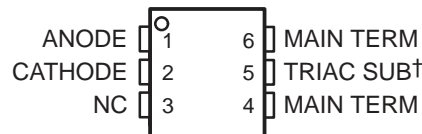


TIL3020 THRU TIL3023 OPTOCOUPLED/OPTOISOLATORS

SOES028A – DECEMBER 1987 – REVISED APRIL 1998

- 400-V Phototriac Driver Output
- Gallium-Arsenide-Diode Infrared Source and Optically-Coupled Silicon Triac Driver (Bilateral Switch)
- UL Recognized . . . File Number E65085
- High Isolation . . . 3535 V peak
- Output Driver Designed for 220 Vac
- Standard 6-Pin Plastic DIP

TIL3020 – TIL3023 . . . PACKAGE
(TOP VIEW)

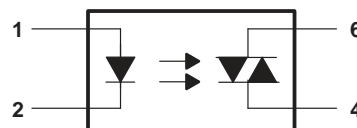


† Do not connect this terminal
NC – No internal connection

typical 115/240 Vac(rms) applications

- Solenoid/Valve Controls
- Lamp Ballasts
- Interfacing Microprocessors to 115/240 Vac Peripherals
- Motor Controls
- Incandescent Lamp Dimmers

logic diagram



description

Each device consists of a gallium-arsenide infrared-emitting diode optically coupled to a silicon phototriac mounted on a 6-pin lead frame encapsulated within an electrically nonconductive plastic compound. The case withstands soldering temperature with no deformation. Device performance characteristics remain stable when operated in high-humidity conditions.

absolute maximum ratings at 25°C free-air (unless otherwise noted)†

Input-to-output peak voltage, 5 s maximum duration, 60 Hz (see Note 1)	3.535 kV
Input diode reverse voltage	3 V
Input diode forward current, continuous	50 mA
Output repetitive peak off-state voltage	400 V
Output on-state current, total rms value (50-60 Hz, full sine wave): $T_A = 25^\circ\text{C}$	100 mA
$T_A = 70^\circ\text{C}$	50 mA
Output driver nonrepetitive peak on-state current ($t_W = 10$ ms, duty cycle = 10%, see Figure 7)	1.2 A
Continuous power dissipation at (or below) 25°C free-air temperature:	
Infrared-emitting diode (see Note 2)	100 mW
Phototriac (see Note 3)	300 mW
Total device (see Note 4)	330 mW
Operating junction temperature range, T_J	-40°C to 100°C
Storage temperature range, T_{stg}	-40°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. Input-to-output peak voltage is the internal device dielectric breakdown rating.
 2. Derate linearly to 100°C free-air temperature at the rate of 1.33 mW/°C.
 3. Derate linearly to 100°C free-air temperature at the rate of 4 mW/°C.
 4. Derate linearly to 100°C free-air temperature at the rate of 4.4 mW/°C.

TIL3020 THRU TIL3023 OPTOCOUPLEDERS/OPTOISOLATORS

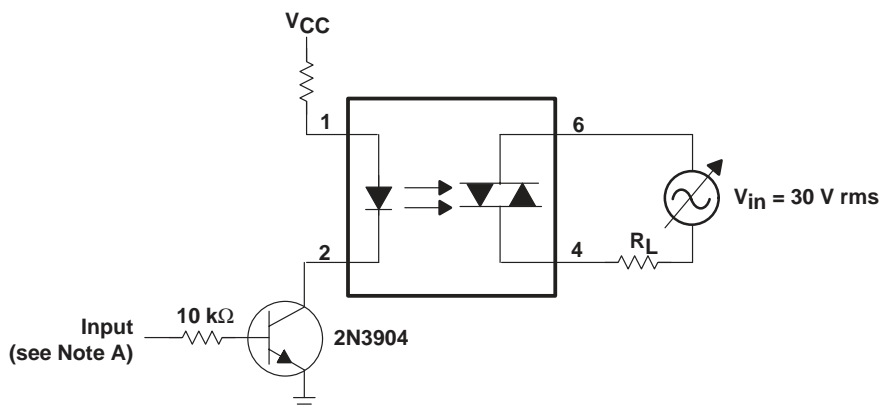
SOES028A – DECEMBER 1987 – REVISED APRIL 1998

electrical characteristics 25°C free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
I_R	Static reverse current	$V_R = 3\text{ V}$		0.05	100	μA
V_F	Static forward voltage	$I_F = 10\text{ mA}$		1.2	1.5	V
I_{DRM}	Repetitive off-state current, either direction	$V_{DRM} = 400\text{ V}$, See Note 5		10	100	nA
dv/dt	Critical rate of rise of off-state voltage	See Figure 1		100		V/ μs
dv/dt(c)	Critical rate of rise of communication voltage	$I_O = 15\text{ mA}$, See Figure 1		0.15		V/ μs
I_{FT}	Input trigger current, either direction	Output supply voltage = 3 V	TIL3020	15	30	mA
			TIL3021	8	15	
			TIL3022	5	10	
			TIL3023	3	5	
V_{TM}	Peak on-state voltage, either direction	$I_{TM} = 100\text{ mA}$		1.4	3	V
I_H	Holding current, either direction			100		μA

NOTE 5: Test voltage must be applied at a rate no higher than 12 V/ μs .

PARAMETER MEASUREMENT INFORMATION



NOTE A. The critical rate of rise of off-state voltage, dv/dt, is measured with the input set at 0 volts. The frequency of V_{in} is increased until the phototriac turns on. This frequency is then used to calculate the dv/dt according to the following formula:

$$dv/dt = 2\sqrt{2}\pi f V_{in}$$

The critical rate of rise of commutating voltage, dv/dt(c), is measured by applying occasional 5-volt pulses to the input and increasing the frequency of V_{in} until the phototriac remains on (latches) after the input pulse has ceased. With no further input pulses, the frequency of V_{in} is then gradually decreased until the phototriac turns off. The frequency at which turn-off occurs can then be used to calculate the dv/dt(c) according to the formula shown above.

Figure 1. Critical Rate of Rise Test Circuit

TYPICAL CHARACTERISTICS

EMITTING DIODE TRIGGER CURRENT (NORMALIZED)
vs
FREE-AIR TEMPERATURE

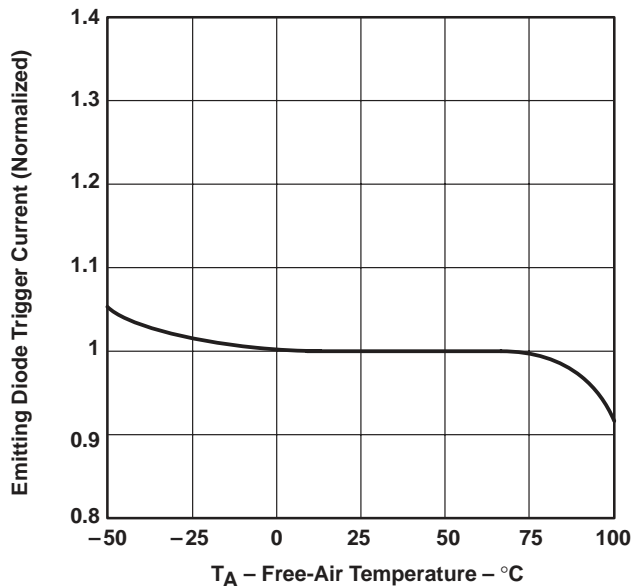


Figure 2

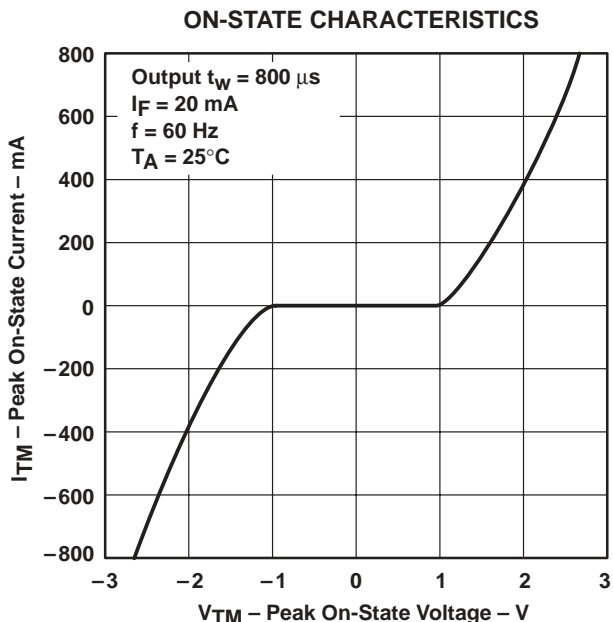


Figure 3

NONREPETITIVE PEAK ON-STATE CURRENT
vs
PULSE DURATION

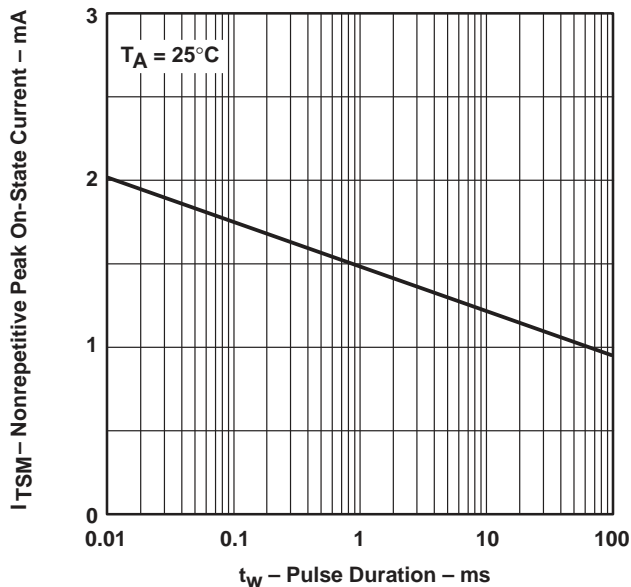


Figure 4

TIL3020 THRU TIL3023 OPTOCOUPLEDERS/OPTOISOLATORS

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APPLICATION INFORMATION

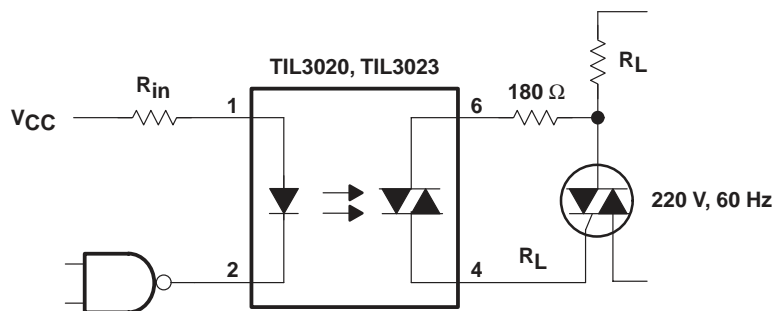


Figure 5. Resistive Load

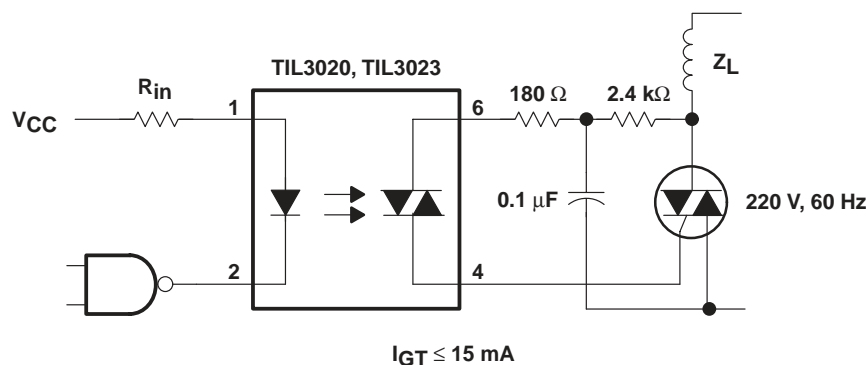


Figure 6. Inductive Load With Sensitive-Gate Triac

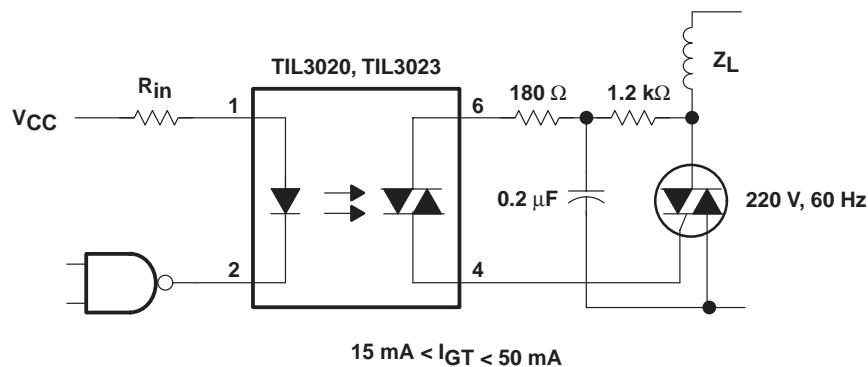
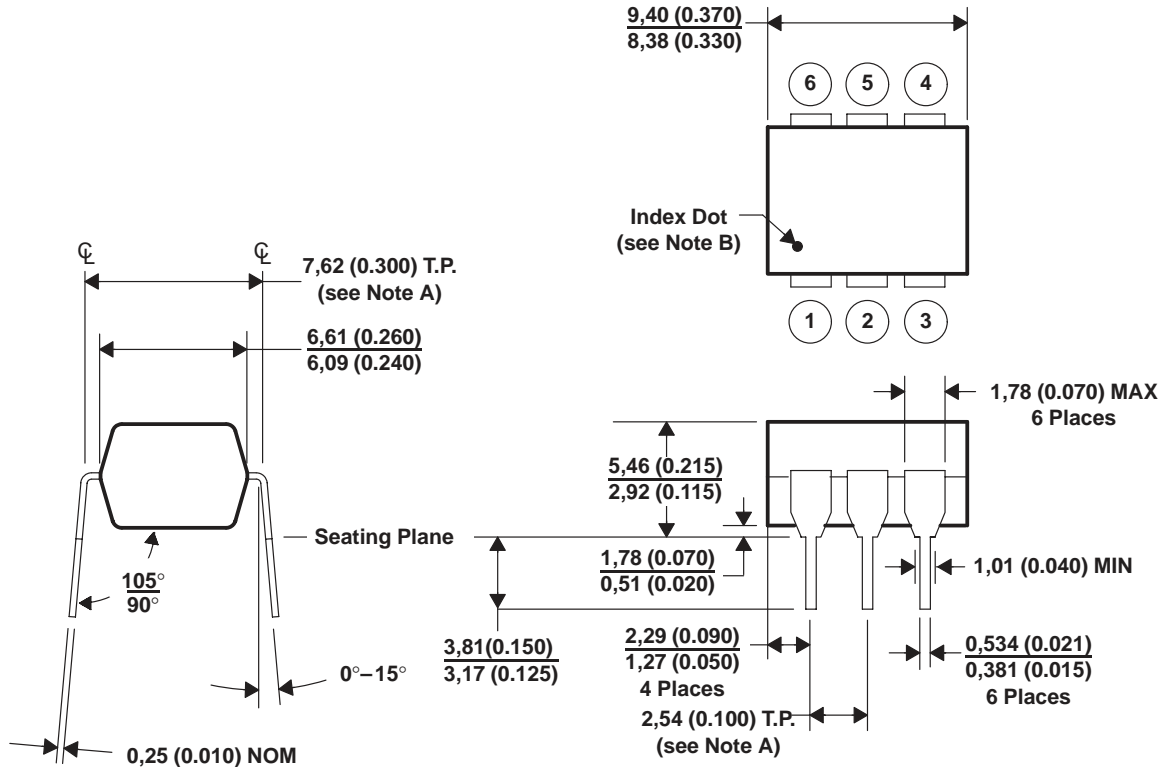


Figure 7. Inductive Load With Nonsensitive-Gate Triac

MECHANICAL INFORMATION



- NOTES: A. Leads are within 0,13 (0.005) radius of true position (T.P.) with maximum material condition and unit installed.
 B. Pin 1 identified by index dot.
 C. The dimensions given fall within JEDEC MO-001 AM dimensions.
 D. All linear dimensions are given in millimeters and parenthetically given in inches.

Figure 8. Packaging Specifications

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TIL3020	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI
TIL3021	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI
TIL3022	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI
TIL3023	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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