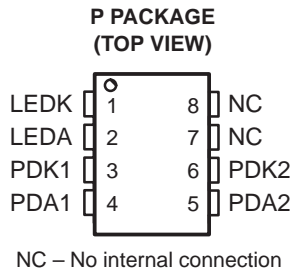


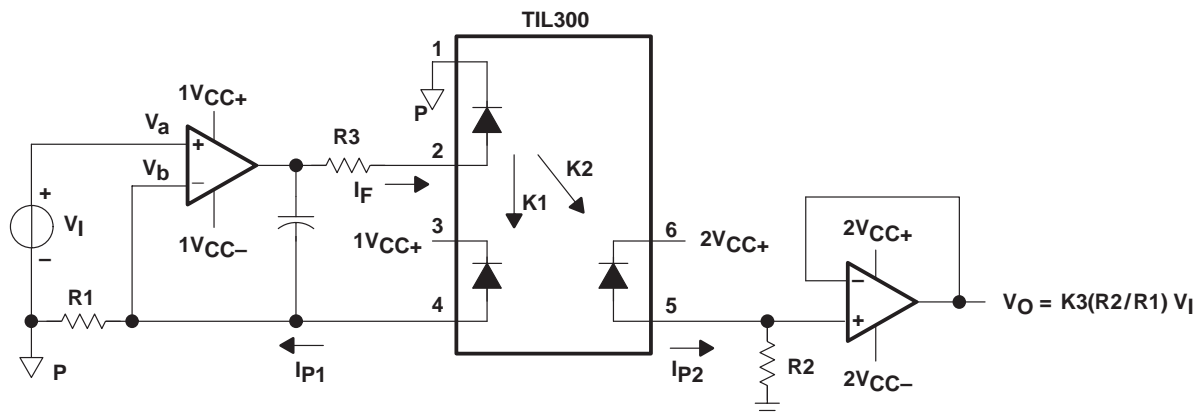
- ac or dc Signal Coupling
- Wide Bandwidth . . . >200 kHz
- High Transfer-Gain Stability . . . $\pm 0.05\%/^{\circ}\text{C}$
- 3500 V Peak Isolation
- UL Approval Pending
- Applications
 - Power-Supply Feedback
 - Medical-Sensor Isolation
 - Opto Direct-Access Arrangement (DAA)
 - Isolated Process-Control Transducers



description

The TIL300 precision linear optocoupler consists of an infrared LED irradiating an isolated feedback photodiode and an output photodiode in a bifurcated arrangement. The feedback photodiode captures a percentage of the flux of the LED and generates a control signal that can be used to regulate the LED drive current. This technique is used to compensate for the nonlinear time and temperature characteristics of the LED. The output-side photodiode produces an output signal that is linearly proportional to the servo-optical flux emitted from the LED.

A typical application circuit (shown in Figure 1) uses an operational amplifier as the input to drive the LED. The feedback photodiode sources current through R1, which is connected to the inverting input of the input operational amplifier. The photocurrent I_{P1} assumes a magnitude that satisfies the relationship $I_{P1} = V_i/R1$. The magnitude of the current is directly proportional to the LED current through the feedback transfer gain $K1$ ($V_i/R1 = K1 \times I_F$). The operational amplifier supplies LED current to produce sufficient photocurrent to keep the node voltage V_b equal to node voltage V_a .



- NOTES:
- A. $K1$ is servo current gain, the ratio of the feedback photodiode current (I_{P1}) to the input LED current (I_F), i.e. $K1 = I_{P1}/I_F$.
 - B. $K2$ is forward gain, the ratio of the output photodiode current (I_{P2}) to the input LED current (I_F), i.e. $K2 = I_{P2}/I_F$.
 - C. $K3$ is transfer gain, the ratio of the forward gain to the servo gain, i.e. $K3 = K2/K1$.

Figure 1. Typical Application Circuit



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

TIL300, TIL300A PRECISION LINEAR OPTOCOUPLER

SOES019A – OCTOBER 1995 – REVISED JULY 1996

Terminal Functions

TERMINAL NAME	NO.	I/O	DESCRIPTION
LEDK	1		LED cathode
LEDA	2		LED anode
PDK1	3		Photodiode 1 cathode
PDA1	4		Photodiode 1 anode
PDA2	5		Photodiode 2 anode
PDK2	6		Photodiode 2 cathode
NC	7		No internal connection
NC	8		No internal connection

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Emitter

Continuous total power dissipation (see Note 1) 160 mW
 Input LED forward current, I_F 60 mA
 Surge current with pulse width < 10 μ s 250 mA
 Reverse voltage, V_R 5 V
 Reverse current, I_R 10 μ A

Detector

Continuous power dissipation (see Note 2) 50 mW
 Reverse voltage, V_R 50 V

Coupler

Continuous total power dissipation (see Note 3) 210 mW
 Storage temperature, T_{stg} -55°C to 150°C
 Operating temperature, T_A -55°C to 100°C
 Input-to-output voltage 3535 V_{peak}
 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. Derate linearly from 25°C at a rate of 2.66 mW/°C.
 2. Derate linearly from 25°C at a rate of 0.66 mW/°C.
 3. Derate linearly from 25°C at a rate of 3.33 mW/°C.



electrical characteristics at $T_A = 25^\circ\text{C}$

Emitter

PARAMETER		CONDITIONS	MIN	TYP†	MAX	UNIT
V_F	Forward voltage	$I_F = 10\text{ mA}$		1.25	1.50	V
	Temperature coefficient of V_F			-2.2		mV/°C
I_R	Reverse current	$V_R = 5\text{ V}$			10	μA
t_r	Rise time	$I_F = 10\text{ mA}$, $\Delta I_F = 2\text{ mA}$		1		μs
t_f	Fall time	$I_F = 10\text{ mA}$, $\Delta I_F = 2\text{ mA}$		1		μs
C_j	Junction capacitance	$V_F = 0$, $f = 1\text{ MHz}$		15		pF

Detector

PARAMETER		CONDITIONS	MIN	TYP†	MAX	UNIT
I_{DK}^\dagger	Dark current	$V_R = 15\text{ V}$, $I_F = 0$			25	nA
	Open circuit voltage	$I_F = 10\text{ mA}$		0.5		V
I_{OS}	Short circuit current limit	$I_F = 10\text{ mA}$		80		μA
C_j	Junction capacitance	$V_F = 0$, $f = 1\text{ MHz}$		12		pF

Coupler

PARAMETER		CONDITIONS	MIN	TYP†	MAX	UNIT	
$K1^\ddagger$	Servo current gain	$I_F = 1\text{ mA}$	0.3%	0.7%	1.5%		
		$I_F = 10\text{ mA}$	0.5%	1.25%	2%		
$K2^\S$	Forward current gain	$I_F = 1\text{ mA}$	0.3%	0.7%	1.5%		
		$I_F = 10\text{ mA}$	0.5%	1.25%	2%		
$K3^\P$	Transfer gain	Detector bias voltage = -15 V	TIL300 $I_F = 1\text{ mA}$	0.75	1	1.25	
			TIL300 $I_F = 10\text{ mA}$	0.75	1	1.25	
			TIL300A $I_F = 1\text{ mA}$	0.9	1	1.10	
			TIL300A $I_F = 10\text{ mA}$	0.9	1	1.10	
Gain temperature coefficient	K1/K2	$I_F = 10\text{ mA}$		-0.5		%/°C	
	K3	$I_F = 10\text{ mA}$		± 0.005			
$\Delta K3^\#$	Transfer gain linearity	$I_F = 1\text{ to }10\text{ mA}$		$\pm 0.25\%$			
		$I_F = 1\text{ to }10\text{ mA}$, $T_A = 0\text{ to }75^\circ\text{C}$		$\pm 0.5\%$			
BW	Bandwidth	$I_F = 10\text{ mA}$, $I_F(\text{MODULATION}) = \pm 2\text{ mA}$		200		kHz	
t_r	Rise time	$I_F = 10\text{ mA}$, $I_F(\text{MODULATION}) = \pm 2\text{ mA}$		1.75		μs	
t_f	Fall time	$I_F = 10\text{ mA}$, $I_F(\text{MODULATION}) = \pm 2\text{ mA}$		1.75		μs	
V_{iso}^\dagger	Peak Isolation voltage	$I_{IO} = 10\text{ }\mu\text{A}$, time = 1 minute		3535		V	

† This symbol is not currently listed within EIA or JEDEC standards for semiconductor symbology.

‡ Servo current gain ($K1$) is the ratio of the feedback photodiode current (I_{P1}) to the input LED current (I_F), i.e. $K1 = I_{P1}/I_F$.

§ Forward gain ($K2$) is the ratio of the output photodiode current (I_{P2}) to the input LED current (I_F), i.e. $K2 = I_{P2}/I_F$.

¶ Transfer gain ($K3$) is the ratio of the forward gain to the servo gain, i.e. $K3 = K2/K1$.

Transfer gain linearity ($\Delta K3$) is the percent deviation of the transfer gain $K3$ as a function of LED input current (I_F) or the package temperature.

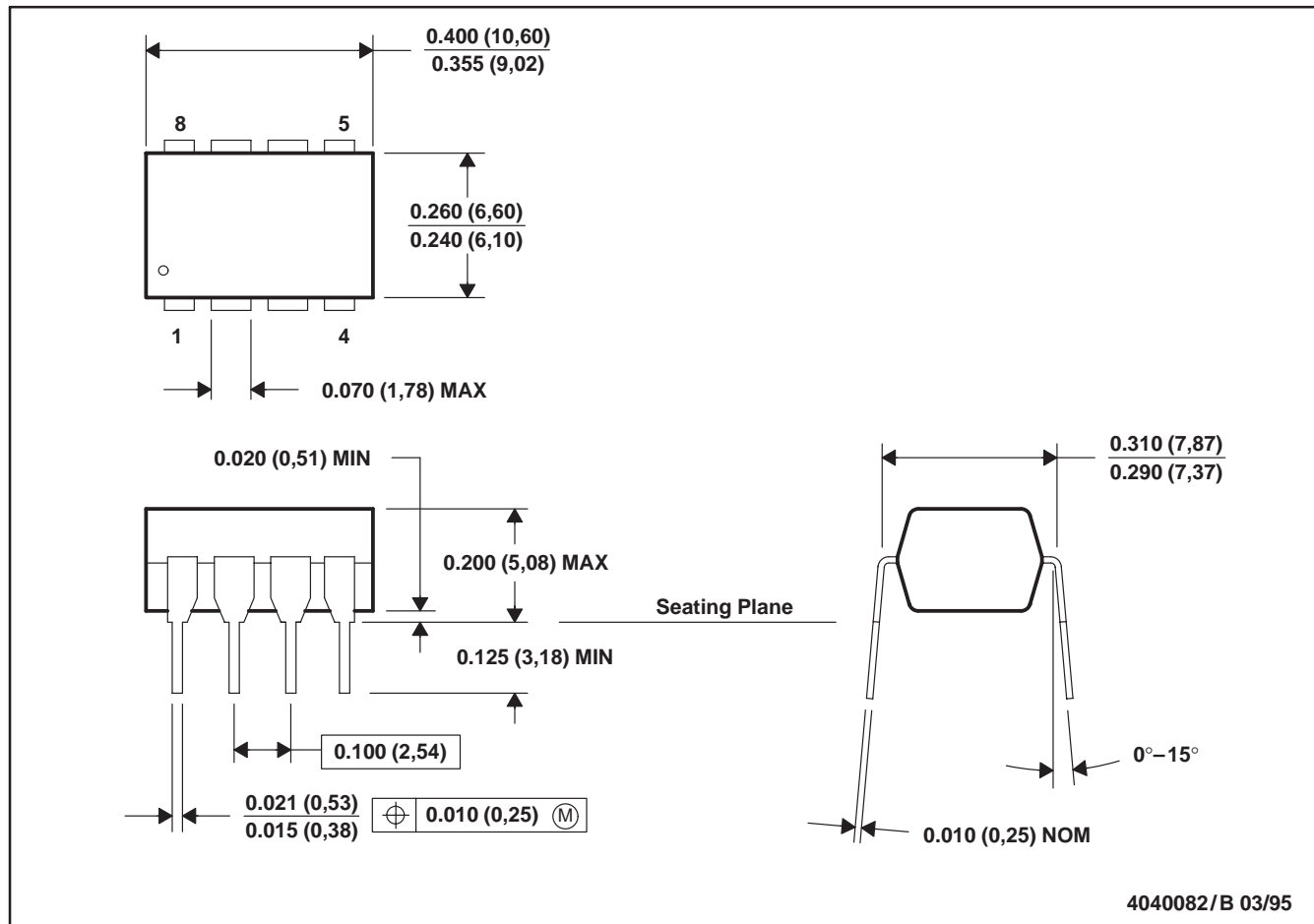
TIL300, TIL300A PRECISION LINEAR OPTOCOUPLER

SOES019A – OCTOBER 1995 – REVISED JULY 1996

MECHANICAL DATA

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



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

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TIL300	OBSOLETE	PDIP	N	8		TBD	Call TI	Call TI
TIL300A	OBSOLETE	PDIP	N	8		TBD	Call TI	Call TI
TIL300ADCS	OBSOLETE	OPTO	DCS	8		TBD	Call TI	Call TI
TIL300DCS	OBSOLETE	OPTO	DCS	8		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.

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265