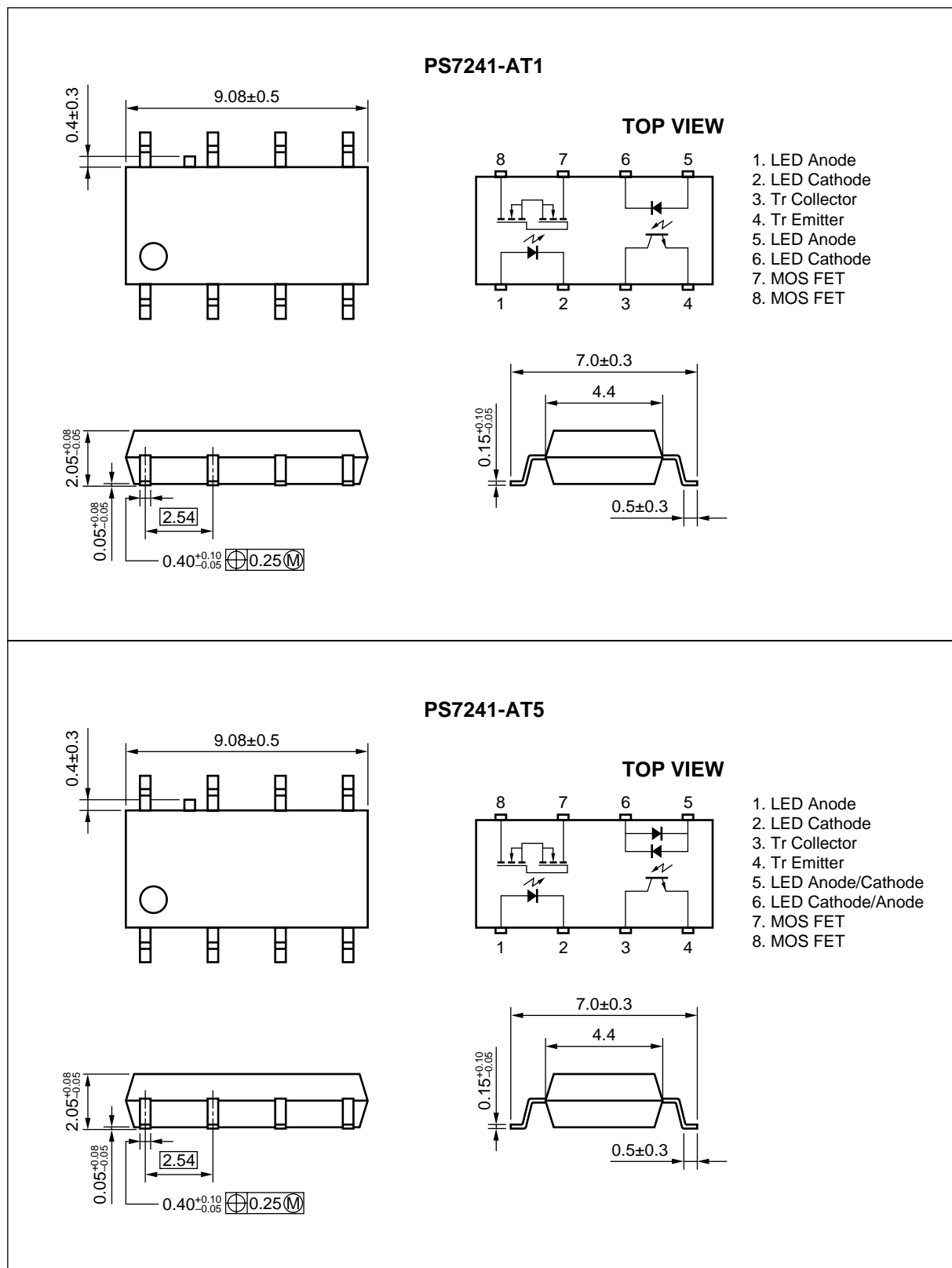
- 2 channel type (OCMOS FET + Photocoupler)
- Low LED operating current ( $I_f = 2 \text{ mA}$ )
- Designed for AC/DC switching line changer
- Small and thin package (8-pin SOP, Height = 2.1 mm)
- Low offset voltage
- Ordering number of taping product: PS7241-AT1-F3, F4, PS7241-AT5-F3, F4
- Safety standards
  - UL approved: File No. E72422 (S)
  - ★ BSI approved: No. 8190/8191
  - CSA approved: No. CA 101391

## APPLICATIONS

- Exchange equipment
- Measurement equipment
- FA/OA equipment

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PACKAGE DIMENSIONS (Unit: mm)



# ORDERING INFORMATION

Part Number	Package	Packing Style	Application Part Number <sup>1</sup>
PS7241-AT1	8-pin SOP	Magazine case 45 pcs	PS7241-AT1
PS7241-AT1-F3		Embossed Tape 1 500 pcs/reel	
PS7241-AT1-F4			
PS7241-AT5		Magazine case 45 pcs	PS7241-AT5
PS7241-AT5-F3		Embossed Tape 1 500 pcs/reel	
PS7241-AT5-F4			

\*1 For the application of the Safety Standard, following part number should be used.

## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C, unless otherwise specified)

Parameter			Symbol	Ratings	Unit
OCMOS FET	Diode	Forward Current (DC)	I <sub>F</sub>	50	mA
		Reverse Voltage	V <sub>R</sub>	5.0	V
		Power Dissipation	P <sub>D</sub>	50	mW/ch
		Peak Forward Current <sup>*1</sup>	I <sub>FP</sub>	1	A
	MOS FET	Break Down Voltage	V <sub>L</sub>	400	V
		Continuous Load Current	I <sub>L</sub>	120	mA
		Pulse Load Current <sup>*2</sup> (AC/DC Connection)	I <sub>LP</sub>	250	mA
		Power Dissipation	P <sub>D</sub>	430	mW
Photocoupler	Diode	Forward Current	I <sub>F</sub>	50	mA
		Reverse Voltage <sup>*3</sup>	V <sub>R</sub>	5.0	V
		Power Dissipation	P <sub>D</sub>	50	mW/ch
		Peak Forward Current <sup>*1</sup>	I <sub>FP</sub>	1	A
	Transistor	Collector to Emitter Voltage	V <sub>CEO</sub>	40	V
		Emitter to Collector Voltage	V <sub>ECO</sub>	6	V
		Collector Current	I <sub>C</sub>	80	mA
		Power Dissipation	P <sub>C</sub>	100	mW
Isolation Voltage <sup>*4</sup>			BV	1 500	Vr.m.s.
Total Power Dissipation			P <sub>T</sub>	630	mW
Operating Ambient Temperature			T <sub>A</sub>	−40 to +80	°C
Storage Temperature			T <sub>stg</sub>	−40 to +100	°C

\*1 PW = 100 μs, Duty Cycle = 1%

\*2 PW = 100 ms, 1 shot

\*3 PS7241-AT1 only

\*4 AC voltage for 1 minute at T<sub>A</sub> = 25°C, RH = 60% between input and output

RECOMMENDED OPERATING CONDITIONS (T<sub>A</sub> = 25°C)

Parameter		Symbol	MIN.	TYP.	MAX.	Unit
OCMOS FET	LED Operating Current	I <sub>F</sub>	2	10	20	mA
	LED Off Voltage	V <sub>F</sub>	0		0.5	V

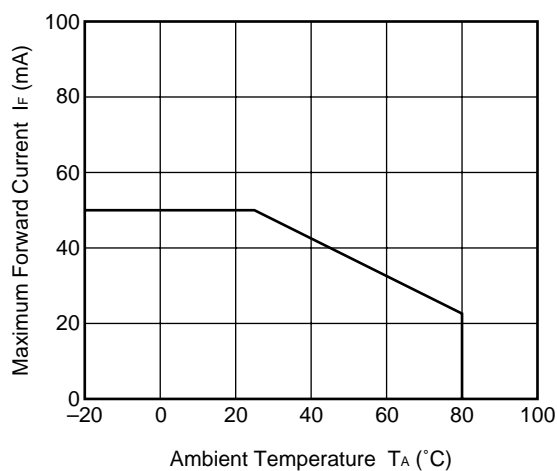
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

Parameter			Symbol	Conditions	MIN.	TYP.	MAX.	Unit
OCMOS FET	Diode	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 10 mA		1.2	1.4	V
		Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 5 V			5.0	μA
	MOS FET	Off-state Leakage Current	I <sub>Leak</sub>	V <sub>D</sub> = 400 V		0.03	1.0	μA
		Output Capacitance	C <sub>out</sub>	V <sub>D</sub> = 0 V, f = 1 MHz		65		pF
	Coupler	LED On-state Current	I <sub>Fon</sub>	I <sub>L</sub> = 120 mA			2.0	mA
		On-state Resistance	R <sub>on1</sub>	I <sub>F</sub> = 10 mA, I <sub>L</sub> = 10 mA		20	30	Ω
			R <sub>on2</sub>	I <sub>F</sub> = 10 mA, I <sub>L</sub> = 120 mA, t ≤ 10 ms			25	
		Turn-on Time *1	t <sub>on</sub>	I <sub>F</sub> = 10 mA, V <sub>O</sub> = 5 V,		0.3	1.0	ms
		Turn-off Time *1	t <sub>off</sub>	PW ≥ 10 ms, R <sub>L</sub> = 500 Ω		0.04	0.2	
		Isolation Resistance	R <sub>I-O</sub>	V <sub>I-O</sub> = 1.0 kV <sub>DC</sub>	10 <sup>9</sup>			Ω
		Isolation Capacitance	C <sub>I-O</sub>	V = 0 V, f = 1 MHz		1.1		pF
Photo-coupler	Diode	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 10 mA		1.2	1.4	V
		Reverse Current *2	I <sub>R</sub>	V <sub>R</sub> = 5 V			5.0	μA
	Transistor	Collector to Emitter Dark Current	I <sub>CEO</sub>	V <sub>CE</sub> = 40 V, I <sub>F</sub> = 0 mA			100	nA
		Collector to Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> = 1 mA	40			V
		Emitter to Collector Breakdown Voltage	BV <sub>ECO</sub>	I <sub>E</sub> = 100 μA	6			V
	Coupler	Current Transfer Ratio	CTR	I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V	50		400	%
		Collector Saturation Voltage	V <sub>CE(sat)</sub>	I <sub>F</sub> = 10 mA, I <sub>C</sub> = 2 mA			0.3	V
		Isolation Resistance	R <sub>I-O</sub>	V <sub>I-O</sub> = 1.0 kV <sub>DC</sub>	10 <sup>11</sup>			Ω
		Isolation Capacitance	C <sub>I-O</sub>	V = 0 V, f = 1 MHz		0.4		pF
		Rise Time	t <sub>r</sub>	V <sub>CC</sub> = 5 V, I <sub>C</sub> = 2 mA,		3.0		μs
		Fall Time	t <sub>f</sub>	R <sub>L</sub> = 100 Ω		5.0		

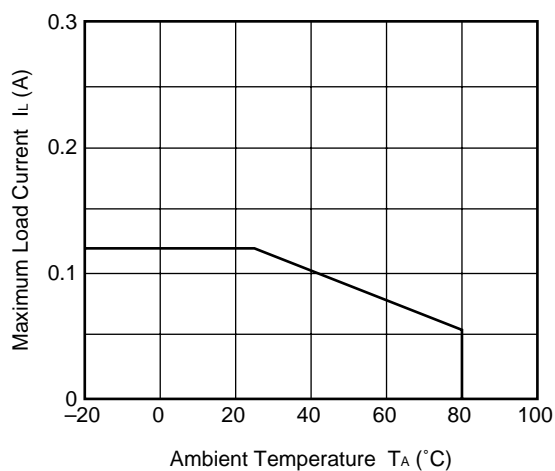
- ★ \*1 The turn-on time and turn-off time are specified as input-pulse width ≥ 10 ms.  
Be aware that when the device operates with an input-pulse width of under 10 ms, the turn-on time and turn-off time will increase.
- \*2 PS7241-AT1 only

OCMOS TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

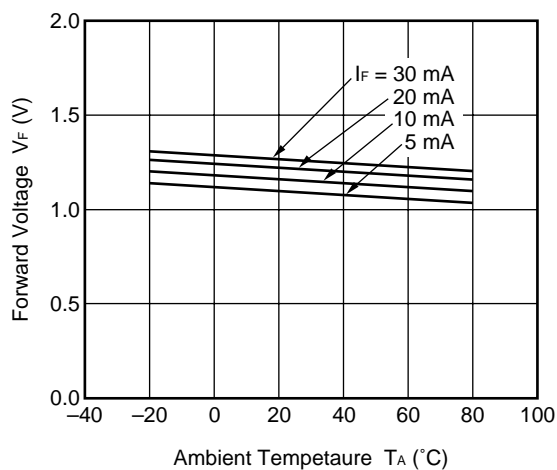
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



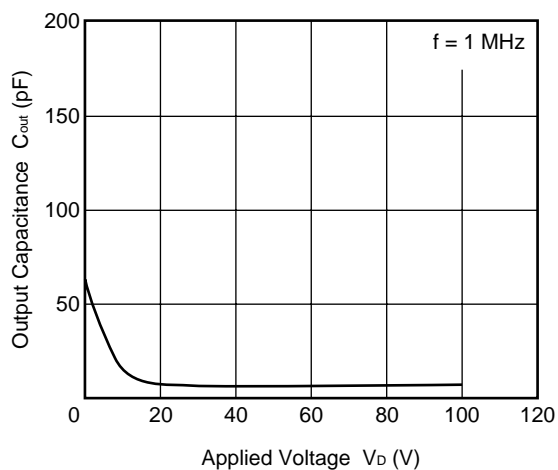
MAXIMUM LOAD CURRENT vs. AMBIENT TEMPERATURE



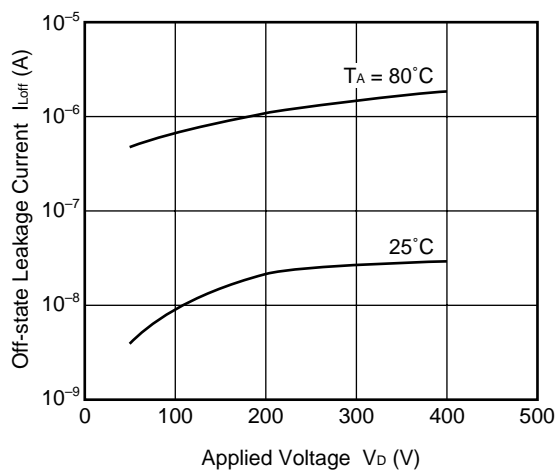
FORWARD VOLTAGE vs. AMBIENT TEMPERATURE



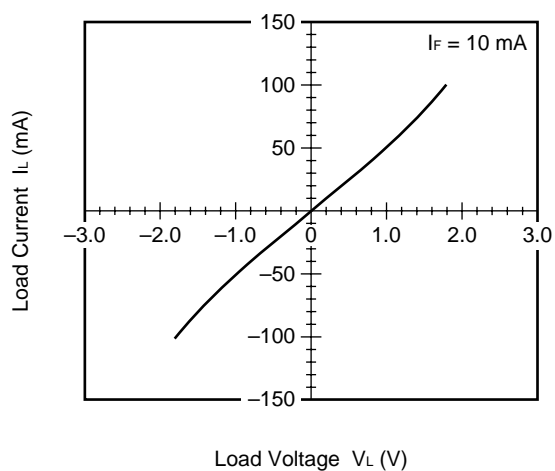
OUTPUT CAPACITANCE vs. APPLIED VOLTAGE



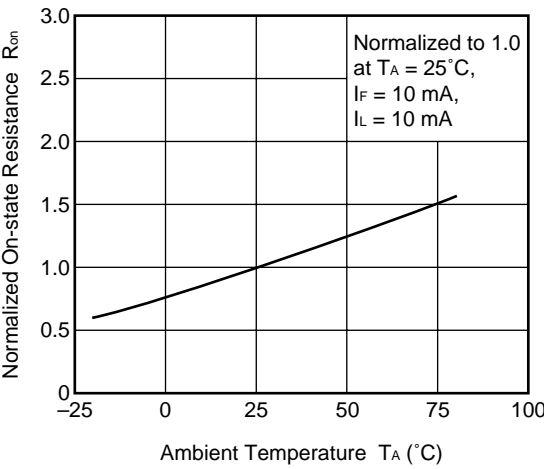
OFF-STATE LEAKAGE CURRENT vs. APPLIED VOLTAGE



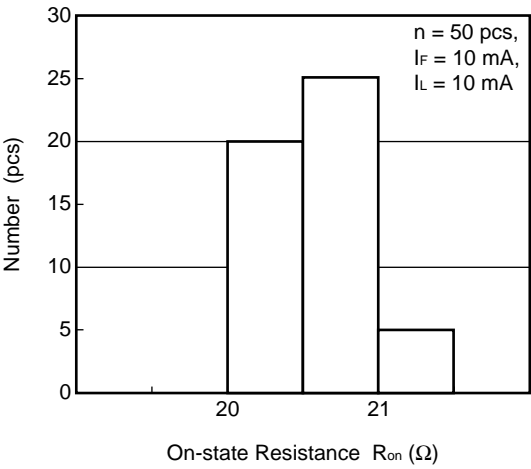
LOAD CURRENT vs. LOAD VOLTAGE



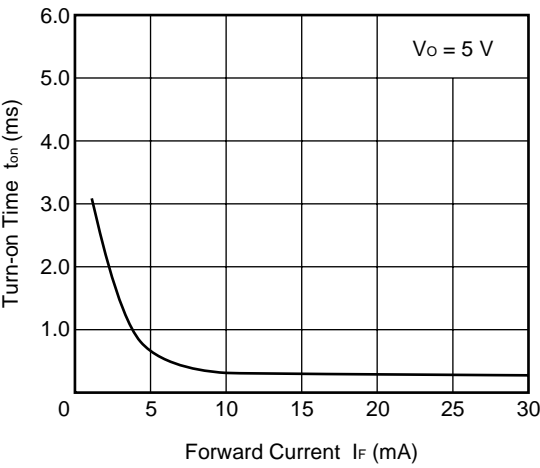
NORMALIZED ON-STATE RESISTANCE vs. AMBIENT TEMPERATURE



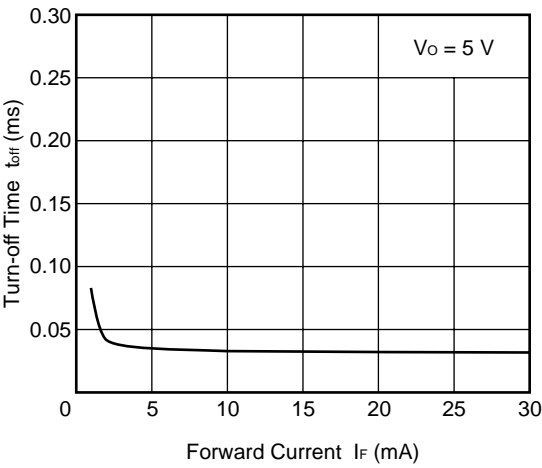
ON-STATE RESISTANCE DISTRIBUTION



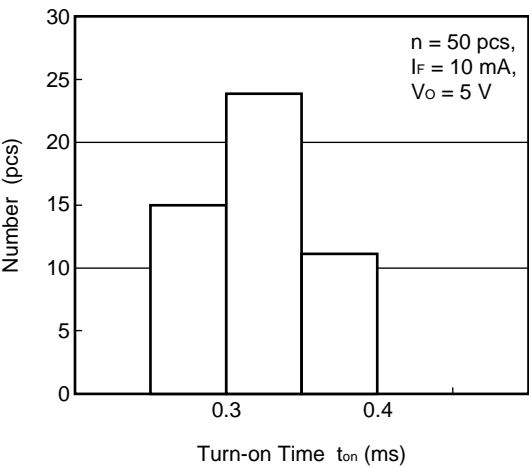
TURN-ON TIME vs. FORWARD CURRENT



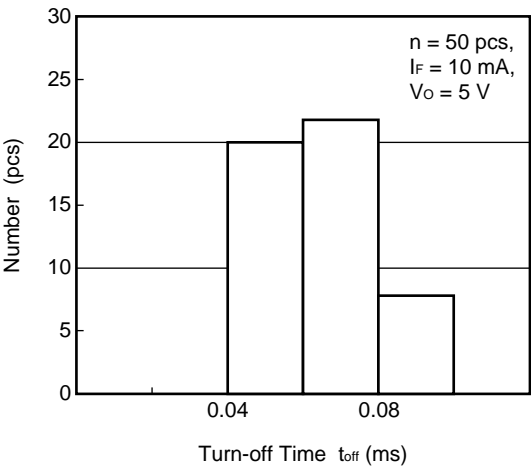
TURN-OFF TIME vs. FORWARD CURRENT



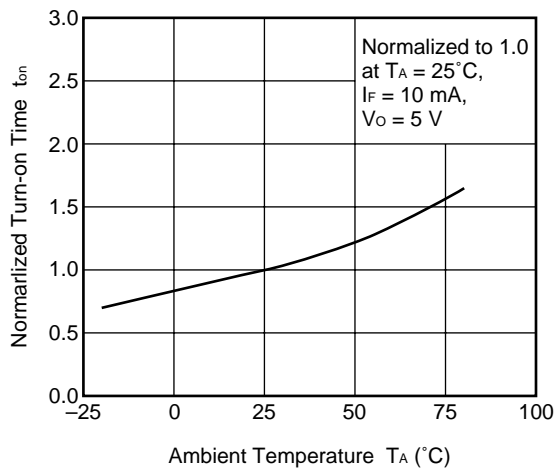
TURN-ON TIME DISTRIBUTION



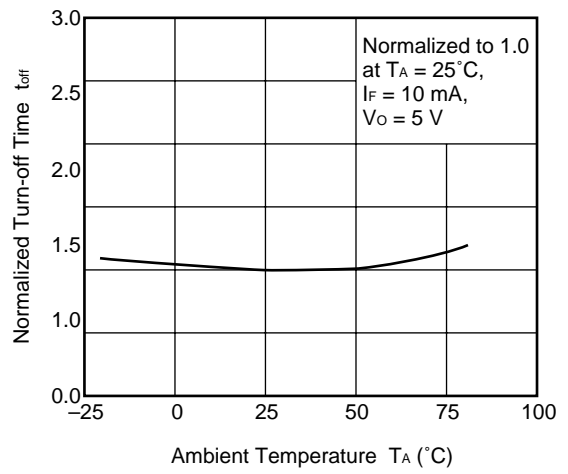
TURN-OFF TIME DISTRIBUTION



NORMALIZED TURN-ON TIME vs.  
AMBIENT TEMPERATURE



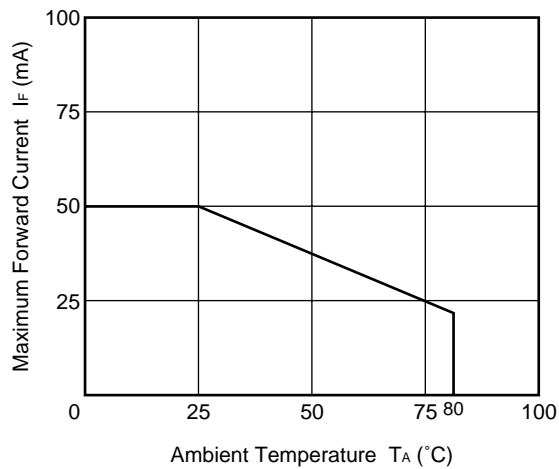
NORMALIZED TURN-OFF TIME vs.  
AMBIENT TEMPERATURE



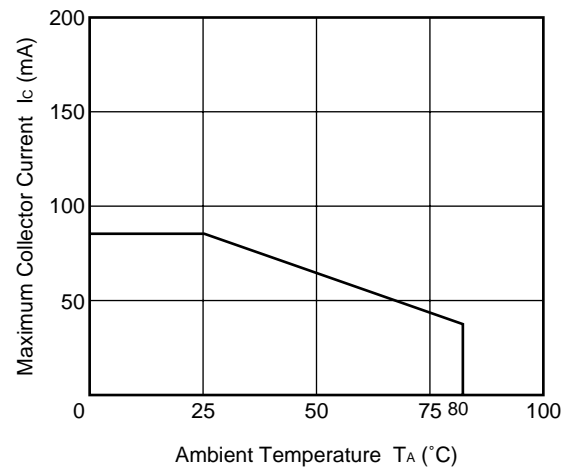
**Remark** The graphs indicate nominal characteristics.

PHOTOCOUPLER TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

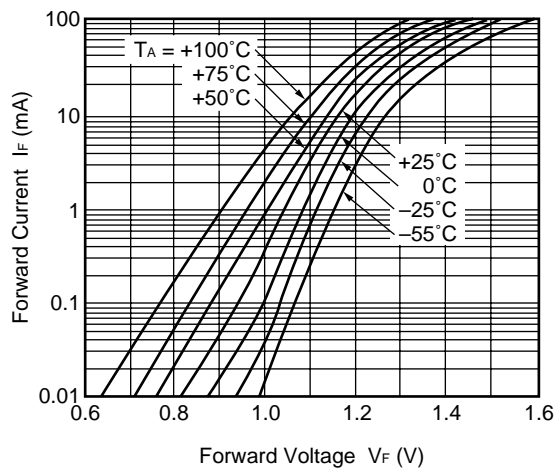
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



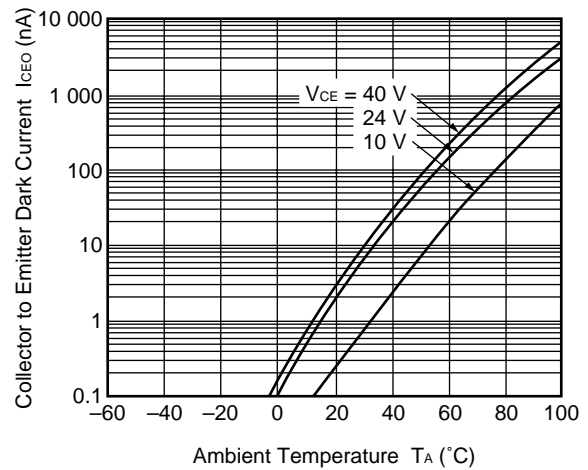
MUXIMUM COLLECTOR CURRENT vs. AMBIENT TEMPERATURE



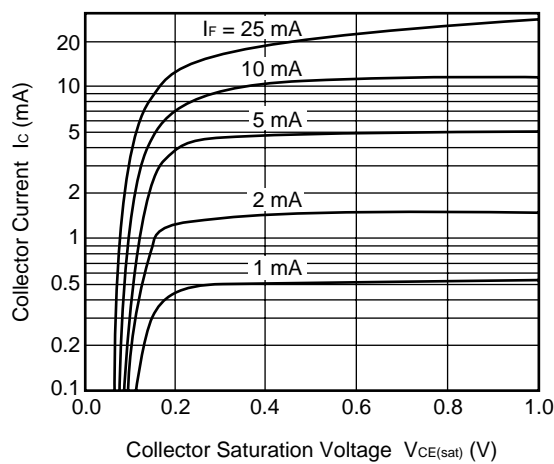
FORWARD CURRENT vs. FORWARD VOLTAGE



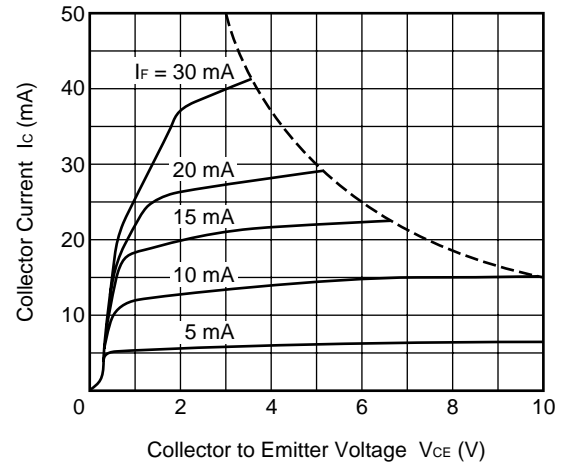
COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE

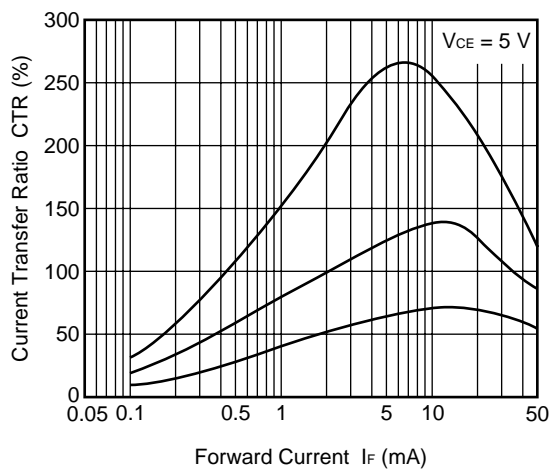


COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

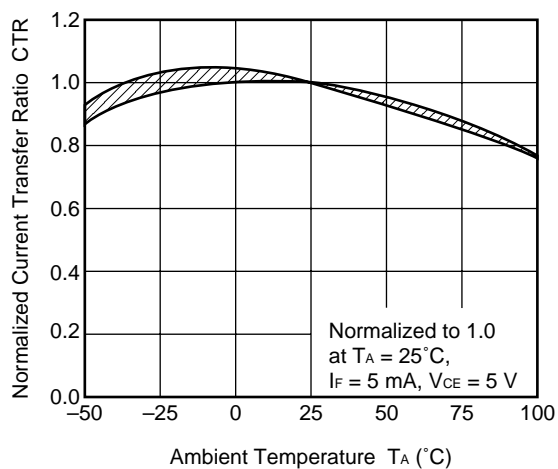




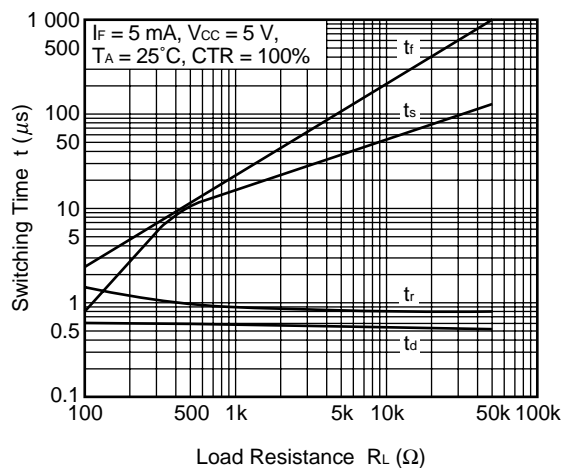
CURRENT TRANSFER RATIO vs.  
FORWARD CURRENT



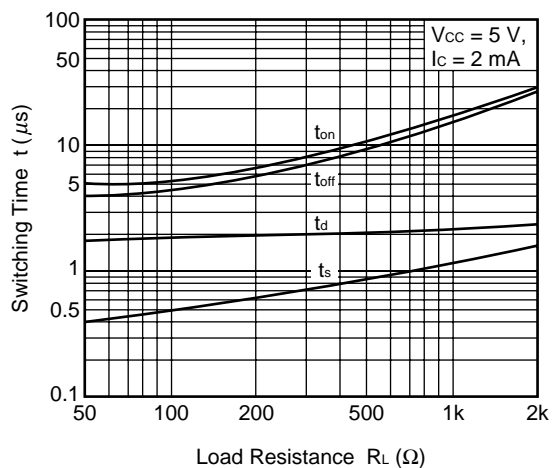
NORMALIZED CURRENT TRANSFER  
RATIO vs. AMBIENT TEMPERATURE



SWITCHING TIME vs.  
LOAD RESISTANCE



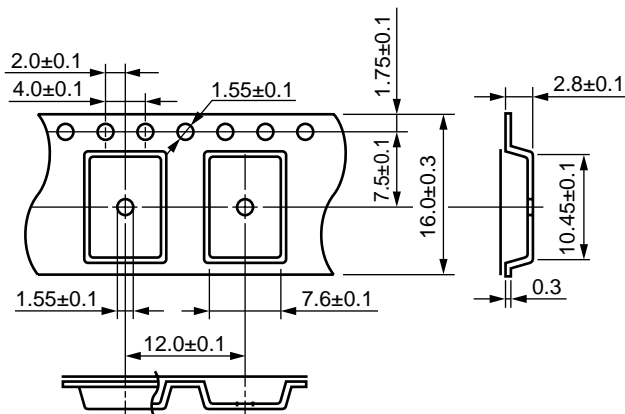
SWITCHING TIME vs.  
LOAD RESISTANCE



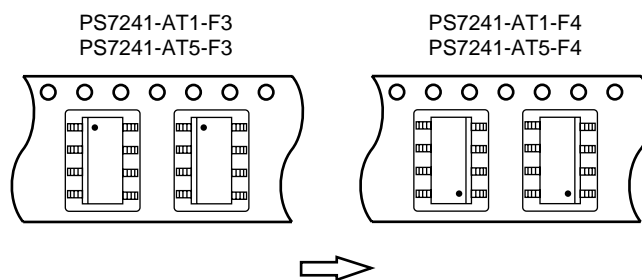
**Remark** The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (Unit: mm)

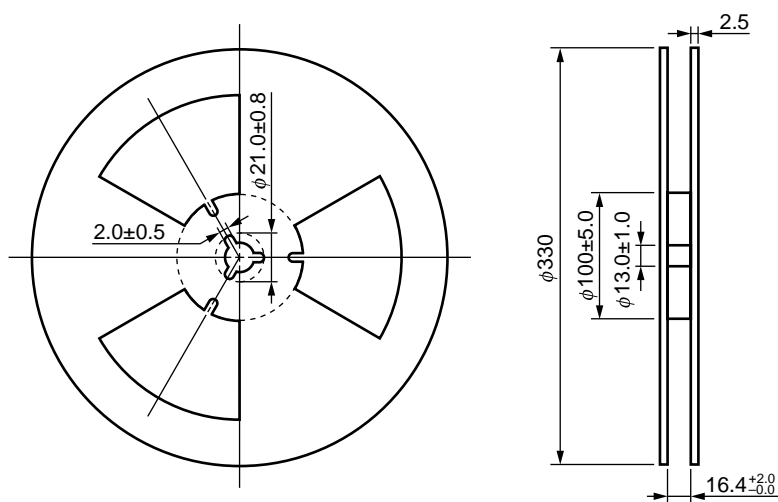
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



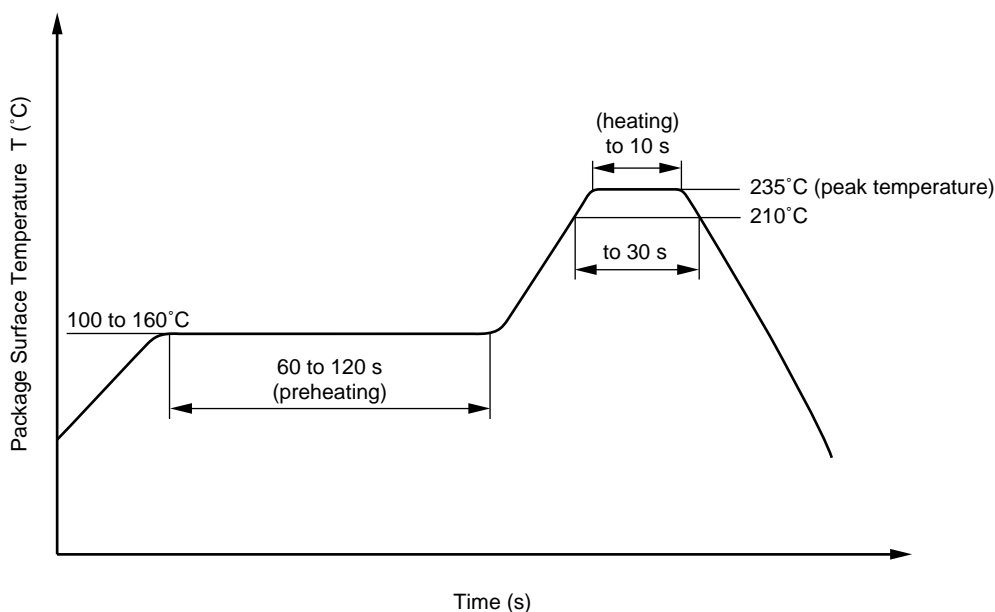
Packing: 1 500 pcs/reel

## RECOMMENDED SOLDERING CONDITIONS

### (1) Infrared reflow soldering

- Peak reflow temperature 235°C (package surface temperature)
- Time of temperature higher than 210°C 30 seconds or less
- Number of reflows Two
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt % is recommended.)

Recommended Temperature Profile of Infrared Reflow

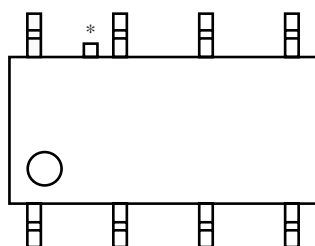


### (2) Dip soldering

- Temperature 260°C or below (molten solder temperature)
- Time 10 seconds or less
- Number of times One
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt % is recommended.)

### (3) Cautions

- Fluxes
  - Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.
- Avoid shorting between portion of frame and leads.



\* : Portion of frame

### SAFETY INFORMATION ON THIS PRODUCT

<div data-bbox="188 277 280 304" data-label="Section-Header"><b>Caution</b></div> <div data-bbox="300 277 448 304" data-label="Text">GaAs Products</div>	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"> <li>• Do not destroy or burn the product.</li> <li>• Do not cut or cleave off any part of the product.</li> <li>• Do not crush or chemically dissolve the product.</li> <li>• Do not put the product in the mouth.</li> </ul> <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
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