NEC

PHOTO COUPLERS

PS9631, PS9631L

HIGH ISOLATION VOLTAGE PHOTO POWER IC COUPLER

— NEPOC SERIES —

DESCRIPTION

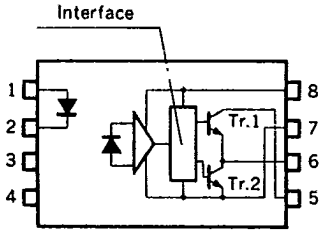
PS9631, PS9631L are optically coupled isolator containing a GaAs light emitting diode and a silicon monolithic photo integrated circuit.

PS9631 is in a plastic DIP (Dual In-line Package).

PS9631L is lead bending type (Gull-wing) for surface mount.

PS9631, PS9631L are available to drive power transistor (15 A to 20 A class) directly.

PIN CONNECTION (Top View)



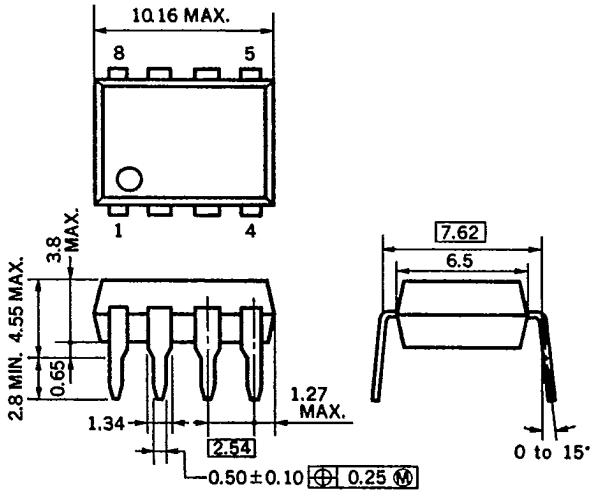
1. Anode
2. Cathode
3. NC
4. NC
5. Output (O1)
6. Output (O2)
7. GND
8. V_{CC}

FEATURES

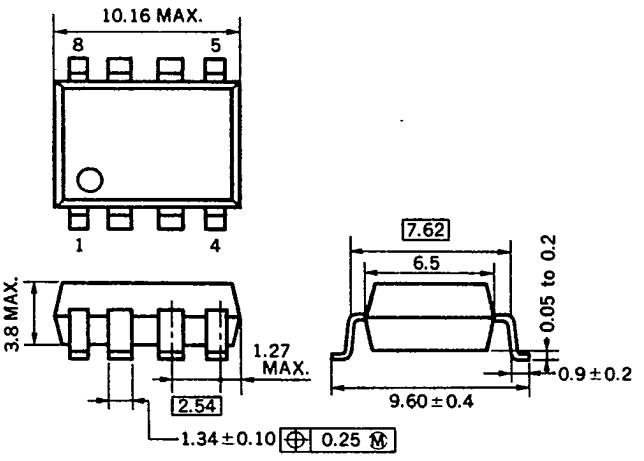
- High isolation voltage (BV: 5 $kV_{r.m.s.}$ MIN.)
- Large output current (I_O: 0.5 A (DC) MAX.)
- High speed switching (t_{PHL}, t_{PLH} = 2 μs TYP.)
- 8 pin DIP

PACKAGE DIMENSIONS (Unit : in millimeters)

PS9631



PS9631L



ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

Diode			
Reverse Voltage	V_R	6	V
Forward Current (DC)	I_F	30	mA
Peak Forward Current *1)	$I_{F(peak)}$	1	A
Detector			
Supply Voltage	V_{CC}	18	V
Output Current (O1)	I_{O1}	0.5	A
Peak Output Current (O1)*2)	I_{O1P}	1.0	A
Output Current (O2)	I_{O2}	0.6	A
Peak Output Current (O2)*2)	I_{O2P}	2.0	A
Output Voltage (O1)	V_{O1}	18	V
Power Dissipation	P_O	500	mW
Coupled			
Total Power Dissipation	P_T	550	mW
Isolation Voltage *3)	BV	5000	$V_{r.m.s.}$
Storage Temperature	T_{stg}	−55 to +150	°C
Operating Temperature	T_{opt}	−20 to +80	°C

*1) Pulse width = 100 μs, Duty cycle 1 %
*2) Pulse width = 5 μs, Duty cycle 1 %
*3) AC voltage for 1 minute at T_a = 25 °C, RH = 60 % between input (pin No. 1, 2, 3, 4 Common) and output (pin No. 5, 6, 7, 8 Common).

ELECTRICAL CHARACTERISTICS ($T_a = T_{opt}$)

CHARACTERISTIC		SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS	Fig.
Diode	Forward Voltage	V_F		1.1	1.4	V	I_F = 5 mA, T_a = 25 °C	
	Reverse Current	I_R			5	μA	V_R = 5 V, T_a = 25 °C	
	Junction Capacitance	C		30		pF	V = 0, f = 1.0 MHz, T_a = 25 °C	
Detector	Low Level Output Voltage (O1)	V_{O1L}		0.25	0.4	V	V_{CC} = 6 V, I_{O1} = 0.4 A, I_F = 5 mA	1
	High Level Output Voltage (O2)	V_{O2H}	4.5	5.0		V	V_{CC} = 6 V, I_{O2} = −0.4 A, I_F = 5 mA	2
	Low Level Output Voltage (O2)	V_{O2L}		0.25	0.4	V	V_{CC} = 6 V, I_{O2} = 0.5 A, I_F = 0	
	Leak Current (O1)	I_{LO1}			100	μA	V_{CC} = 15 V, I_F = 0	3
	Leak Current (O2)	I_{LO2}			100	μA	V_{CC} = 15 V, I_F = 5 mA	4
	High Level Supply Current	I_{CCH}		8	12	mA	V_{CC} = 6 V, I_F = 5 mA, T_a = 25 °C	
					16	mA	V_{CC} = 6 V, I_F = 5 mA	
	Low Level Supply Current	I_{CCL}		8	13	mA	V_{CC} = 6 V, I_F = 0, T_a = 25 °C	
					18	mA	V_{CC} = 6 V, I_F = 0	
Coupled	Threshold Input Current (L → H)	I_{FLH}	0.3	1.5	3.0	mA	V_{CC} = 6 V, T_a = 25 °C	5
			0.2		5.0	mA	V_{CC} = 6 V	
	Isolation Capacitance	C_{1-2}		0.6		pF	V = 0, f = 1.0 MHz, T_a = 25 °C	
	Isolation Resistance	R_{1-2}	10^{11}			Ω	V_{in-out} = 1 kV, T_a = 25 °C	
	Propagation Delay Time (H → L)	t_{PHL}		2	5	μs	V_{CC} = 6 V, I_F = 5 mA, T_a = 25 °C R_{L1} = 5 Ω, R_{L2} = 10 Ω	6
	Propagation Delay Time (L → H)	t_{PLH}		2	5	μs	V_{CC} = 6 V, I_F = 5 mA, T_a = 25 °C R_{L1} = 5 Ω, R_{L2} = 10 Ω	
	Common Mode Transient Immunity at Logic high Output Level	CM_H	−1000	−2000	—	V/μs	V_{CM} = 100 V, I_F = 5 mA, V_{CC} = 6 V R_{L1} = 470 Ω, R_{L2} = 1 kΩ, T_a = 25 °C	7
	Common Mode Transient Immunity at Logic low Output Level	CM_L	1000	2000	—	V/μs	V_{CM} = 100 V, I_F = 0, V_{CC} = 6 V R_{L1} = 470 Ω, R_{L2} = 1 kΩ, T_a = 25 °C	

TRUTH TABLE

	LED	
	ON	OFF
Tr. 1	ON	OFF
Tr. 2	OFF	ON

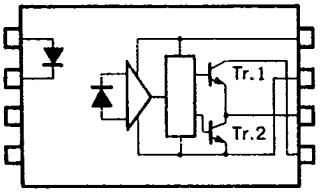
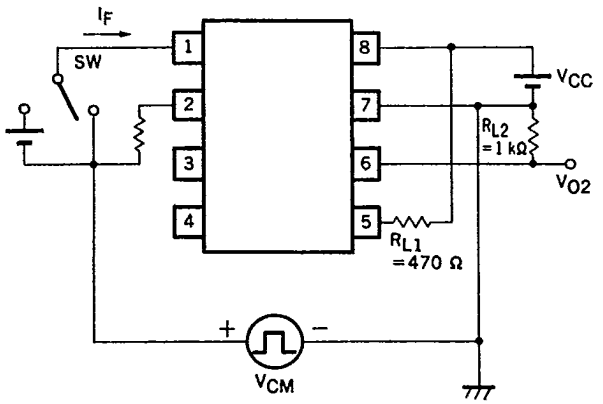
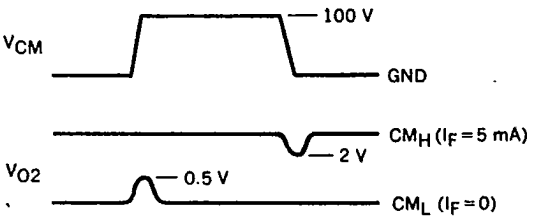


Fig. 7 (CM_H, CM_L)





TEST CIRCUIT FOR ELECTRICAL CHARACTERISTICS

Fig. 1 (V_{O1L})

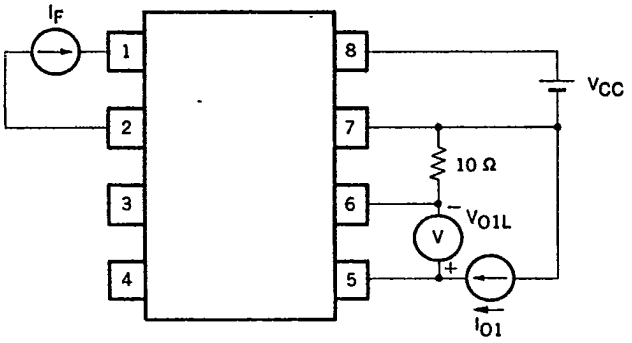


Fig. 2 (V_{O2H})

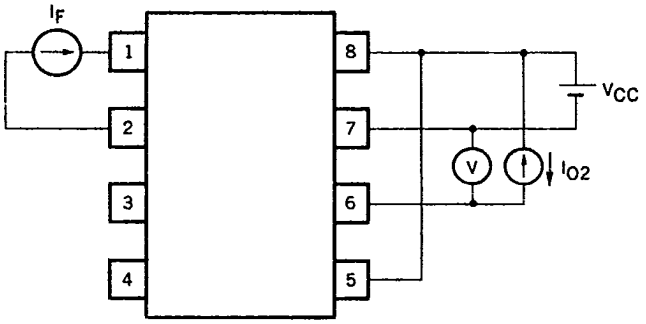


Fig. 3 (I_{LO1})

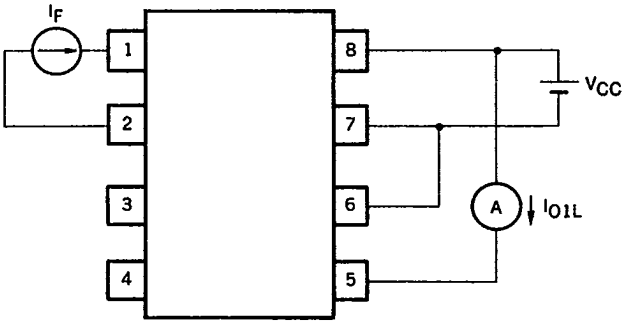


Fig. 4 (I_{LO2})

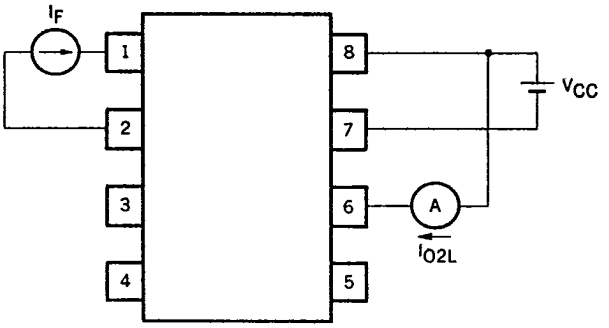


Fig. 5 (I_{FLH})

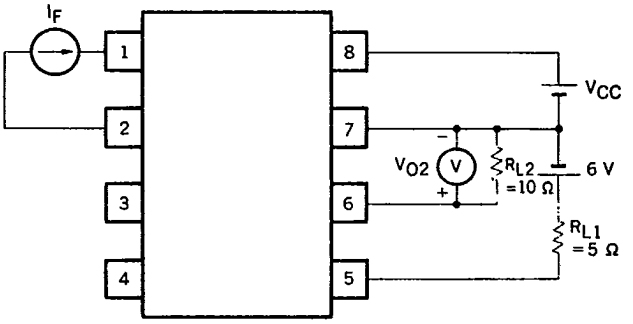
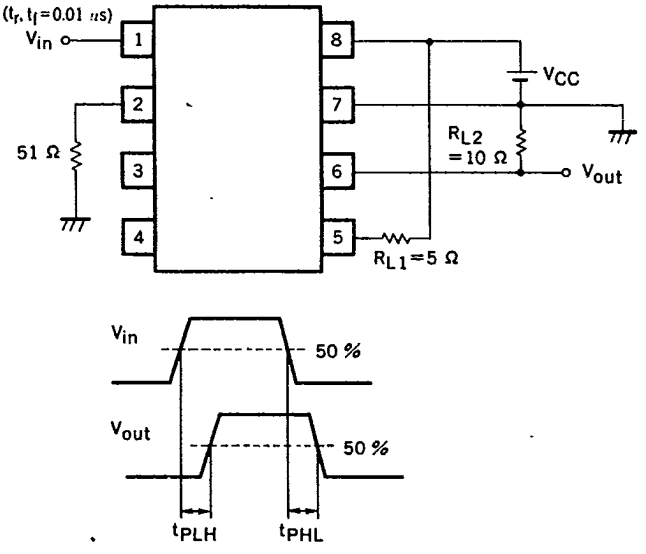
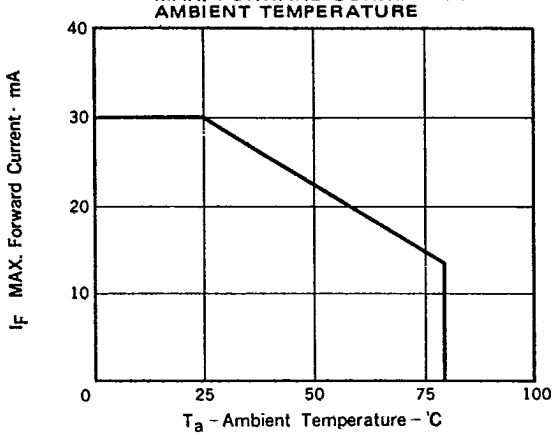


Fig. 6 (t_{PHL}, t_{PLH})

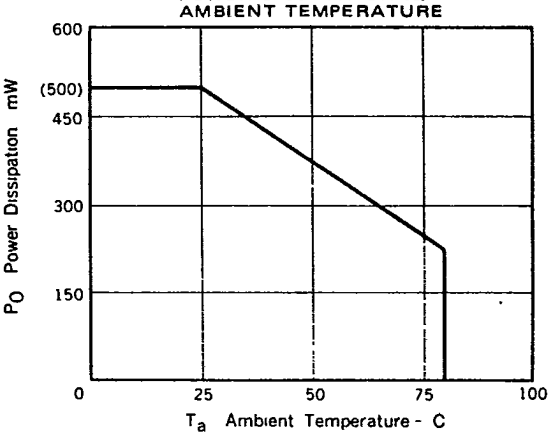


TYPICAL CHARACTERISTICS (T_a = 25 °C)

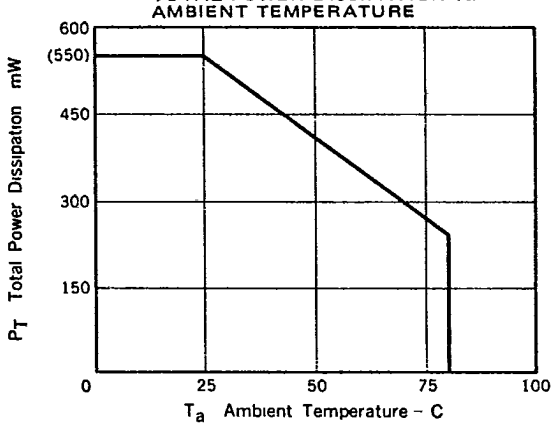
MAX. FORWARD CURRENT vs. AMBIENT TEMPERATURE



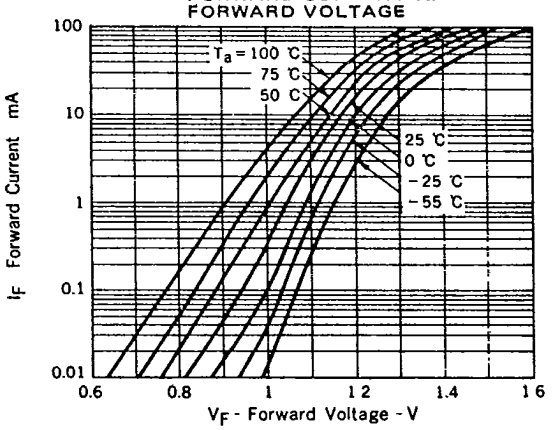
POWER DISSIPATION vs. AMBIENT TEMPERATURE



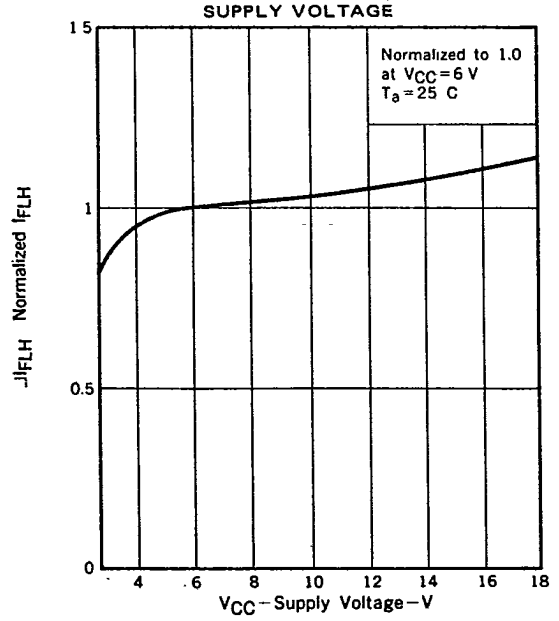
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



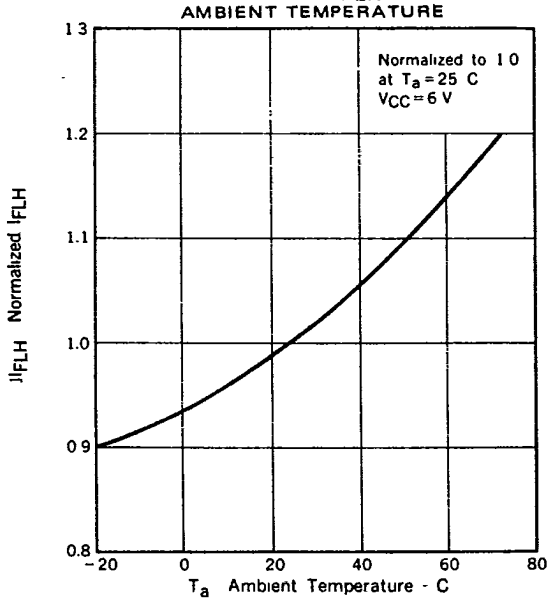
FORWARD CURRENT vs. FORWARD VOLTAGE



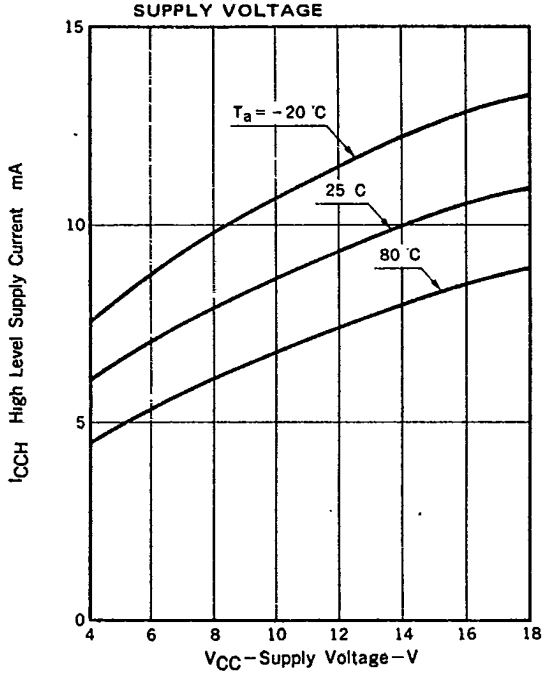
NORMALIZED I_{FLH} vs. SUPPLY VOLTAGE



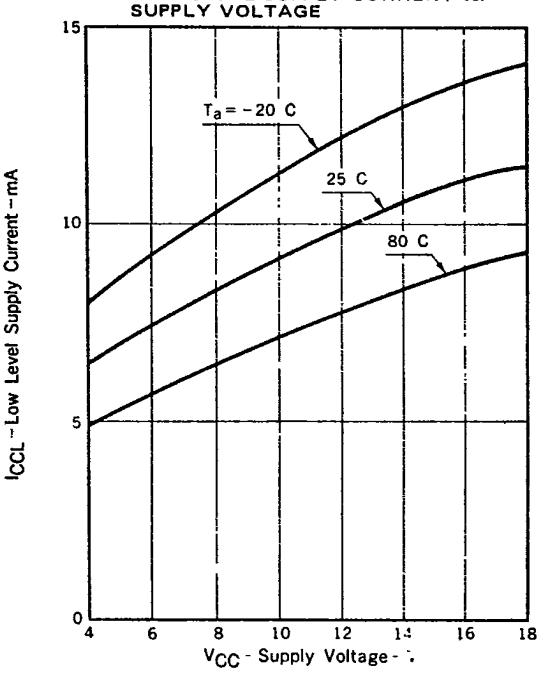
NORMALIZED I_{FLH} vs. AMBIENT TEMPERATURE



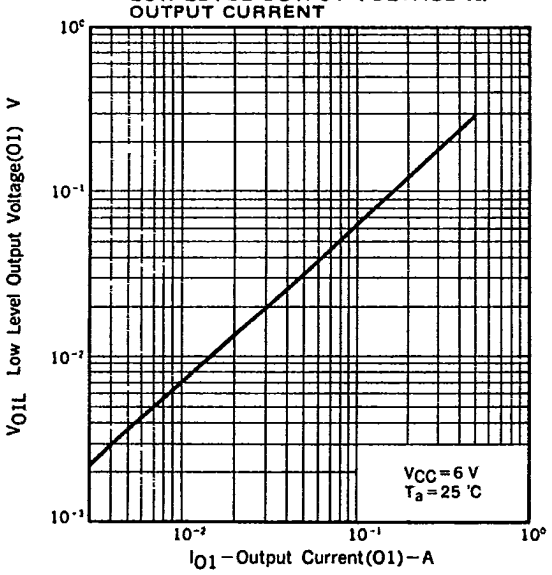
HIGH LEVEL SUPPLY CURRENT vs. SUPPLY VOLTAGE



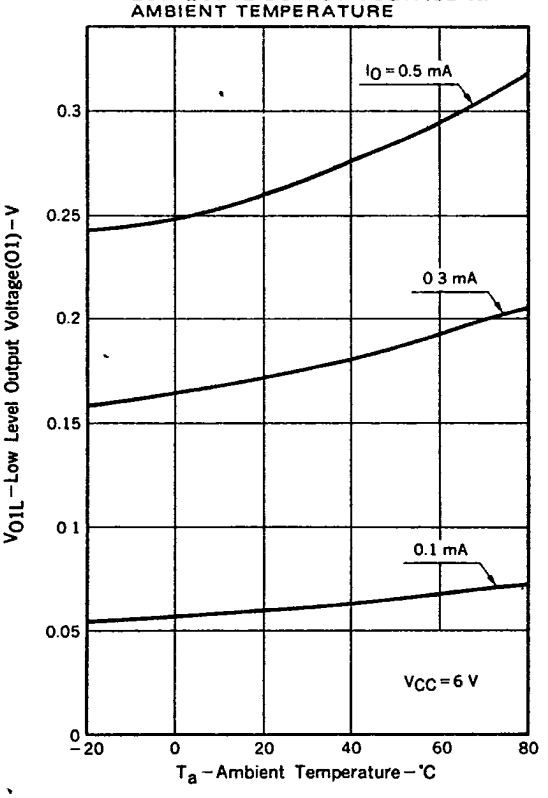
LOW LEVEL SUPPLY CURRENT vs. SUPPLY VOLTAGE



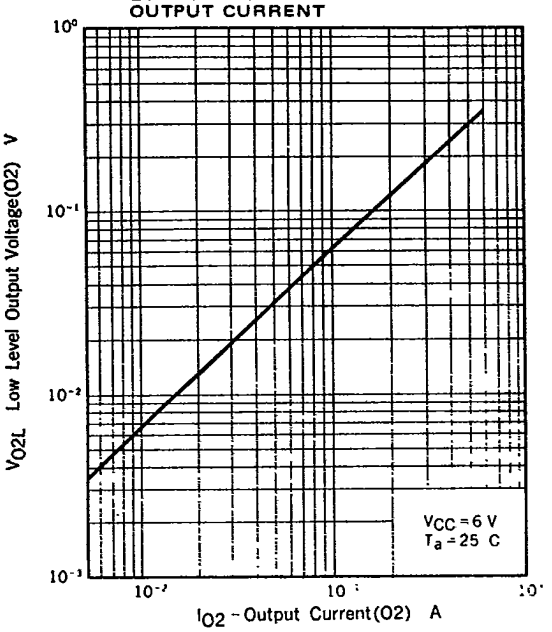
LOW LEVEL OUTPUT VOLTAGE vs. OUTPUT CURRENT



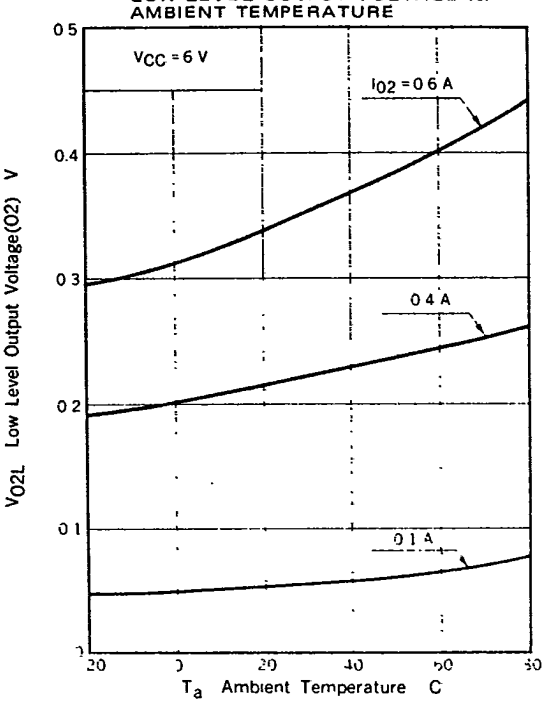
LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



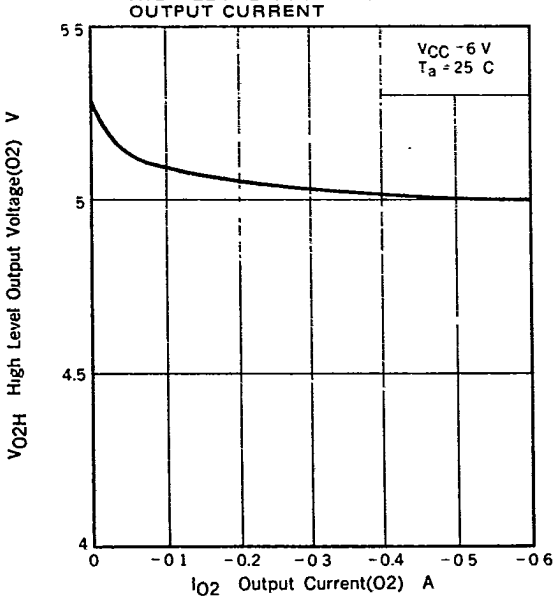
LOW LEVEL OUTPUT VOLTAGE vs. OUTPUT CURRENT



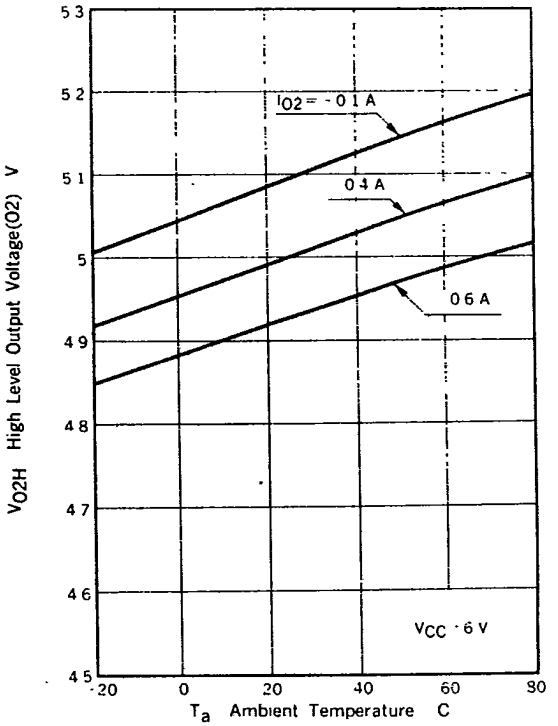
LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



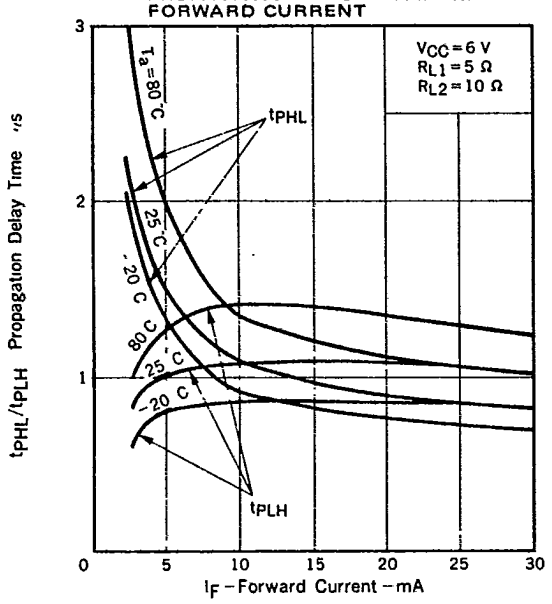
HIGH LEVEL OUTPUT VOLTAGE vs. OUTPUT CURRENT



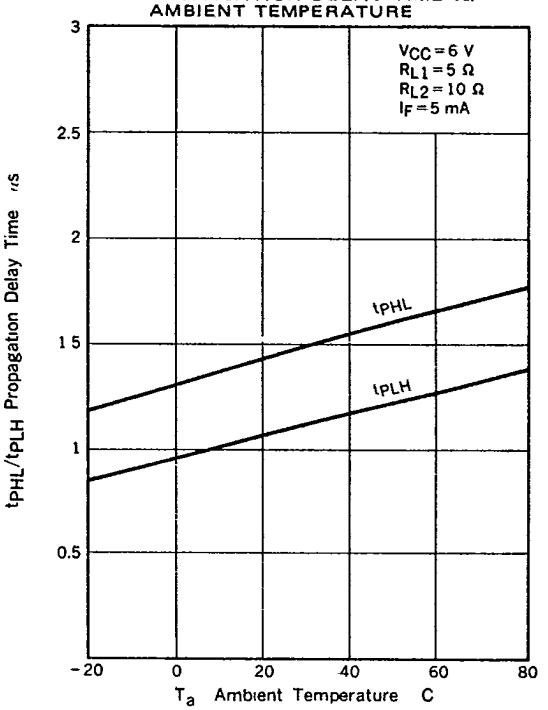
HIGH LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



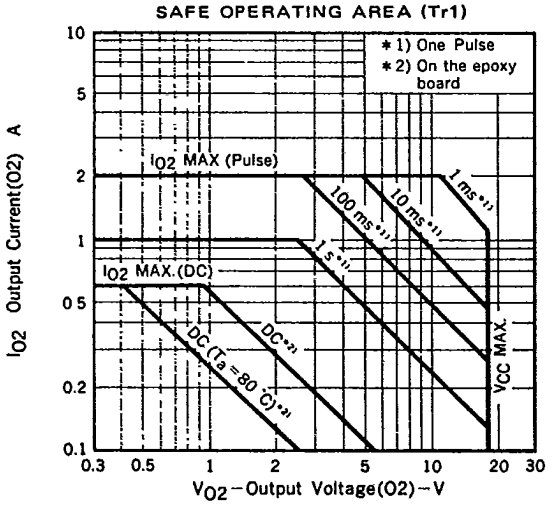
PROPAGATION DELAY TIME vs. FORWARD CURRENT



PROPAGATION DELAY TIME vs. AMBIENT TEMPERATURE



SAFE OPERATING AREA (Tr1)

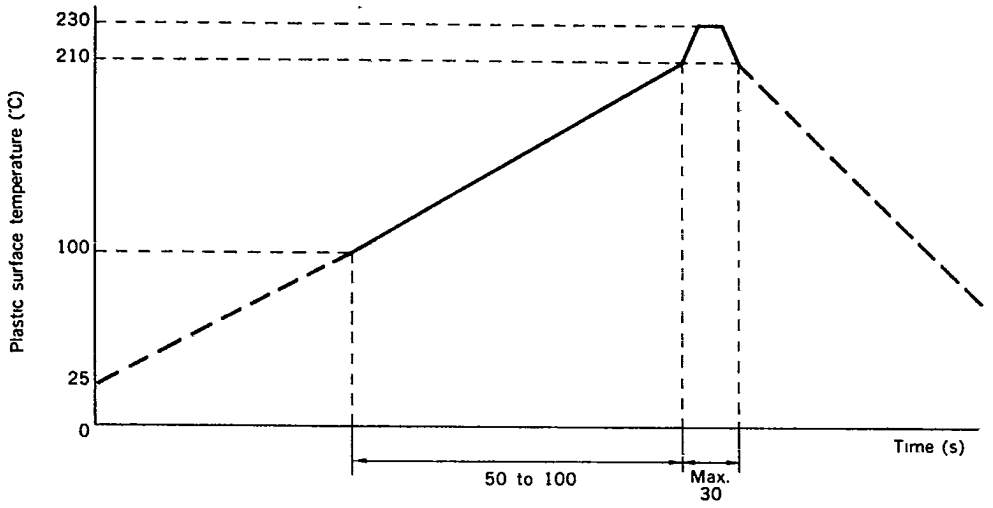


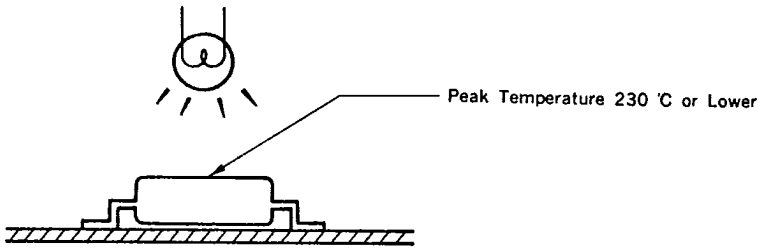
SOLDERING PRECAUTION

(1) Infrared reflow soldering

- Peak temperature : 230 °C or lower (plastic surface)
- Time : 30 s or less
  (Time during plastic surface temperature overs 210 °C)
- No. of reflow times : 1
- Flux : Rosin-base flux

Reflow Temperature Profile

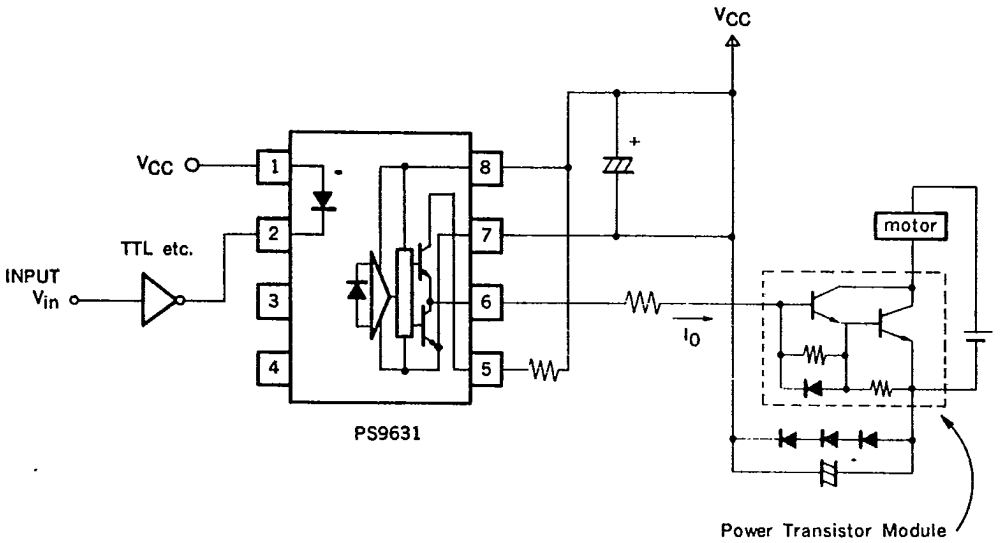


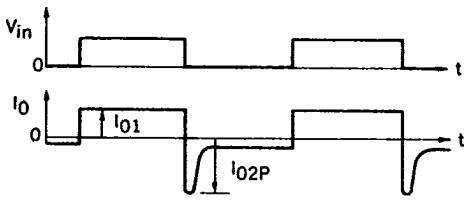


(2) Dip soldering

- Peak temperature : 260 °C or lower
- Time : 10 s or less
- Flux : Rosin-base flux

APPLICATION FOR POWER TRANSISTOR MODULE (EXAMPLE)





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