NEC

Solid State Relay
OCMOS FET

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 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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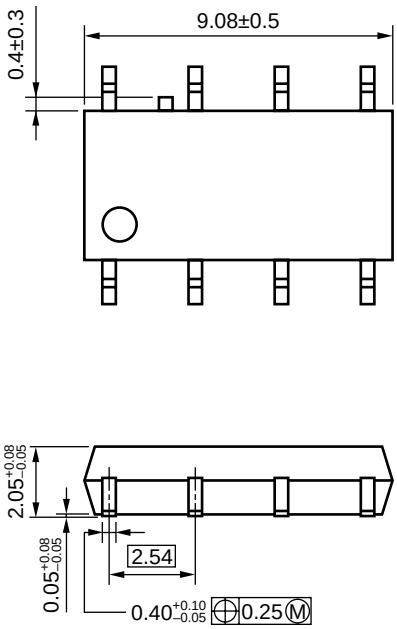
Date Published July 2001 NS CP (K)
Printed in Japan

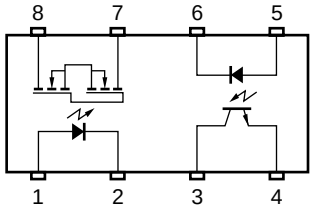
The mark ★ shows major revised points.

PACKAGE DIMENSIONS (Unit: mm)

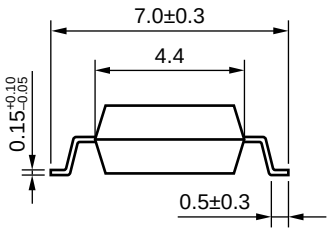
PS7241-AT1



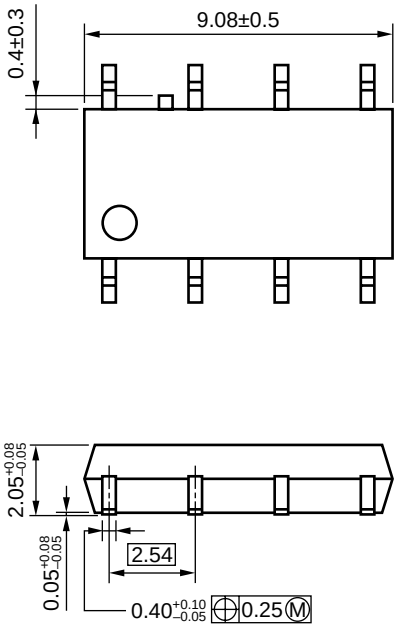
TOP VIEW



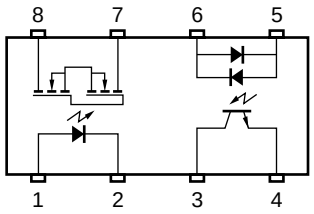
1. LED Anode
2. LED Cathode
3. Tr Collector
4. Tr Emitter
5. LED Anode
6. LED Cathode
7. MOS FET
8. MOS FET



PS7241-AT5



TOP VIEW



1. LED Anode
2. LED Cathode
3. Tr Collector
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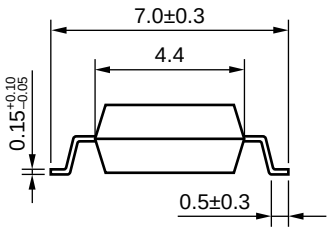
5. LED Anode/Cathode
6. LED Cathode/Anode
7. MOS FET
8. MOS FET



ORDERING INFORMATION

Part Number	Package	Packing Style	Application Part Number[*1]
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_A = 25°C, unless otherwise specified)

Parameter			Symbol	Ratings	Unit
OCMOS FET	Diode	Forward Current (DC)	I_F	50	mA
		Reverse Voltage	V_R	5.0	V
		Power Dissipation	P_D	50	mW/ch
		Peak Forward Current[*1]	I_{FP}	1	A
	MOS FET	Break Down Voltage	V_L	400	V
		Continuous Load Current	I_L	120	mA
		Pulse Load Current[*2] (AC/DC Connection)	I_{LP}	250	mA
		Power Dissipation	P_D	430	mW
Photocoupler	Diode	Forward Current	I_F	50	mA
		Reverse Voltage[*3]	V_R	5.0	V
		Power Dissipation	P_D	50	mW/ch
		Peak Forward Current[*1]	I_{FP}	1	A
	Transistor	Collector to Emitter Voltage	V_{CEO}	40	V
		Emitter to Collector Voltage	V_{ECO}	6	V
		Collector Current	I_C	80	mA
		Power Dissipation	P_C	100	mW
Isolation Voltage[*4]			BV	1 500	Vr.m.s.
Total Power Dissipation			P_T	630	mW
Operating Ambient Temperature			T_A	–40 to +80	°C
Storage Temperature			T_{stg}	–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_A = 25°C, RH = 60% between input and output

RECOMMENDED OPERATING CONDITIONS (T_A = 25°C)

Parameter		Symbol	MIN.	TYP.	MAX.	Unit
OCMOS FET	LED Operating Current	I_F	2	10	20	mA
	LED Off Voltage	V_F	0		0.5	V

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

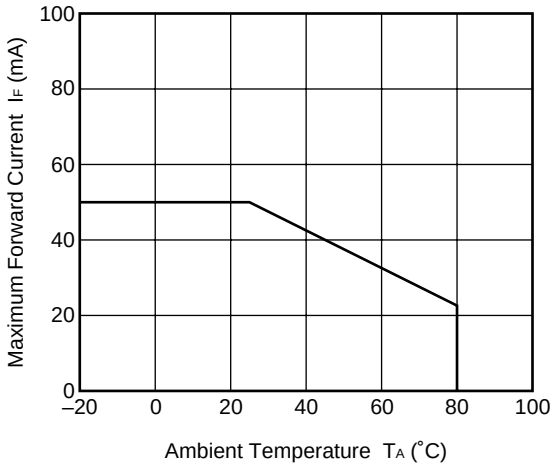
	Parameter			Symbol	Conditions	MIN.	TYP.	MAX.	Unit
	OCMOS FET	Diode	Forward Voltage	V_F	I_F = 10 mA		1.2	1.4	V
			Reverse Current	I_R	V_R = 5 V			5.0	μA
		MOS FET	Off-state Leakage Current	I_{Loff}	V_D = 400 V		0.03	1.0	μA
			Output Capacitance	C_{out}	V_D = 0 V, f = 1 MHz		65		pF
		Coupler	LED On-state Current	I_{Fon}	I_L = 120 mA			2.0	mA
			On-state Resistance	R_{on1}	I_F = 10 mA, I_L = 10 mA		20	30	Ω
				R_{on2}	I_F = 10 mA, I_L = 120 mA, t ≤ 10 ms			25	
★			Turn-on Time *1	t_{on}	I_F = 10 mA, V_O = 5 V,		0.3	1.0	ms
★			Turn-off Time *1	t_{off}	PW ≥ 10 ms, R_L = 500 Ω		0.04	0.2	
			Isolation Resistance	R_{I-O}	V_{I-O} = 1.0 kV_{DC}	10^9			Ω
			Isolation Capacitance	C_{I-O}	V = 0 V, f = 1 MHz		1.1		pF
	Photo-coupler	Diode	Forward Voltage	V_F	I_F = 10 mA		1.2	1.4	V
			Reverse Current *2	I_R	V_R = 5 V			5.0	μA
		Transistor	Collector to Emitter Dark Current	I_{CEO}	V_{CE} = 40 V, I_F = 0 mA			100	nA
			Collector to Emitter Breakdown Voltage	BV_{CEO}	I_C = 1 mA	40			V
			Emitter to Collector Breakdown Voltage	BV_{ECO}	I_E = 100 μA	6			V
		Coupler	Current Transfer Ratio	CTR	I_F = 5 mA, V_{CE} = 5 V	50		400	%
			Collector Saturation Voltage	$V_{CE (sat)}$	I_F = 10 mA, I_C = 2 mA			0.3	V
			Isolation Resistance	R_{I-O}	V_{I-O} = 1.0 kV_{DC}	10^{11}			Ω
			Isolation Capacitance	C_{I-O}	V = 0 V, f = 1 MHz		0.4		pF
			Rise Time	t_r	V_{CC} = 5 V, I_C = 2 mA,		3.0		μs
			Fall Time	t_f	R_L = 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.

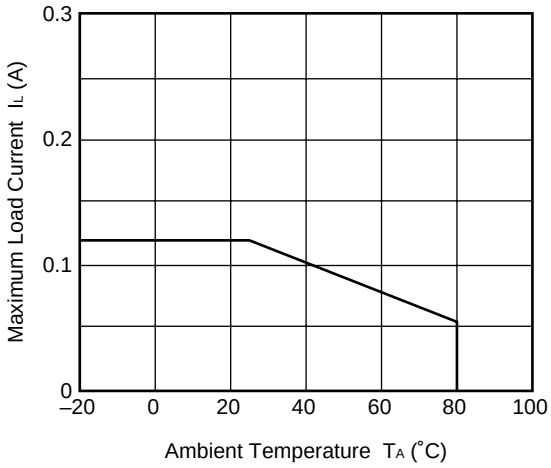
***2** PS7241-AT1 only

OCMOS TYPICAL CHARACTERISTICS (T_A = 25°C, unless otherwise specified)

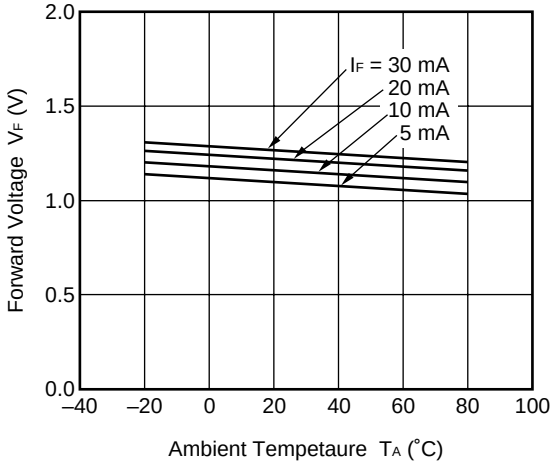
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



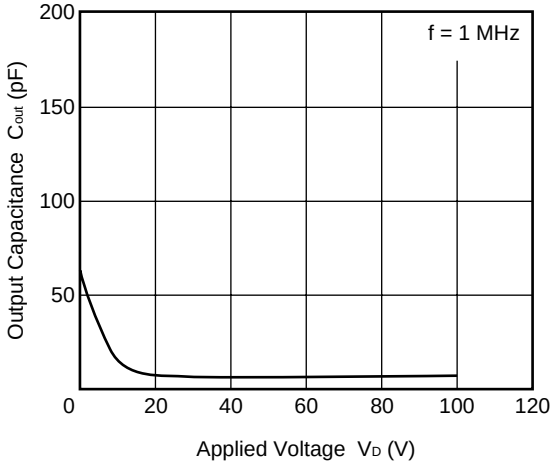
MAXIMUM LOAD CURRENT vs. AMBIENT TEMPERATURE



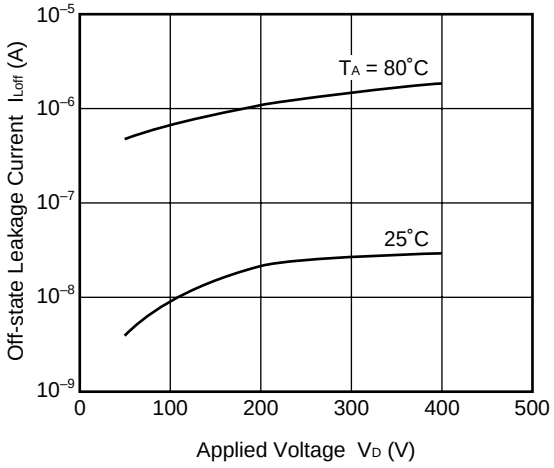
FORWARD VOLTAGE vs. AMBIENT TEMPERATURE



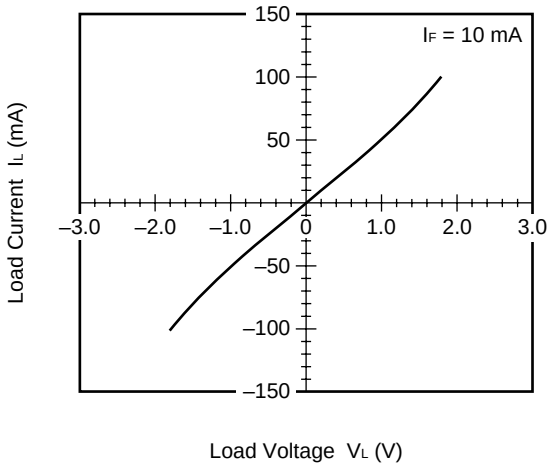
OUTPUT CAPACITANCE vs. APPLIED VOLTAGE



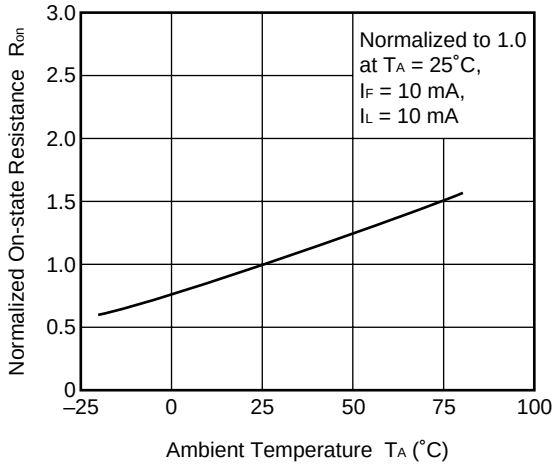
OFF-STATE LEAKAGE CURRENT vs. APPLIED VOLTAGE



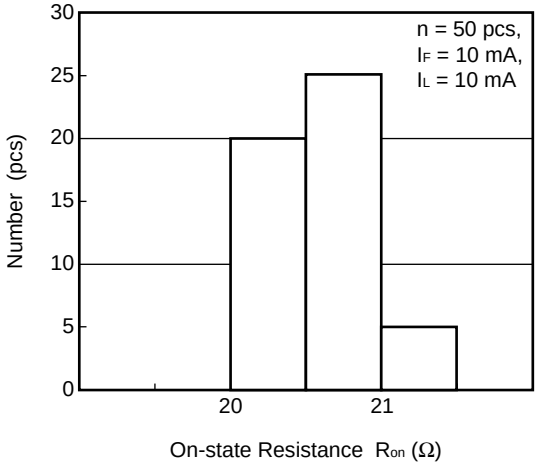
LOAD CURRENT vs. LOAD VOLTAGE



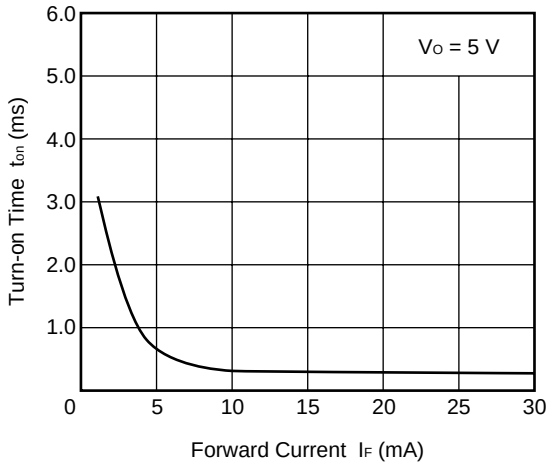
NORMALIZED ON-STATE RESISTANCE vs. AMBIENT TEMPERATURE



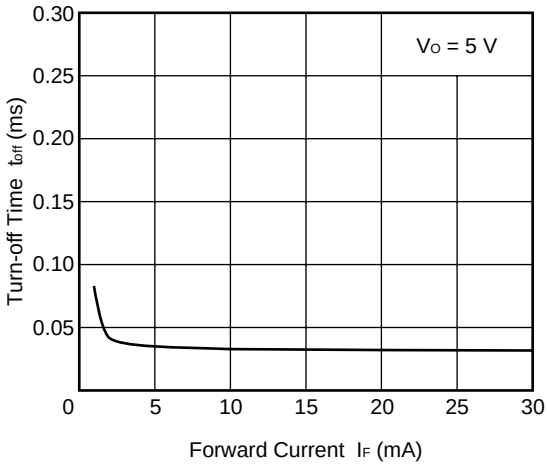
ON-STATE RESISTANCE DISTRIBUTION



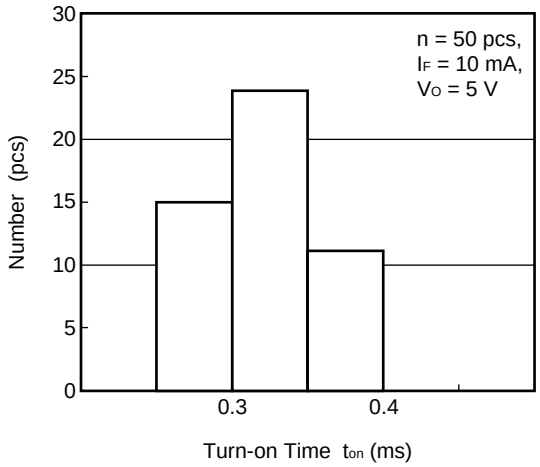
TURN-ON TIME vs. FORWARD CURRENT



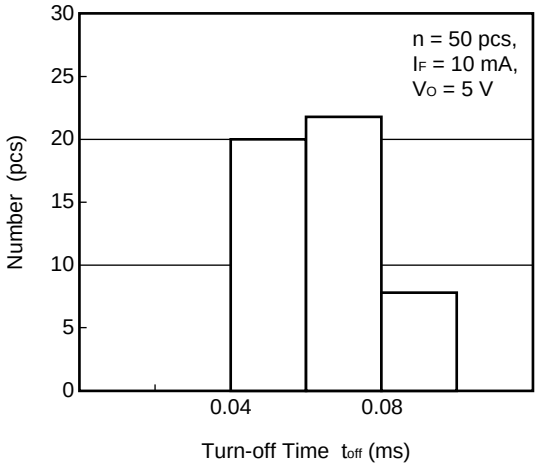
TURN-OFF TIME vs. FORWARD CURRENT



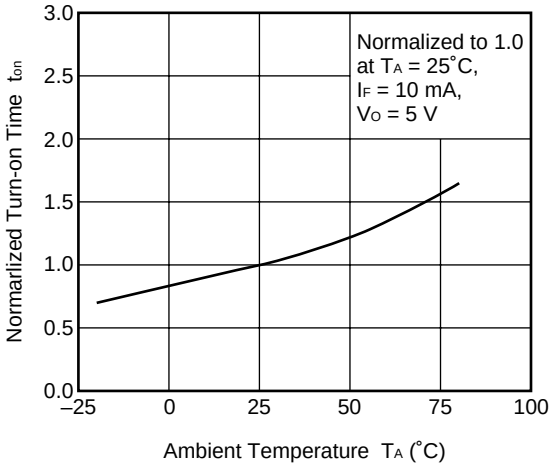
TURN-ON TIME DISTRIBUTION



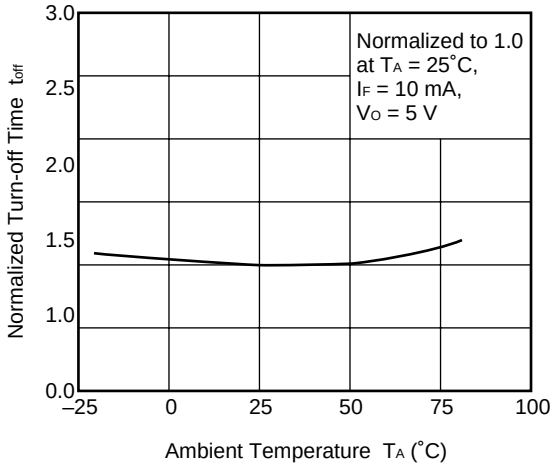
TURN-OFF TIME DISTRIBUTION



NORMALIZED TURN-ON TIME vs. AMBIENT TEMPERATURE



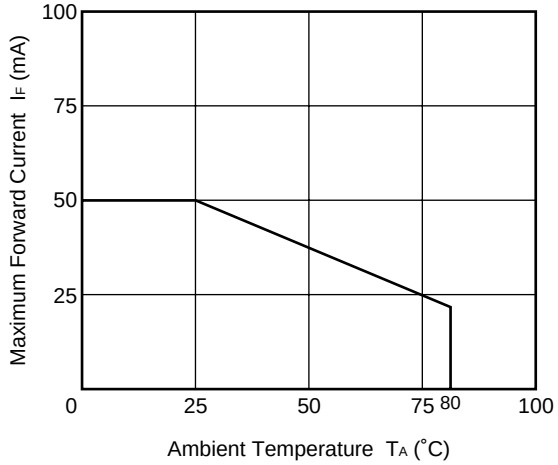
NORMALIZED TURN-OFF TIME vs. AMBIENT TEMPERATURE



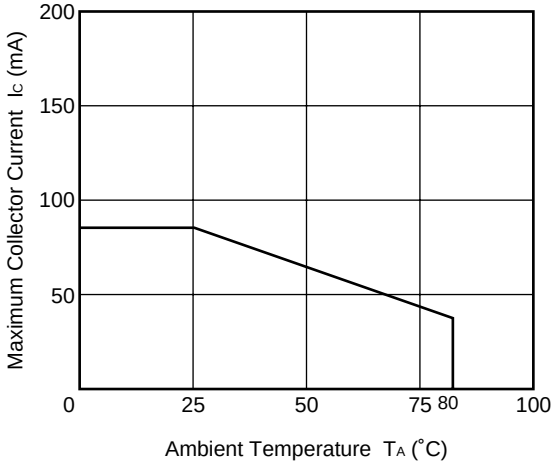
Remark The graphs indicate nominal characteristics.

PHOTOCOUPLER TYPICAL CHARACTERISTICS (T_A = 25°C, unless otherwise specified)

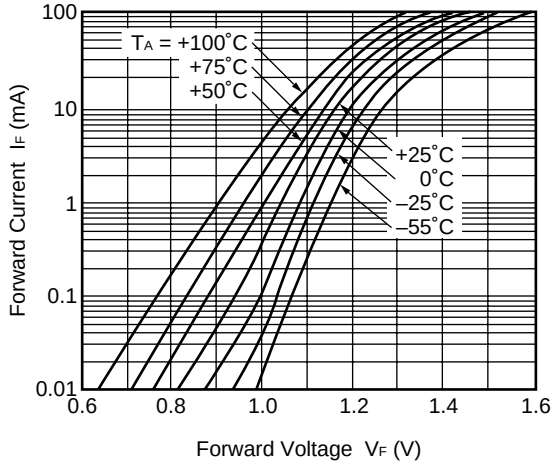
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



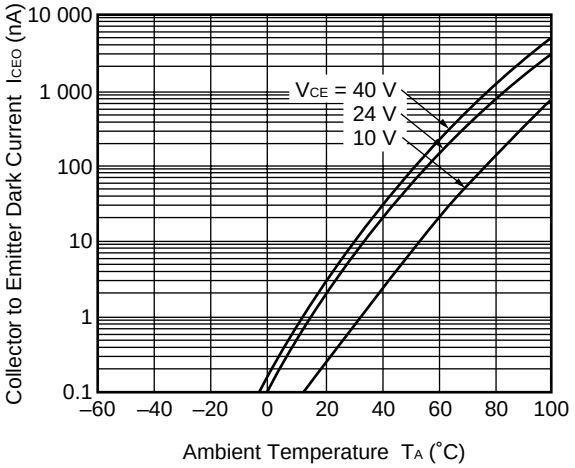
MUXIMUM COLLECTOR CURRENT vs. AMBIENT TEMPERATURE



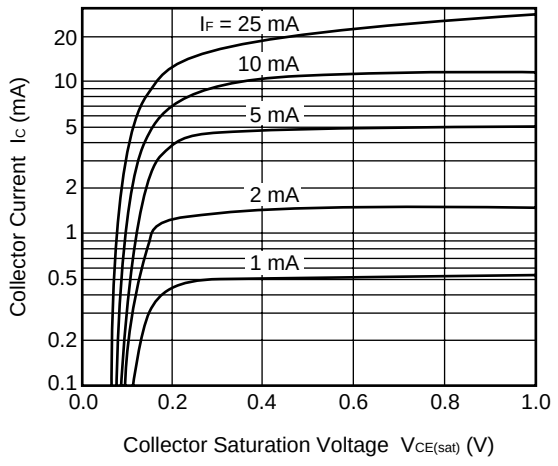
FORWARD CURRENT vs. FORWARD VOLTAGE



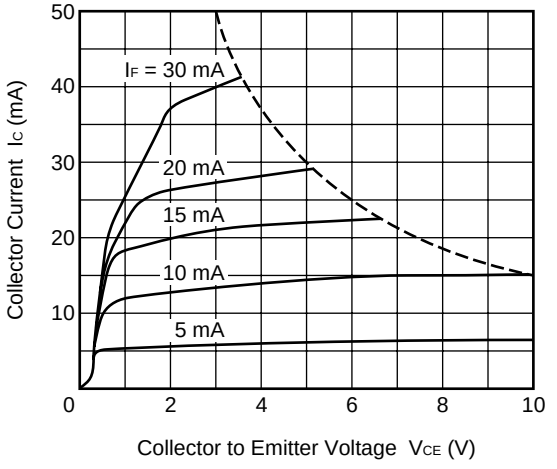
COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



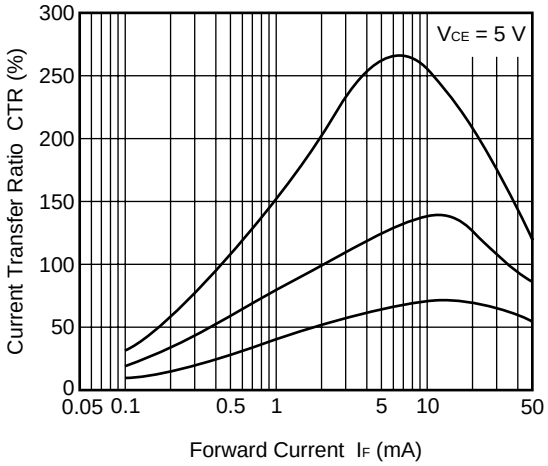
COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



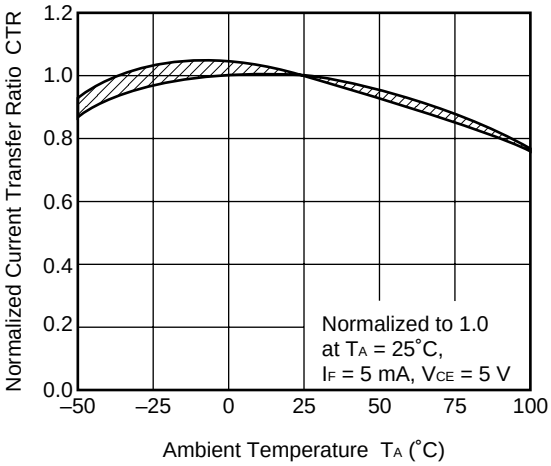
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



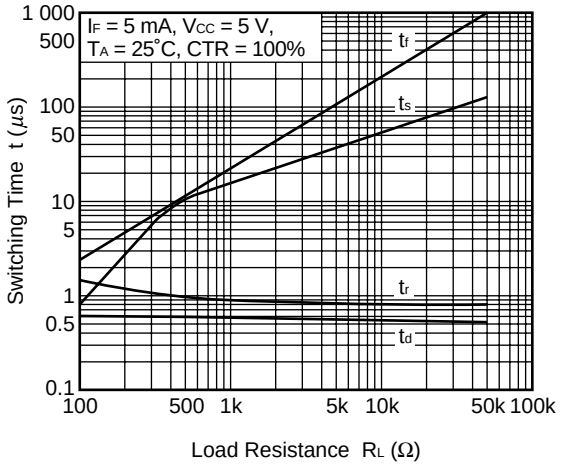
CURRENT TRANSFER RATIO vs.
FORWARD CURRENT



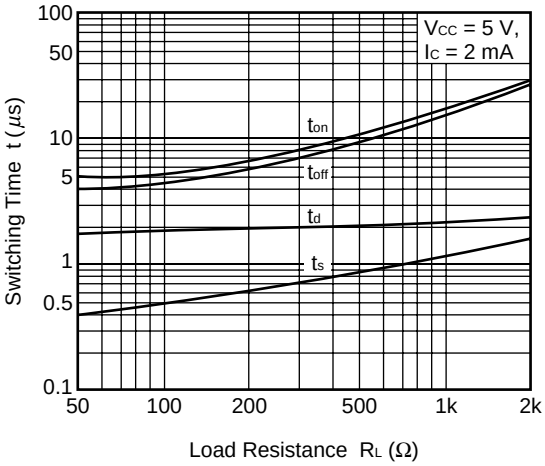
NORMALIZED CURRENT TRANSFER
RATIO vs. AMBIENT TEMPERATURE



SWITCHING TIME vs.
LOAD RESISTANCE



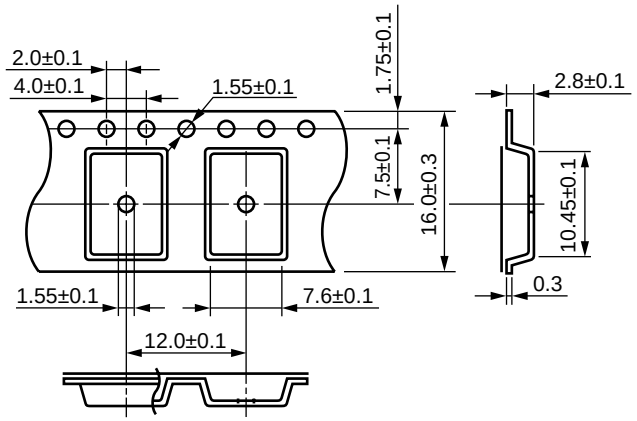
SWITCHING TIME vs.
LOAD RESISTANCE



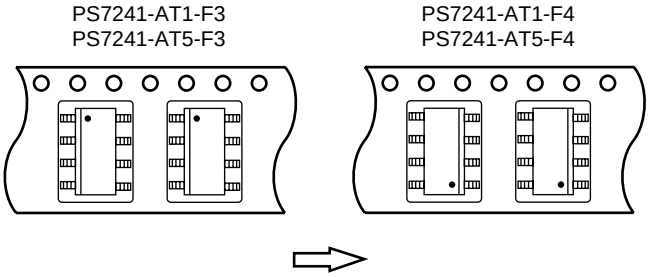
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (Unit: mm)

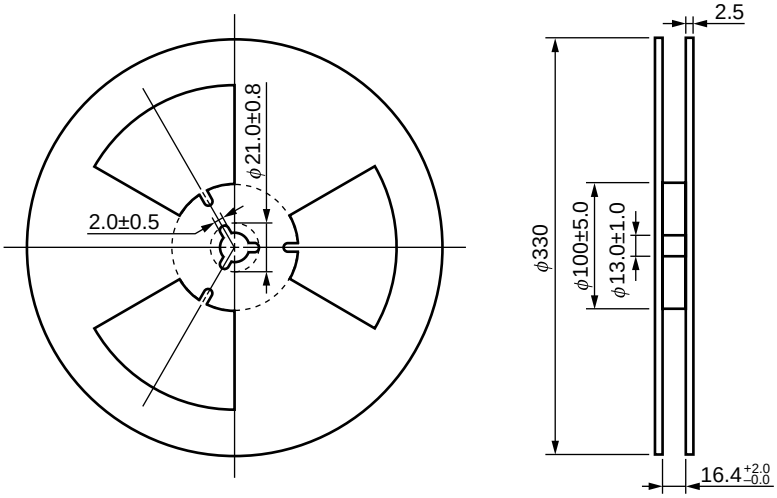
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



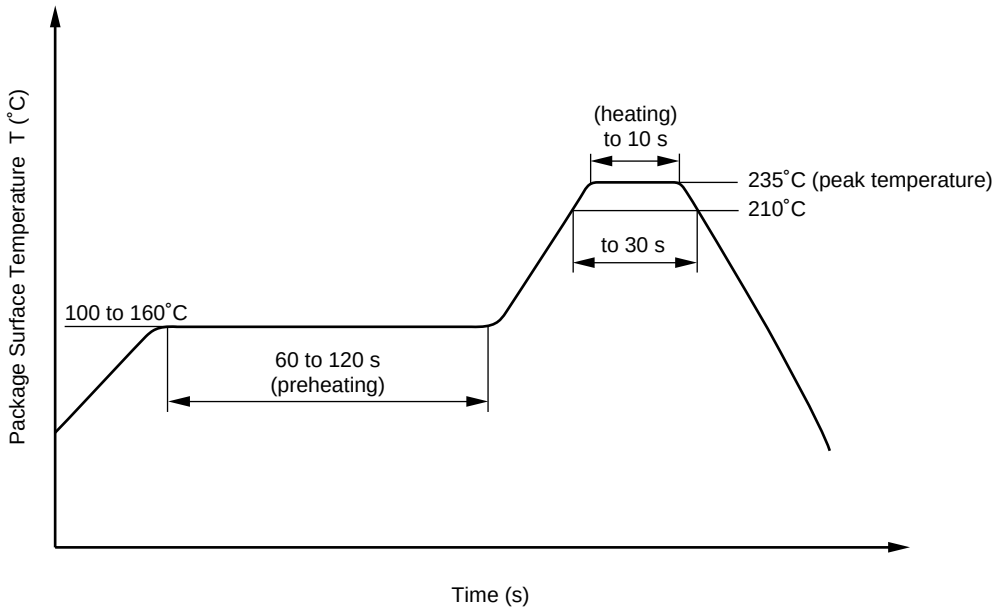
Packing: 1 500 pcs/reel

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

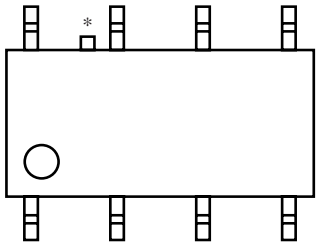


(2) Dip soldering

- 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

Caution GaAs Products	The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested. • Do not destroy or burn the product. • Do not cut or cleave off any part of the product. • Do not crush or chemically dissolve the product. • Do not put the product in the mouth. Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.