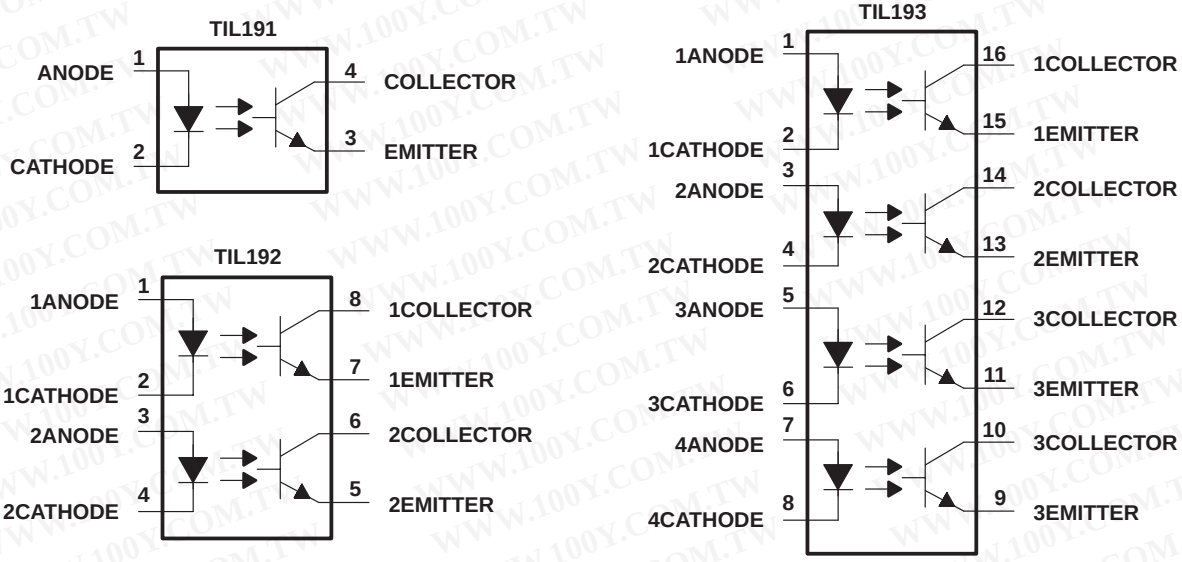
- **Gallium-Arsenide-Diode Infrared Source**
- **Source Is Optically Coupled to Silicon npn Phototransistor**
- **Choice of One, Two, or Four Channels**
- **Choice of Three Current-Transfer Ratios**
- **High-Voltage Electrical Isolation 3.535 kV Peak (2.5 kV rms)**
- **Plastic Dual-In-Line Packages**
- **UL Listed — File #E65085**

description

These optocouplers consist of one gallium-arsenide light-emitting diode and one silicon npn phototransistor per channel. The TIL191 has a single channel in a 4-pin package, the TIL192 has two channels in an 8-package, and the TIL193 has four channels in a 16-pin package. The standard devices, TIL191, TIL192, and TIL193, are tested for a current-transfer ratio of 20% minimum. Devices selected for a current-transfer ratio of 50% and 100% minimum are designated with the suffix A and B respectively.

schematic diagrams



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

Input-to-output voltage (see Note 1) . . . . . ±3.535 kV peak or dc (±2.5 kV rms)
Collector-emitter voltage (see Note 2) . . . . . 35 V
Emitter-collector voltage . . . . . 7 V
Input diode reverse voltage . . . . . 5 V
Input diode continuous forward current at (or below) 25°C free-air temperature (see Note 3) . . . . . 50 mA
Continuous total power dissipation at (or below) 25°C free-air temperature:
  Phototransistor (see Note 4) . . . . . 150 mW
  Input diode plus phototransistor per channel (see Note 5) . . . . . 200 mW
Storage temperature range, T_{stg} . . . . . −55°C to 125°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. This rating applies for sine-wave operation at 50 Hz or 60 Hz. This capability is verified by testing in accordance with UL requirements.
2. This value applies when the base-emitter diode is open circuited.
3. Derate linearly to 100°C free-air temperature at the rate of 0.67 mA/°C.
4. Derate linearly to 100°C free-air temperature at the rate of 2 mW/°C.
5. Derate linearly to 100°C free-air temperature at the rate of 2.67 mW/°C.

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

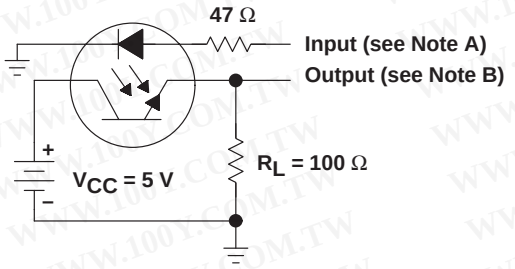
PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$	Collector-emitter breakdown voltage		I_C = 0.5 mA,	I_F = 0	35			V
$V_{(BR)ECO}$	Emitter-collector breakdown voltage		I_C = 100 µA,	I_F = 0	7			V
I_R	Input diode static reverse current		V_R = 5 V				10	µA
$I_{C(off)}$	Off-state collector current		V_{CE} = 24 V,	I_F = 0			100	nA
CTR	Current transfer ratio	TIL191, TIL192, TIL193	I_F = 5 mA,	V_{CE} = 5 V	20%			
		TIL191A, TIL192A, TIL193A			50%			
		TIL191B, TIL192B, TIL193B			100%			
V_F	Input diode static forward voltage		I_F = 20 mA				1.4	V
$V_{CE(sat)}$	Collector-emitter saturation voltage		I_F = 5 mA,	I_C = 1 mA			0.4	V
C_{io}	Input-to-output capacitance		$V_{in–out}$ = 0 mA, See Note 6	f = 1 MHz,		1		pF
r_{io}	Input-to-output internal resistance		$V_{in–out}$ = ±1 mA,	See Note 6		10^{11}		Ω

NOTE 6: These parameters are measured between all input diode leads shorted together and all phototransistor leads shorted together.

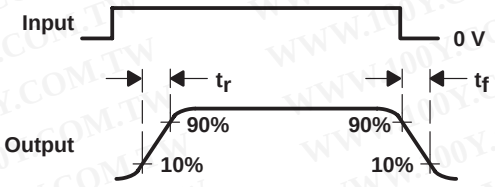
switching characteristics at 25°C free-air temperature

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_r	Rise time	V_{CC} = 5 V,	$I_{C(on)}$ = 2 mA,		6		µs
t_f	Fall time	R_L = 100 Ω,	See Figure 1		6		

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



NOTE C. Adjust amplitude of input pulse for $I_{C(on)}$ = 2 mA

VOLTAGE WAVEFORMS

NOTES: A. The input waveform is supplied by a generator with the following characteristics: Z_{OUT} = 50 Ω, $t_r \le 15$ ns, duty cycle ≈ 1%, t_W = 100 µs.
B. The output waveform is monitored on a oscilloscope with the following characteristic: $t_r \le 12$ ns, $R_{in} \ge 1$ MΩ, $C_{in} \le 20$ pF.

Figure 1. Switching Times

TYPICAL CHARACTERISTICS

FORWARD CURRENT vs FORWARD VOLTAGE

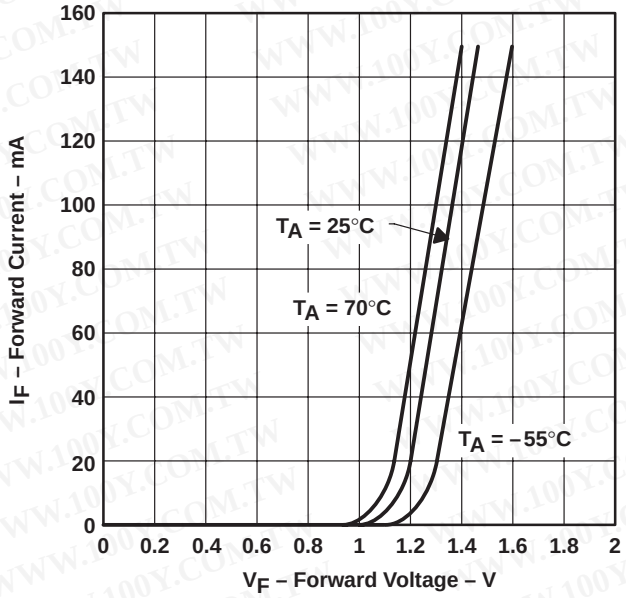


Figure 2

TIL191, TIL192, TIL193
COLLECTOR CURRENT vs COLLECTOR-EMITTER VOLTAGE

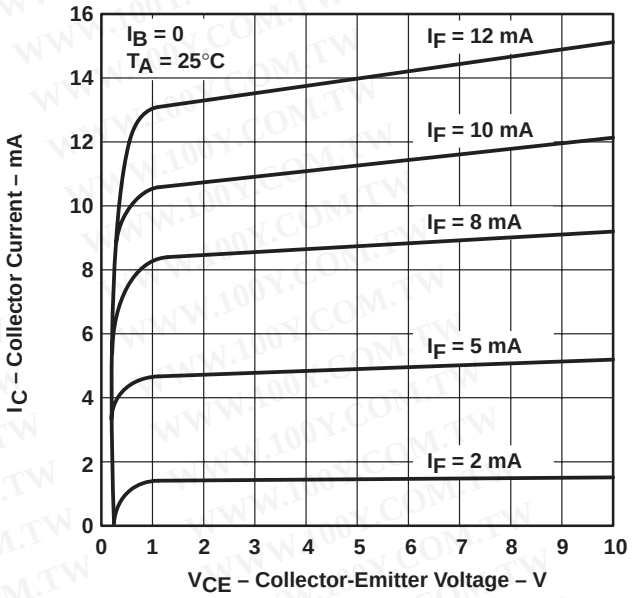


Figure 3

ON-STATE COLLECTOR CURRENT (NORMALIZED) vs INPUT DIODE FORWARD CURRENT

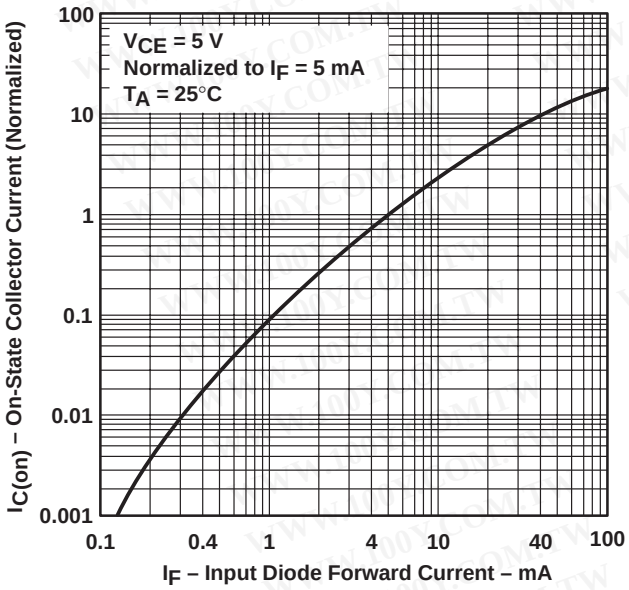


Figure 4

ON-STATE COLLECTOR CURRENT (RELATIVE TO VALUE AT 25°C) vs FREE-AIR TEMPERATURE

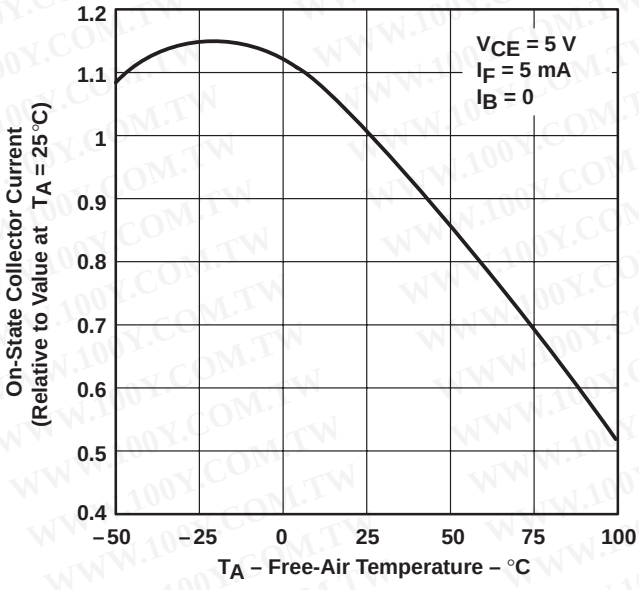


Figure 5

TYPICAL CHARACTERISTICS

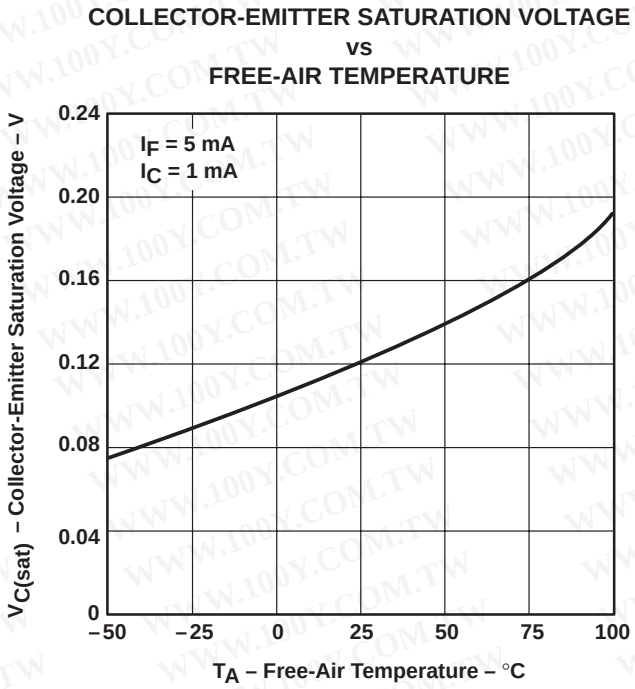


Figure 6

APPLICATION INFORMATION

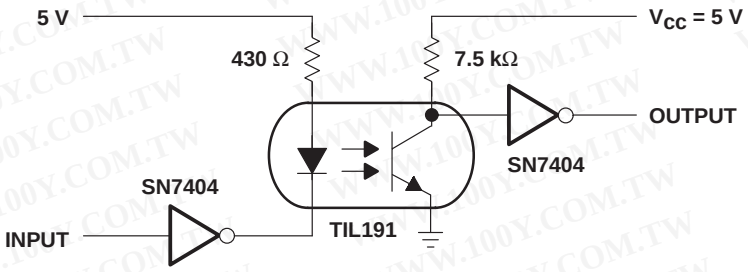
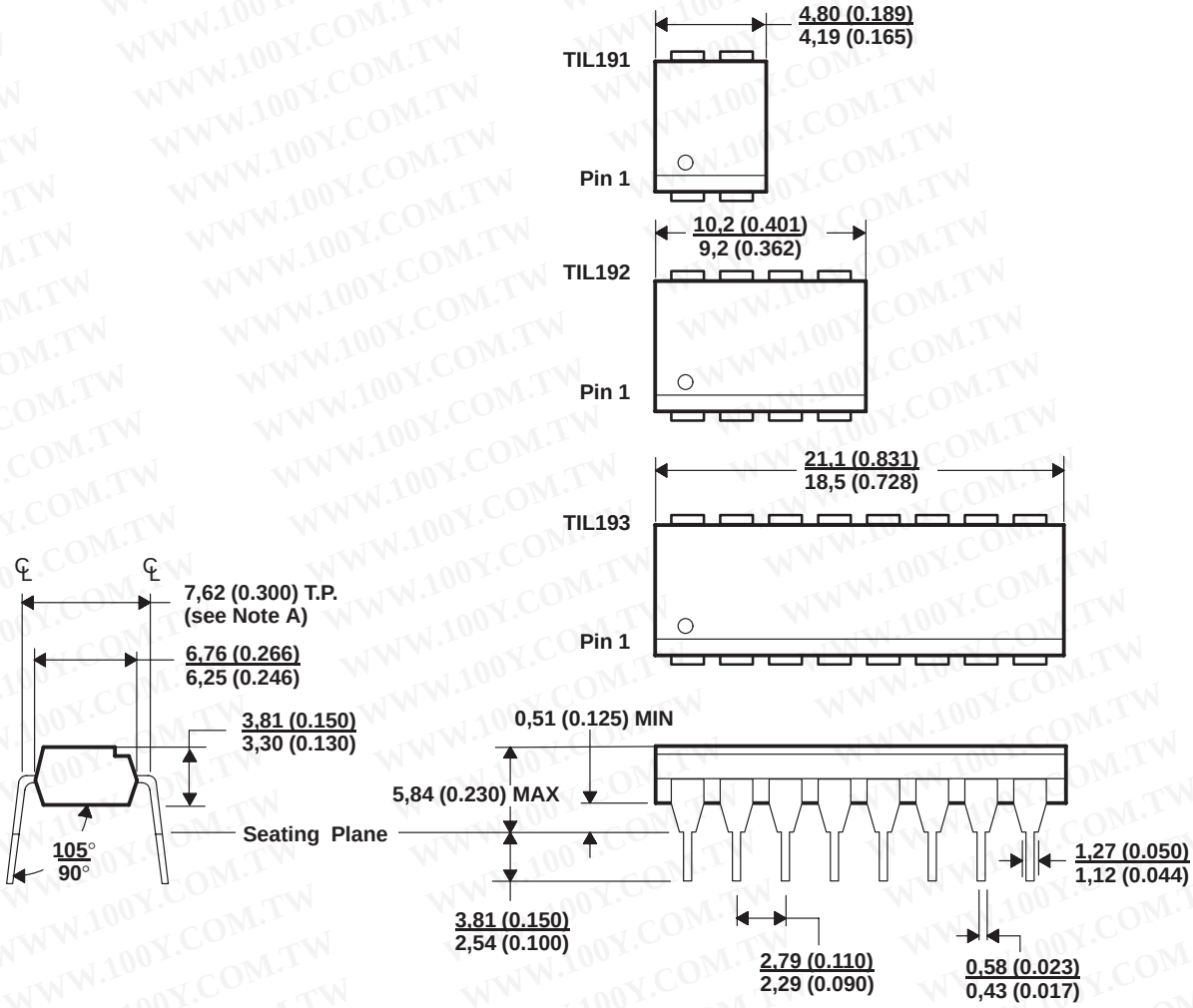


Figure 7

MECHANICAL INFORMATION



NOTES: A. Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.
B. All linear dimensions are given in millimeters and parenthetically given in inches.

Figure 8. Mechanical Information

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
TIL191	OBSOLETE	PDIP	N	4		TBD	Call TI	Call TI
TIL191A	OBSOLETE	PDIP	P	4		TBD	Call TI	Call TI
TIL191B	OBSOLETE	PDIP	P	4		TBD	Call TI	Call TI
TIL192	OBSOLETE	PDIP	N	8		TBD	Call TI	Call TI
TIL192A	OBSOLETE	PDIP	P	8		TBD	Call TI	Call TI
TIL192B	OBSOLETE	PDIP	P	8		TBD	Call TI	Call TI
TIL193	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
TIL193A	OBSOLETE	PDIP	P	16		TBD	Call TI	Call TI
TIL193B	OBSOLETE	PDIP	P	16		TBD	Call TI	Call TI

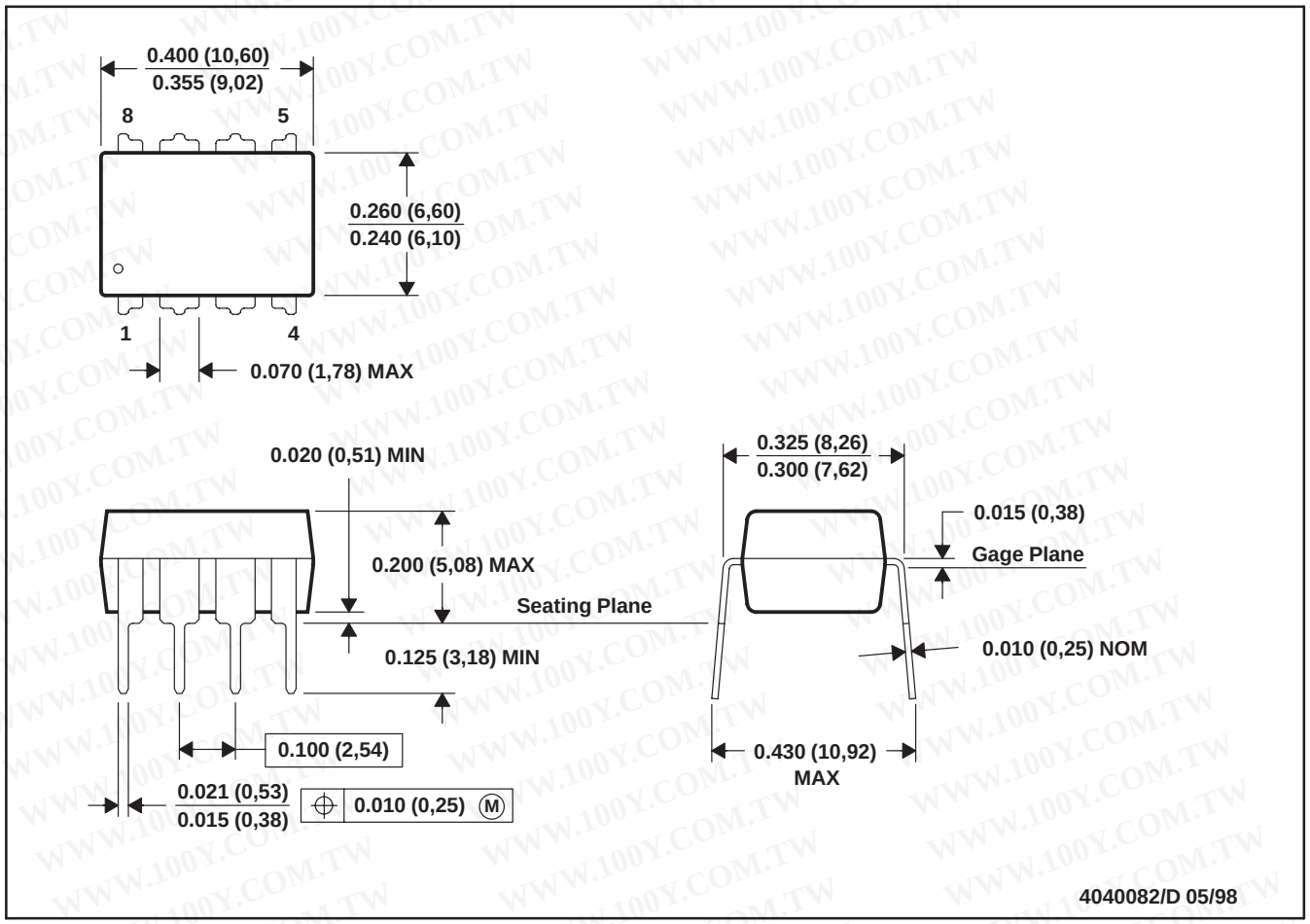
(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, 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.

MPDI001A – JANUARY 1995 – REVISED JUNE 1999

P (R-PDIP-T8) **PLASTIC DUAL-IN-LINE**



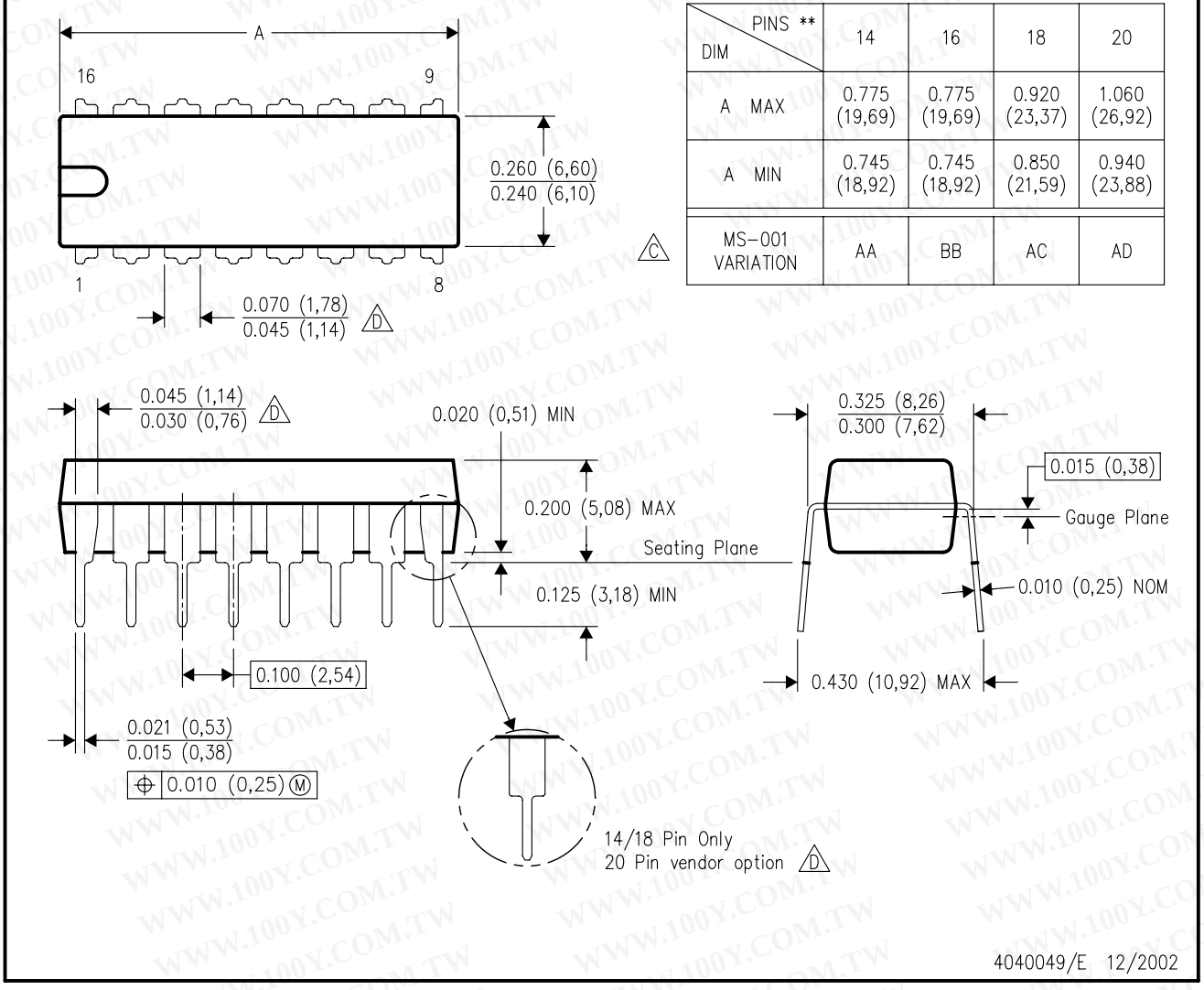
NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS-001

For the latest package information, go to http://www.ti.com/sc/docs/package/pkg_info.htm

N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
C MS–001 VARIATION	AA	BB	AC	AD

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

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