NEC

8-PIN SOP SOLID STATE RELAY

PS7241-AT1
PS7241-AT5

FEATURES

- **2 CHANNEL TYPE:**
  OCMOS FET + PHOTOCOUPLER
- **DESIGNED FOR AC/DC SWITCHING LINE CHANGER**
- **SMALL PACKAGE:**
  8-PIN SOP
- **ISOLATION VOLTAGE:**
  BV: 1500 Vr.m.s. MIN
- **LOW OFFSET VOLTAGE**
- **LOW LED OPERATING CURRENT:**
  I_F = 2 mA
- **AVAILABLE IN TAPE AND REEL**

DESCRIPTION

PS7241-AT1 and PS7241-AT5 are solid state relays containing a GaAs LED on the emitting side (input side) and MOSFETs (+ Phototransistor) on the output side. They are suitable for analog signal control because of their low offset and high linearity.

APPLICATIONS

- **EXCHANGE EQUIPMENT**
- **MEASUREMENT EQUIPMENT**
- **FA/OA EQUIPMENT**

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER						PS7241-AT1, PS7241-AT5		
		SYMBOLS	PARAMETERS	CONDITIONS	UNITS	MIN	TYP	MAX
OCMOS FET	Diode	V_F	Forward Voltage	I_F = 5 mA	V		1.2	1.4
		I_R	Reverse Current	V_R = 5 V	μA			5.0
	MOSFET	I_{LOFF}	Off-state Leakage Current	V_D = 400 V	μA		0.03	1.0
		C_{out}	Output Capacitance	V_D = 0 V, f = 1 MHz	pF		65	
	Coupler	I_{Fon}	LED On-state Current	I_L = 120 mA	mA			2.0
		R_{ON1}	On-state Resistance	I_F = 10 mA, I_L = 10 mA	Ω		20	30
		R_{ON2}		I_F = 10 mA, I_L = 120 mA, t≤10 ms	Ω			25
		t_{ON}	Turn-on Time	I_F = 10 mA, V_O = 5 V, PW ≥10 ms	ms		0.3	1.0
		t_{OFF}	Turn-off Time		ms		0.04	0.2
		R_{I-O}	Isolation Resistance	V_{I-0} = 1.0 kV	Ω	10^9		
		C_{I-O}	Isolation Capacitance	V = 0 V, f = 1 MHz	pF		1.1	
Photocoupler	Diode	V_F	Forward Voltage	I_F = 10 mA	V		1.2	1.4
		I_R	Reverse Current[1]	V_R = 5 V	μA			5.0
	Transistor	I_{CEO}	Collector to Emitter Dark Current	V_{CE} = 40 V, I_F = 0 mA	nA			100
		BV_{CEO}	Collector to Emitter Breakdown Voltage	I_C = 1 mA	V	40		
	Coupler	BV_{ECO}	Emitter to Collector Breakdown Voltage	I_E = 100 μA	V	6		
		CTR	Current Transfer Ratio	I_F = 5 mA, V_{CE} = 5 V	%	50		400
		$V_{CE(sat)}$	Collector Saturation Voltage	I_F = 10 mA, I_C = 2 mA	V			0.3
		R_{I-O}	Isolation Resistance	V_{in-out} = 1.0 kVcc	Ω	10^{11}		
		C_{I-O}	Isolation Capacitance	V = 0 V, f = 1 MHz	pF		0.4	
		tR	Rise Time	V_{cc} = 5 V, I_c = 2 mA	μs		3.0	
		tF	Fall Time	R_L = 100 Ω	μs		5.0	

Note:
1. PS7241-AT1 only.

ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

	SYMBOLS	PARAMETERS	UNITS	RATINGS
OCMOS	Diode			
	I_F	Forward Current (DC)	mA	50
	V_R	Reverse Voltage	V	5.0
	P_D	Power Dissipation	mW/ch	50
	I_{FP}	Peak Forward Current[2]	A	1.0
	MOSFET			
	V_L	Break Down Voltage	V	400
	I_L	Continuous Load Current	mA	120
	I_{LP}	Pulse Load Current[3] (AC/DC Connection)	mA	250
	P_D	Power Dissipation	mW	430
Photocoupler	Diode			
	I_F	Forward Current	mA	50
	V_R	Reverse Voltage[4]	V	5.0
	P_D	Power Dissipation	mW/ch	50
	I_{FP}	Peak Forward Current[2]	A	1.0
	Transistor			
	V_{CEO}	Collector to Emitter Voltage	V	40
	V_{ECO}	Emitter to Collector Voltage	V	6.0
	I_C	Collector Current	mA	80
	P_C	Power Dissipation	mW	100
	BV	Isolation Voltage[5]	Vr.m.s.	1500
	P_T	Total Power Dissipation	mW	630
	T_A	Operating Ambient Temp.	°C	-40 to 80
	T_{STG}	Storage Temperature	°C	-40 to 100

Notes:
1 .Operation in excess of any one of these parameters may result in permanent damage.
2. PW = 100 μs, Duty Cycle = 1%.
3. PW = 100 ms, 1 shot.
4. PS7241-AT1 only.
5. AC voltage for 1 minute at T_A = 25 °C, RH = 60 % between input and ouput.

RECOMMENDED OPERATING CONDITIONS (T_A = 25°C)

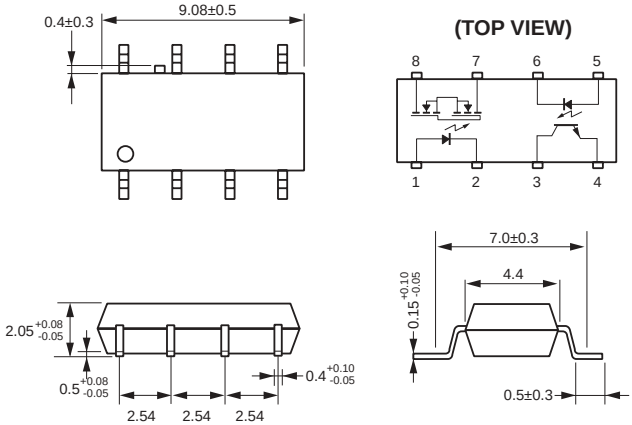
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
OCMOS FET					
IF	LED Operating Current	mA	2	10	20
VF	LED Off Voltage	V	0		0.5

ORDERING INFORMATION

PART NUMBER	PACKAGE	PACKING STYLE
PS7241-AT1	8-pin SOP	Magazine case 45 pcs
PS7241-AT1-F3		Embossed Tape 1500 pcs/reel
PS7241-AT1-F4		
PS7241-AT5		Magazine case 45 pcs
PS7241-AT5-F3		Embossed Tape 1500 pcs/reel
PS7241-AT5-F4		

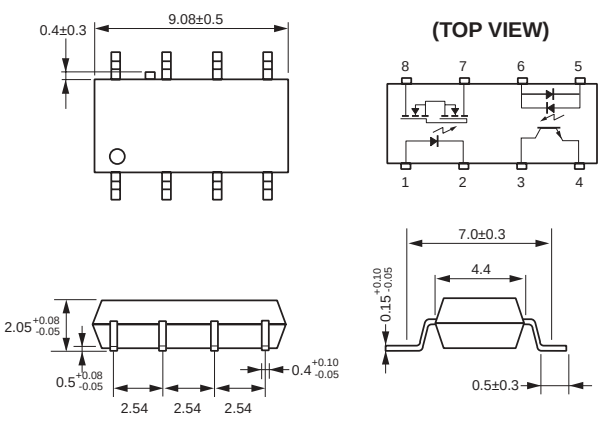
OUTLINE DIMENSIONS (Units in mm)

PS7241-AT1



1 LED Anode
2 LED Cathode
3 Tr Collector
4 Tr Emitter
5 LED Anode
6 LED Cathode
7 MOSFET
8 MOSFET

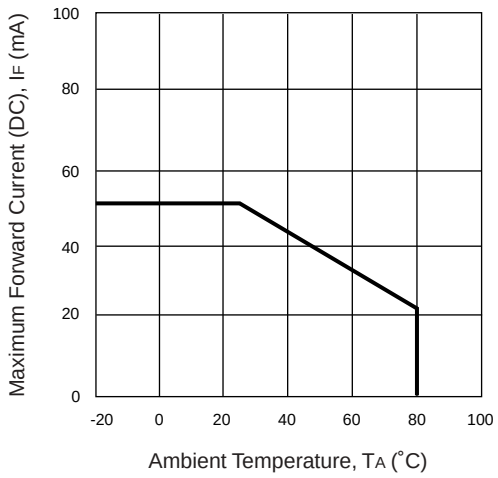
PS7241-AT5



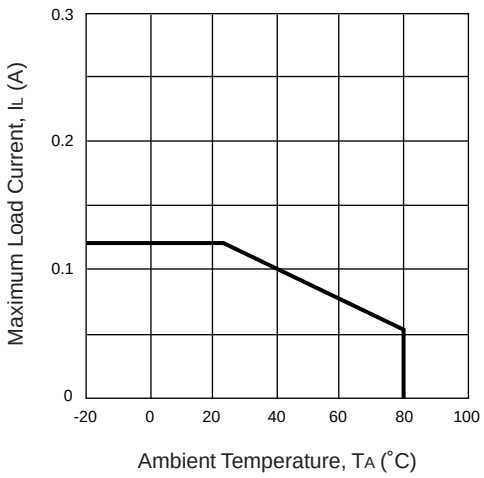
1 LED Anode
2 LED Cathode
3 Tr Collector
4 Tr Emitter
5 LED Anode/Cathode
6 LED Cathode/Anode
7 MOSFET
8 MOSFET

OCMOS TYPICAL PERFORMANCE CURVES (T_A = 25°C)

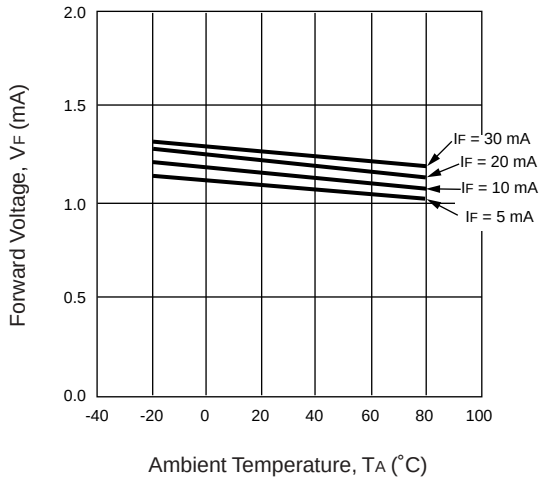
MAXIMUM FORWARD CURRENT (DC) vs. AMBIENT TEMPERATURE



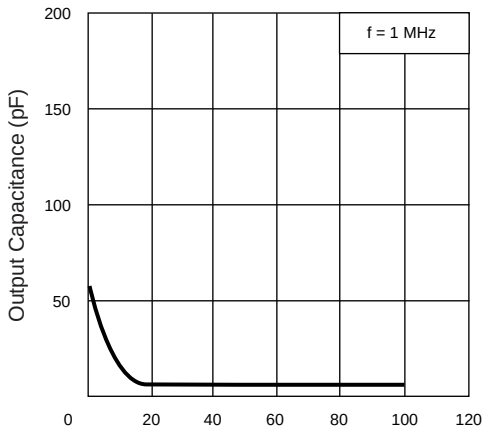
MAXIMUM LOAD CURRENT vs. AMBIENT TEMPERATURE



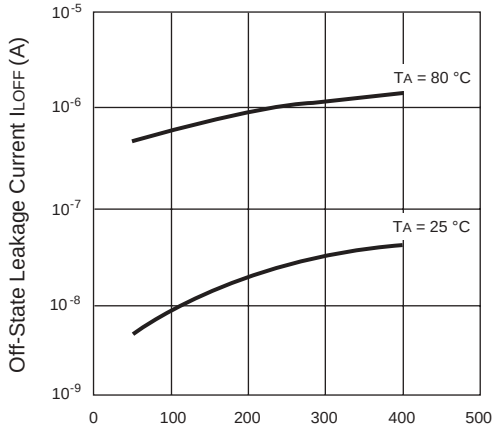
FORWARD VOLTAGE vs. AMBIENT TEMPERATURE



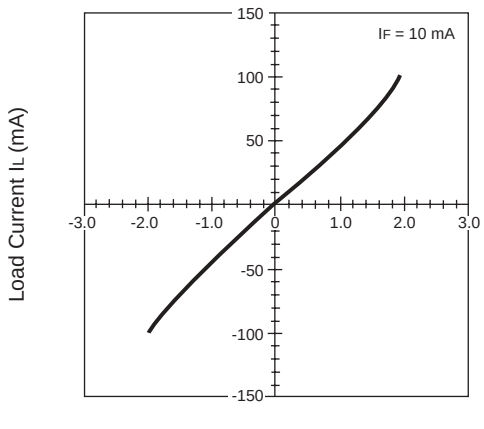
OUTPUT CAPACITANCE vs. SUPPLY VOLTAGE



OFF-STATE LEAKAGE CURRENT vs. SUPPLY VOLTAGE

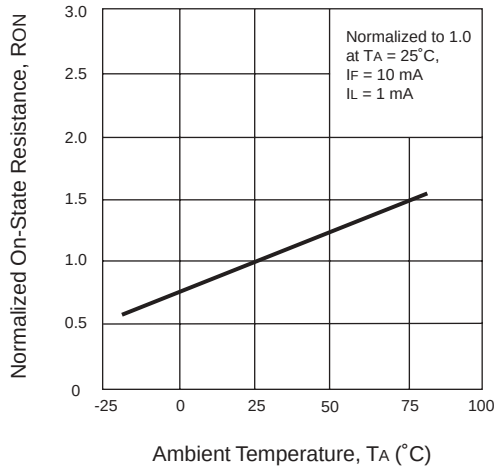


LOAD CURRENT vs. LOAD VOLTAGE

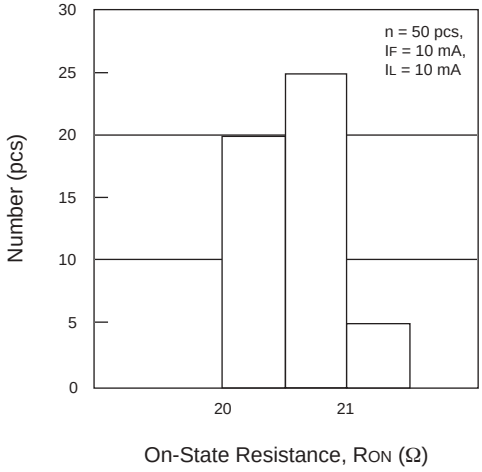


OCMOS TYPICAL PERFORMANCE CURVES (TA = 25˚C)

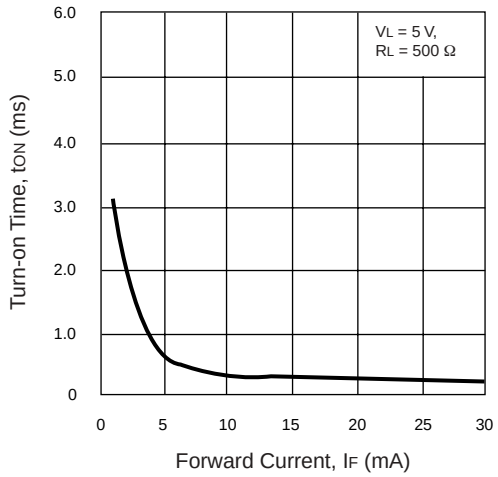
NORMALIZED ON-STATE RESISTANCE vs. AMBIENT TEMPERATURE



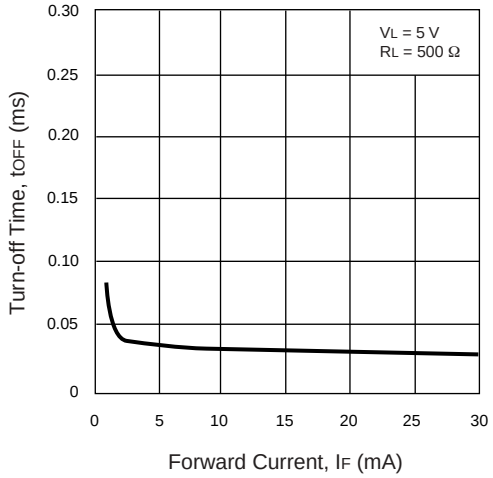
ON-STATE RESISTANCE DISTRIBUTION



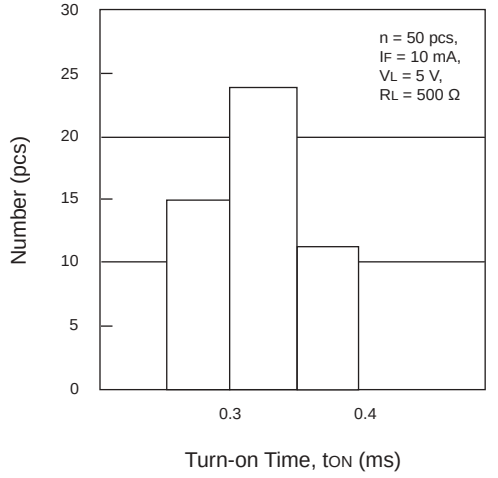
TURN-ON TIME vs. FORWARD CURRENT



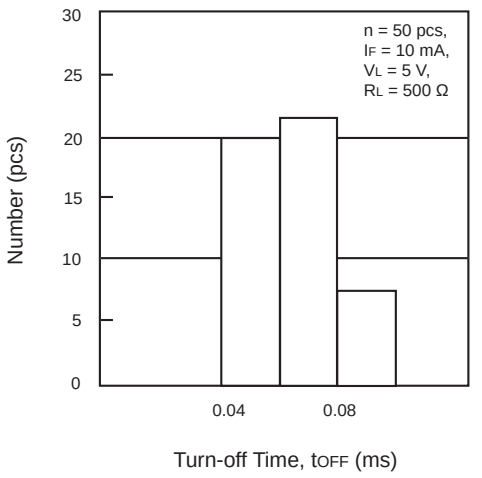
TURN-OFF TIME vs. FORWARD CURRENT



TURN-ON TIME DISTRIBUTION

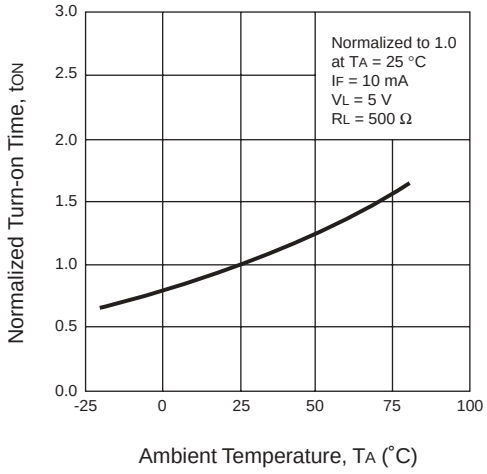


TURN-OFF TIME DISTRIBUTION

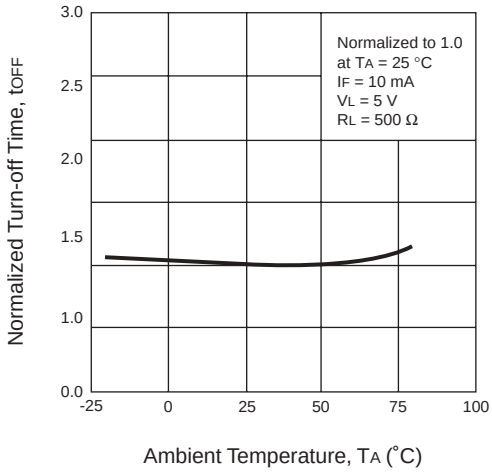


OCMOS TYPICAL PERFORMANCE CURVES (TA = 25˚C)

NORMALIZED TURN-ON TIME vs. AMBIENT TEMPERATURE

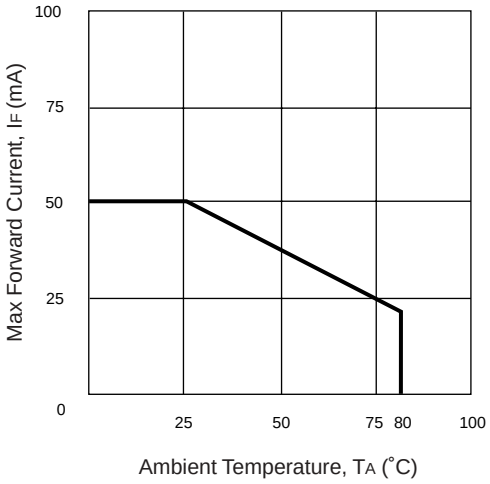


NORMALIZED TURN-OFF TIME vs. AMBIENT TEMPERATURE

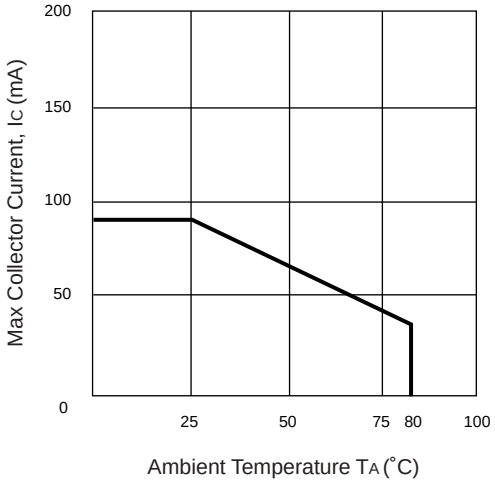


PHOTOCOUPLER TYPICAL PERFORMANCE CURVES (TA = 25˚C)

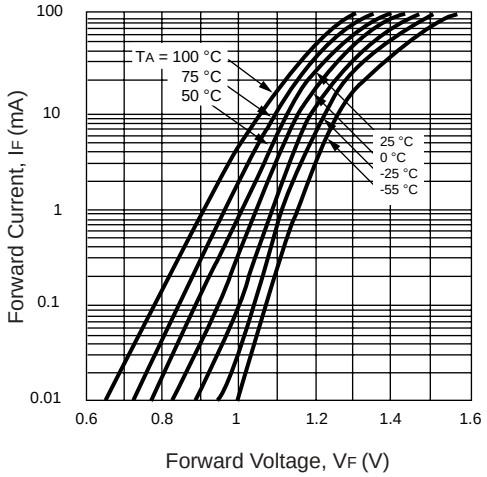
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



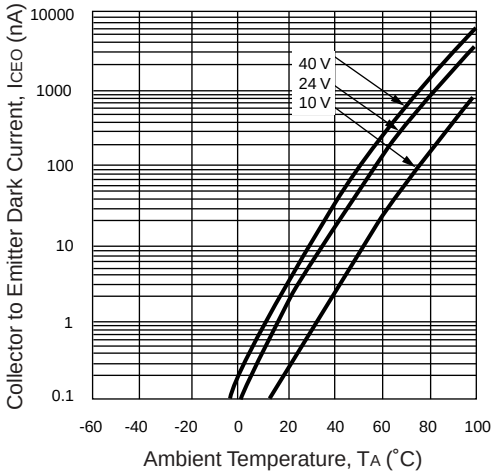
MAXIMUM COLLECTOR CURRENT vs. AMBIENT TEMPERATURE



FORWARD CURRENT vs. FORWARD VOLTAGE

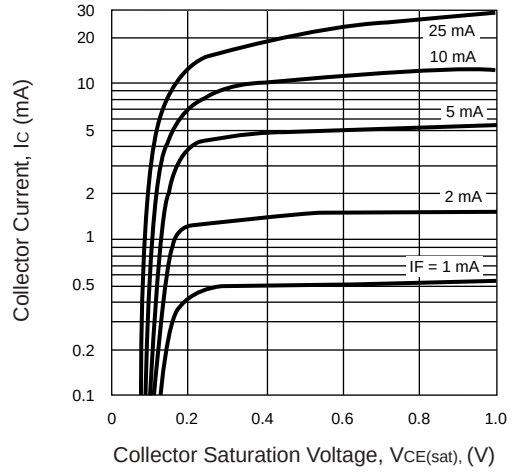


COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE

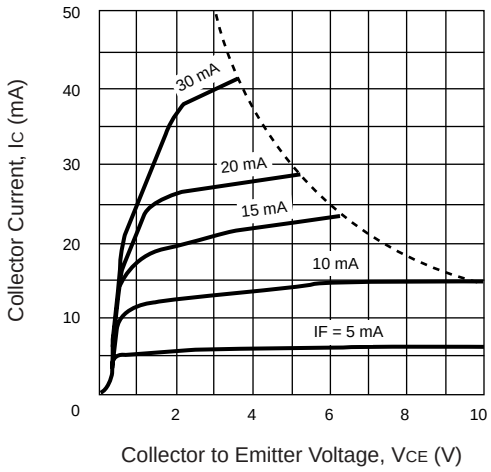


PHOTOCOUPLER TYPICAL PERFORMANCE CURVES (TA = 25°C)

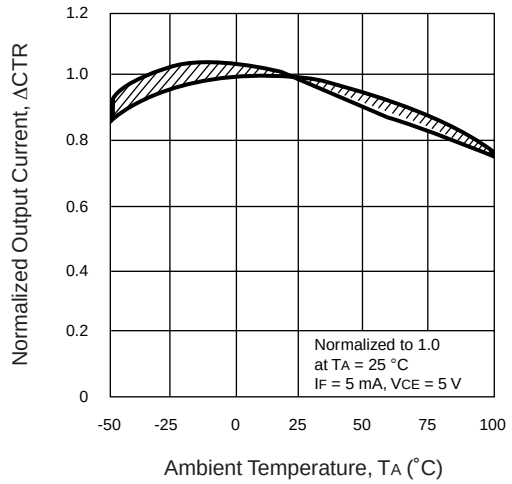
COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



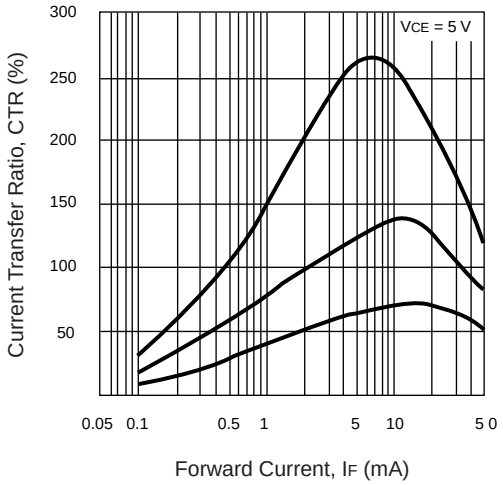
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



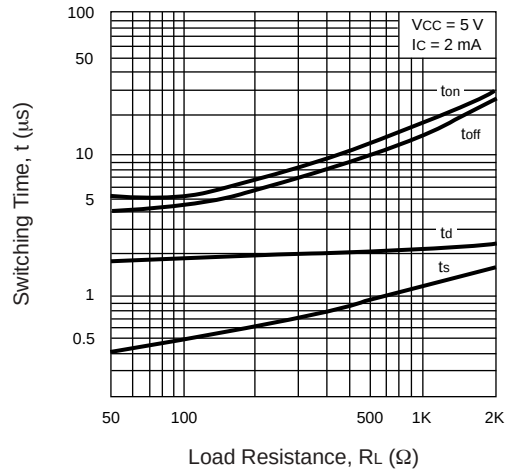
NORMALIZED OUTPUT CURRENT vs. AMBIENT TEMPERATURE



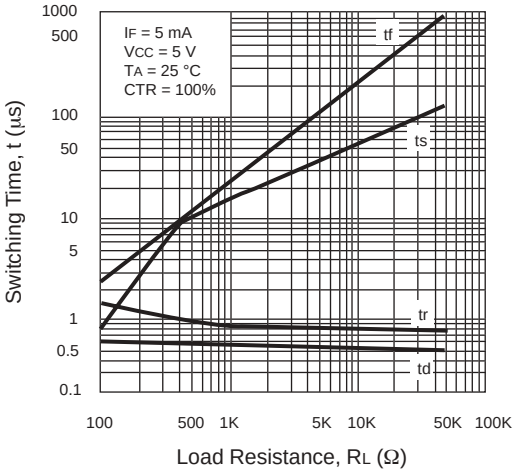
CURRENT TRANSFER RATIO (CTR) vs. FORWARD CURRENT



SWITCHING TIME vs. LOAD RESISTANCE

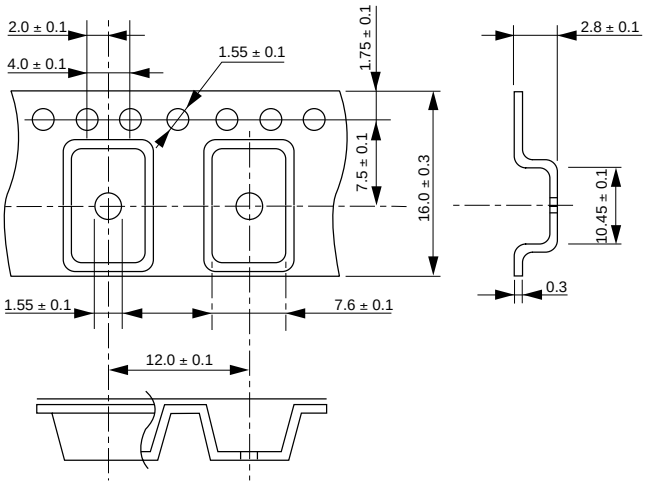


SWITCHING TIME vs. LOAD RESISTANCE

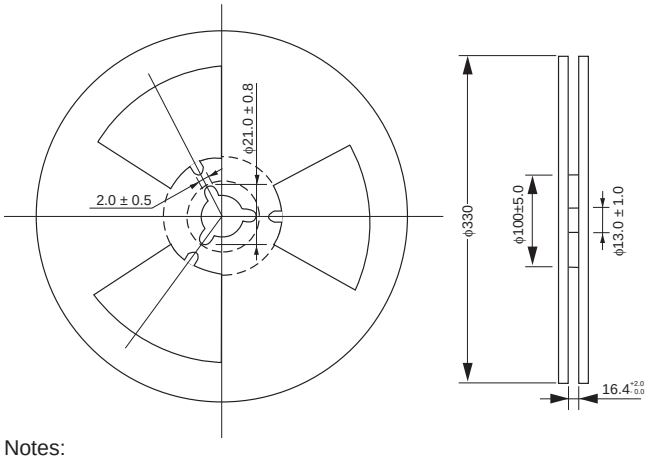


TAPING SPECIFICATIONS (Units in mm)

OUTLINE AND DIMENSIONS (TAPE)



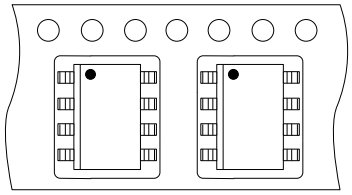
OUTLINE AND DIMENSIONS (REEL)



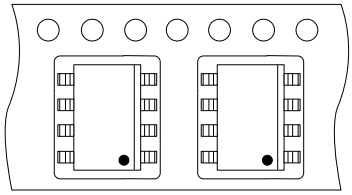
Notes:
1. Packaging : 1500 pcs/reel

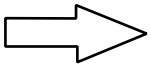
TAPING DIRECTION

PS7241-AT1-F3
PS7241-AT5-F3



PS7241-AT1-F4
PS7241-AT5-F4



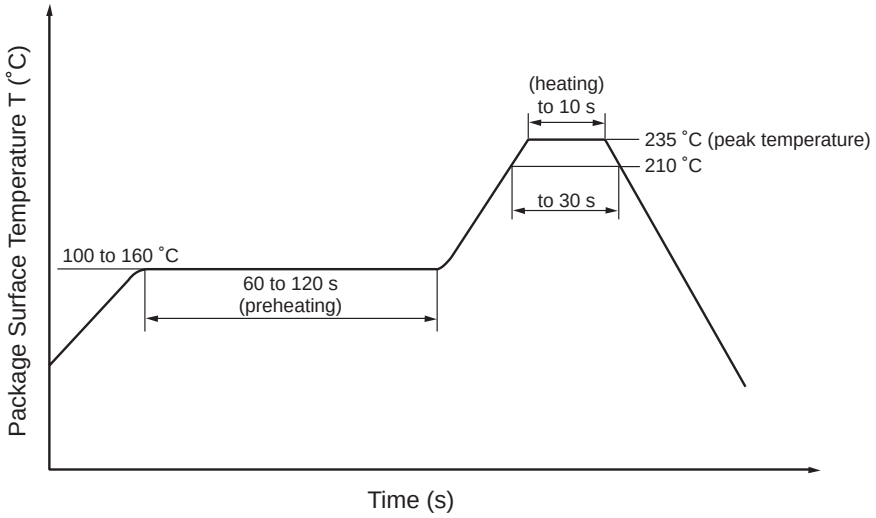


RECOMMENDED SOLDERING CONDITIONS

(1) Infrared reflow soldering

• Peak reflow temperature	235 °C or below (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

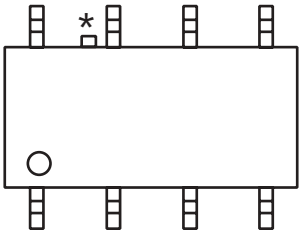


(2) Dip soldering

• 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 cleaning solvent.
- Avoid shorting between portion of frame and leads.



* Portion of frame