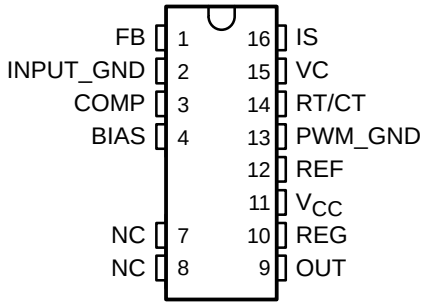
- **TL1431, Optocoupler, and Advanced Current-Mode-PWM in a 16-Pin DIP**
- **LinBiCMOS™ Current-Mode-PWM Operates at Frequencies up to 1 MHz**
- **100-μA Maximum Start-up Current**
- **2-A, 30-ns MOSFET Drive Output**
- **TL1431 Voltage Reference/Feedback Amplifier**
- **7500-V Peak Withstand Voltage**
- **Available With Gull Wing VDE Lead Forms**
- **–40°C to 100°C Free-Air Operating Temperature Range**
- **Safety Regulatory Approvals Pending**
  - **UL . . . File Number E65085**
  - **FIMKO, SEMKO, NEMKO, DEMKO**
    - **EN60065/IEC 65**
    - **EN60950/IEC 950**
  - **VDE 0884, Level 4 (6000-V Insulation)**

NFC or NFD PACKAGE
(TOP VIEW)



description

The TIL5942 and TIL5942A consist of an advanced current-mode-PWM controller and a TL1431 adjustable precision shunt regulator, incorporated in a single package. The controller provides a photodetector, an improved MOSFET drive output, and an LED for isolation. The TL1431 is configured as a precision reference/error amplifier. Using the TIL5942 or the TIL5942A, the power-supply designer can implement the controller for an isolated dc/dc converter or off-line switching power supply, with one IC and a few passive components. The TIL5942 standard version has a reference voltage tolerance of 0.8% and the TIL5942A has a reference voltage tolerance of 0.4%

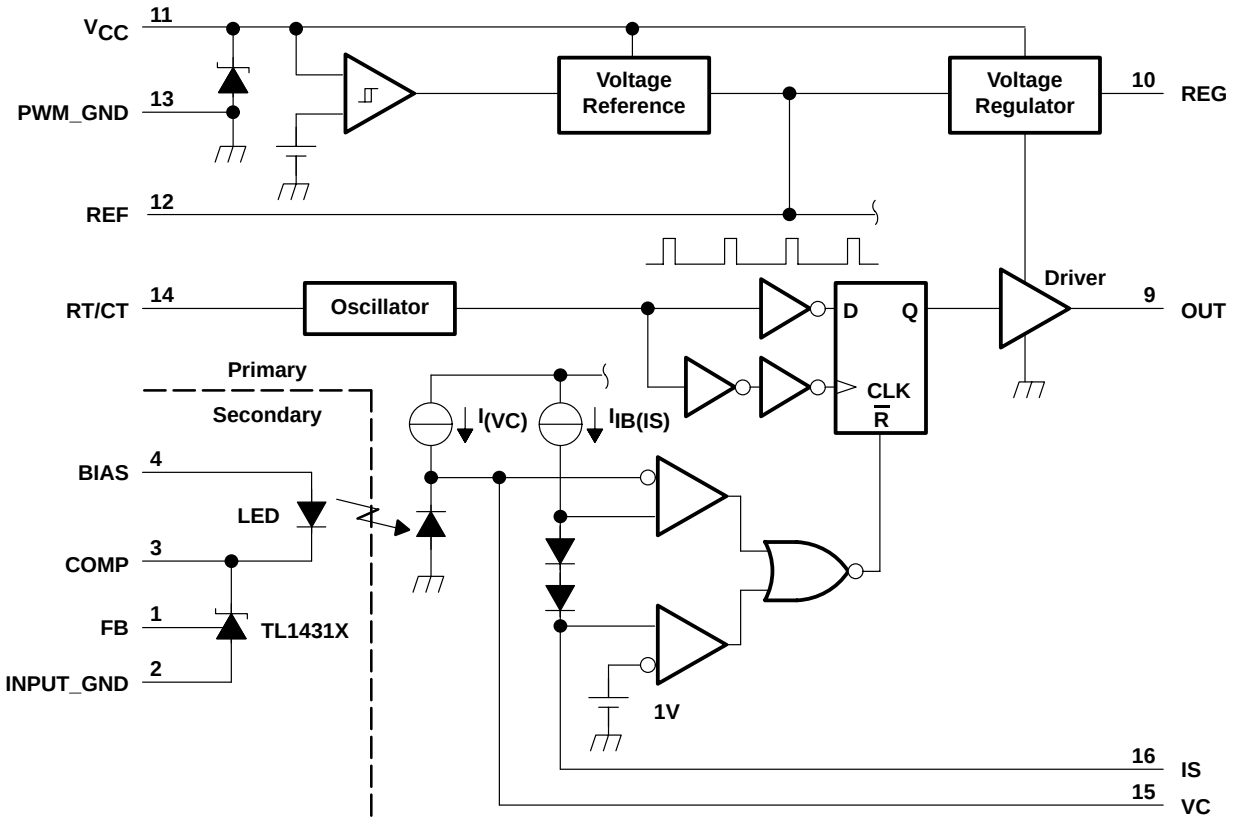
These controllers are available in a 16-pin PDIP with a lead form for through-hole, or gull-wing lead form for surface-mount applications. These devices operate over a –40°C to 100°C junction temperature range.

End equipment applications for the TIL5942 and the TIL5942A include isolated ac-to-dc power supplies and dc/dc converters.

AVAILABLE OPTIONS

T_A	PACKAGED DEVICES	
	PLASTIC DUAL-IN-LINE WITH VDE LEAD FORM, THROUGH-HOLE	PLASTIC DUAL-IN-LINE WITH VDE LEAD FORM, SURFACE-MOUNT LEADS
–40°C to 100°C	TIL5942NFC, TIL5942ANFC	TIL5942NFD, TIL5942ANFD

functional block diagram



Terminal Functions

TERMINAL NAME	TERMINAL NO.	I/O	DESCRIPTION
FB	1	I	Feedback. FB is an error-amplifier inverting input.
INPUT_GND	2	I	Ground connection for the voltage reference/error amplifier section.
COMP	3	O	Error amplifier output/LED cathode connection. RC networks may be connected between COMP, FB, and GND to stabilize the control loop of the dc/dc converter.
BIAS	4	I	Optocoupler LED anode. BIAS connects to the output voltage of the dc/dc converter or to some other suitable supply voltage through a resistor.
NC	7,8		No connection.
OUT	9	O	Drive output. OUT is a pulse-width-modulated output.
REG	10	O	Regulator output. A 0.1-μF, typical, ceramic capacitor should be connected between REG and PWM_GND.
V_{CC}	11	I	Supply voltage for PWM controller
REF	12	O	PWM 5-V reference output
PWM_GND	13	I	PWM ground connection
RT/CT	14		Connection for external RC network to set PWM oscillator frequency
VC	15		Connection for integrating capacitor (0.1μF typ) to PWM_GND (terminal 13)
IS	16	I	PWM current sense input

theory of operation

The current through the LED is controlled by the precision reference amplifier according to the voltage error at FB, with respect to the internal 2.5-V reference. The light emitted by the LED is coupled to the PWM controller to change the modulation duty cycle and reduce the error voltage.

The PWM controller is in the off state until V_{CC} is greater than the turn-on threshold voltage level. Typically the controller turns on at 16 V. It stays in the on state until the voltage drops below the turn-off threshold of 10 V typical. Upon turning on, the controller generates an internal reference voltage V_{ref} of 5 V, which controls the chip logic and can be used for low-power external applications. A voltage V_{reg} is also generated to supply current to charge an external capacitor C_{reg}, which supplies instant current for the pulsing output.

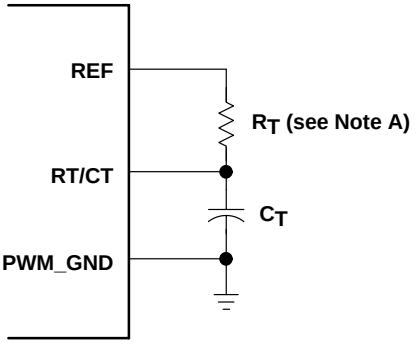
The oscillator shown in Figure 1 consists of an external resistance-capacitance (RC) network, a voltage comparator, logic, a 125-ns one-shot for the dead time, and a MOSFET used to discharge the external capacitor to ground each cycle. At the end of the reset period, C_T charges toward the 5-V reference through timing resistor R_T for a time given by one time constant R_TC_T. The oscillator period is given by:

$$T_{OSC} = R_TC_T + 0.125\ \mu s.$$

A current $I_{IB(IS)}$ supplied out of IS biases the current-sense resistor on the primary side of the power supply. If the voltage $V_{(IS)}$ at IS exceeds 1 V, the output pulse is reset. An internal current source $I_{(VC)}$ supplies a nominal current of –4 μA as a reference. This current charges a capacitor connected between VC and ground. The photodiode is connected internally in parallel with the capacitor. The light-generated photodiode current tends to discharge the capacitor until a steady-state balance is reached. When $I_{(VC)}$ is greater than the photodiode current, a net current is being sourced and the capacitor is charged. When $I_{(VC)}$ is lower than the photodiode current, a net current is being sinked and the capacitor is discharged. When $I_{(VC)}$ is equal to the photodiode current, the capacitor voltage stays constant. The voltage at VC is monitored by an internal comparator with a threshold voltage given by $V_{(IS)}$ + 2Vd, where Vd is a diode voltage drop of typically 0.7 V.

Whenever VC is below this threshold, the output pulse is reset. The output pulse is enabled if $V_{(IS)}$ is less than 1 V and VC is greater than its threshold.

The 5-V reference on the PWM chip is brought out on REF and can be used as a reference and/or supply for external circuits as long as the output current is limited to 20 mA and the power dissipation is not exceeded. It is recommended that a 0.1-F ceramic capacitor be connected between REF and PWM_GND.



NOTE A: $t_{osc} = R_TC_T + 0.125\ \mu s$

Figure 1. Typical Oscillator Application

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

LED/REF section

Supply voltage range, V_{CC}, BIAS to GND . . . . . –0.3 V to 37 V
Input current range at FB . . . . . –50 μA to 10 mA
LED forward current . . . . . 50 mA
Input LED reverse voltage . . . . . 6 V

PWM section

Supply voltage range, V_{CC} . . . . . –0.3 V to 30 V
Input voltage at IS . . . . . –0.3 V to 5 V
Continuous supply current, I_{CC} . . . . . 15 mA

entire package

Isolation voltage . . . . . 7.5 kV peak or dc (5.3 kVrms)
Total continuous power dissipation . . . . . See Dissipation Rating Table
Operating free-air temperature range, T_A . . . . . –40°C to 100°C
Storage temperature range, T_{stg} . . . . . –55°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.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 85°C$ POWER RATING
NFD	1000 mW	8 mW/°C	640 mW	520 mW
NFC	1000 mW	8 mW/°C	640 mW	520 mW

recommended operating conditions

	MIN	MAX	UNIT
Supply voltage range, V_{CC}, PWM	11	30	V
Peak output current, I_O		2	A
Output current, REF	0	20	mA
Oscillator frequency, f_{osc}	10	1000	kHz
External timing resistance, R_T	2	39	kΩ
External timing capacitance, C_T	0.47	10	nF

electrical characteristics over recommended operating junction temperature range, V_{CC} = 17 V, R_T = 3.9 kΩ, C_T = 1 nF (unless otherwise noted)

voltage reference/error amplifier

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{ref}	Reference voltage	T_A = 25°C, $V_{O(COMP)} = V_{I(FB)}$, $I_{I(LED)}$ = 10 mA, See Figure 2	TIL5942	2.48	2.5	2.52	V
			TIL5942A	2.49	2.5	2.51	V
$V_{ref(dev)}$	Deviation of reference voltage over temperature	T_A = 25°C to 100°C, $V_{O(COMP)} = V_{I(FB)}$, $I_{I(LED)}$ = 10 mA, See Figure 2			25		mV
$\frac{\Delta V_{ref}}{\Delta V_{I(LED)}}$	Ratio of reference voltage change to change in input light-emitting-diode voltage	$\Delta V_{I(LED)}$ = 4 V to 37 V, $I_{I(LED)}$ = 10 mA			1.1	2	mV/V
$I_{I(FB)}$	Feedback input current	$I_{I(LED)}$ = 10 mA, See Figure 4	R3 = 10 kΩ		1.5	3	µA
$I_{ref(dev)}$	Deviation of reference input current over full temperature range	$I_{I(LED)}$ = 10 mA, T_A = 25°C to 100°C	R3 = 10 kΩ, See Figure 4		0.5		µA
$I_{DRV(min)}$	Minimum drive current	T_A = 25°C, $V_{O(COMP)} = V_{I(FB)}$			0.4	1	mA
$I_{I(off)}$	Off-state input light-emitting diode current	$V_{I(LED)}$ = 37 V, See Figure 5	$V_{I(FB)}$ = 0		0.18	0.5	µA
$\lvert Zka \rvert$ †	Regulator output impedance	$V_{O(COMP)} = V_{I(FB)}$, $I_{O(COMP)}$ = 1 mA to 50 mA	f ≤ 1 kHz		0.1		

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

LED

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_F	Forward voltage	T_A = 25°C, $V_{O(COMP)} = V_{I(FB)}$, $I_{I(LED)}$ = 10 mA, See Figure 2		1.2	1.4	V
I_R	LED reverse current	V_O = 6 V			10	µA

PWM Section

voltage reference

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{ref}	Reference voltage	I_O = 1 mA, T_J = 25°C	4.95	5	5.05	V
$V_{ref(line\ reg)}$	Reference line regulation	V_{CC} = 11 V to 30 V			50	mV
$V_{ref(load\ reg)}$	Reference load regulation	I_O = 0 mA to 20 mA			25	mV
$V_{ref(temp\ reg)}$	Reference temperature regulation	T_A = 25°C to 100°C		–4		mV
		T_A = 25°C to –40°C		–4		mV

oscillator

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
f_{osc}	Frequency	R = 3.9 kΩ, C = 1 nF	225	250	275	kHz
$t_{(off)}$	Dead time, (minimum off time)		100	148	200	ns
	Minimum timing ramp voltage			0.5		V
	Peak timing ramp voltage			3.2		V

electrical characteristics over recommended operating junction temperature range, V_{CC} = 15 V, R_T = 3.9 kΩ, C_T = 1 nF (unless otherwise noted) (continued)

current sense

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$I_{IB(IS)}$	Input bias current, IS			–4	–10	µA
t_d	Delay time to output			70		ns
$V_{IT(CS)}$	Current sense threshold		0.9	1.0	1.1	V

integrating capacitor current

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$I_{O(cap)}$	Capacitor integrating current at VC with LED off	$I_{I(LED)}$ = 0		–5	–10	µA
I_L	Photodiode light current at VC, $I_{(VC)(on)} - I_{(VC)(off)}$	$I_{I(LED)}$ = 10 mA, T_A = 25°C	5	8		µA

PWM (pulse-width modulation)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Maximum duty cycle	C_L = 1 nF, C_{REG} = 0.1 µF		97%		
Minimum duty cycle	C_L = 1 nF, C_{REG} = 0.1 µF			0	

UVLO (under voltage lockout)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{IT(H)}$	Start-up threshold voltage		15	16	17	V
$V_{IT(L)}$	Minimum operating voltage after start-up		9	10	11	V

supply current

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$I_{CC(off)}$	Start-up current	V_{CC} < 15 V		55	100	µA
$I_{CC(on)}$	Operating supply current	V_{CC} > 11 V	8	13	16	mA

output section

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	I_O = –20 mA	11	11.7		V
		I_O = –200 mA	10.5	11.2		
V_{OL}	Low-level output voltage	I_O = 20 mA		0.78	0.9	V
		I_O = 200 mA		1.38	2	
t_r	Rise time	T_J = 25°C, C_L = 1 nF		20	35	ns
t_f	Fall time	T_J = 25°C, C_L = 1 nF		20	35	ns

regulator

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{O(REG)}$	Regulator output Voltage	V_{CC} = 17 V	12	12.5	13.5	V
$I_{OS(REG)}$	Regulator short-circuit output current	V_O = 0 V	–9	–12.5	–15.0	mA

PARAMETER MEASUREMENT INFORMATION

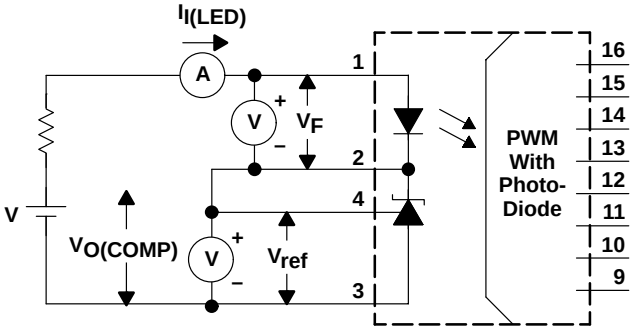


Figure 2. V_{ref}, V_F, I_{min} Test Circuit

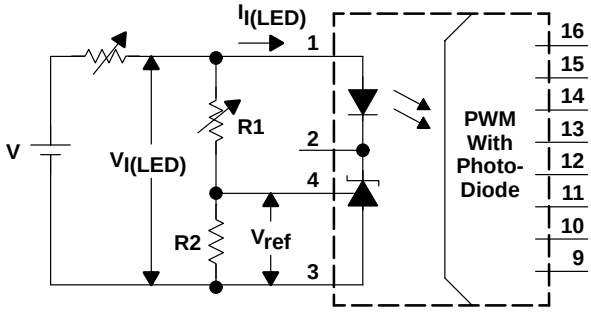


Figure 3. $\Delta V_{ref}/\Delta V_{I(LED)}$ Test Circuit

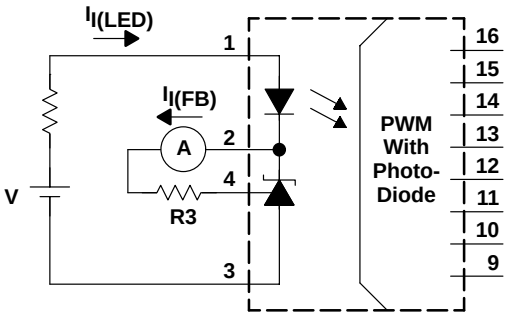


Figure 4. $I_{I(FB)}$ Test Circuit

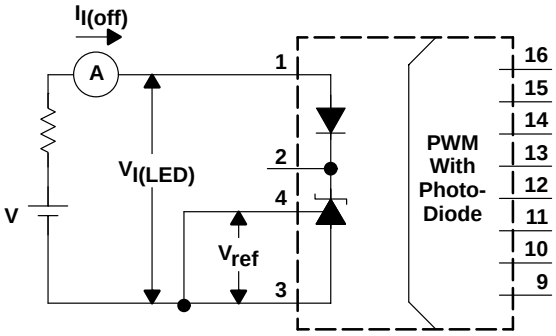


Figure 5. $I_{I(off)}$ Test Circuit

TYPICAL CHARACTERISTICS

Table of Graphs

			FIGURE
V_F	LED forward voltage	Free-air temperature	6
V_{ref}	Input reference voltage	Free-air temperature	7
$I_{I(FB)}$	Feedback input current	Free-air temperature	8
$I_{CC(on)}$	On-state supply current	Free-air temperature	9
V_{ref}	PWM reference voltage	Free-air temperature	10
V_{reg}	PWM regulator voltage	Free-air temperature	11
	PWM relative oscillator frequency	Free-air temperature	12
$I_{(VC)}$	Integrating capacitor current	Free-air temperature	13
I_L	Photodiode current source	Free-air temperature	14
$I_{IB(IS)}$	Sense current source	Free-air temperature	15
$t_{(off)}$	PWM dead time	Free-air temperature	16
$I_{OS(REG)}$	PWM regulator short-circuit current	Free-air temperature	17
$V_{OL(1)}$	Low-state output voltage	Free-air temperature	18
$V_{OL(2)}$	Low-state output voltage	Free-air temperature	19
$V_{IT(H)}$	PWM turn-on threshold voltage	Free-air temperature	20
$V_{IT(L)}$	PWM turn-off threshold voltage	Free-air temperature	21
	PWM threshold voltages showing hysteresis	Free-air temperature	22

TYPICAL CHARACTERISTICS

LED FORWARD VOLTAGE vs FREE-AIR TEMPERATURE

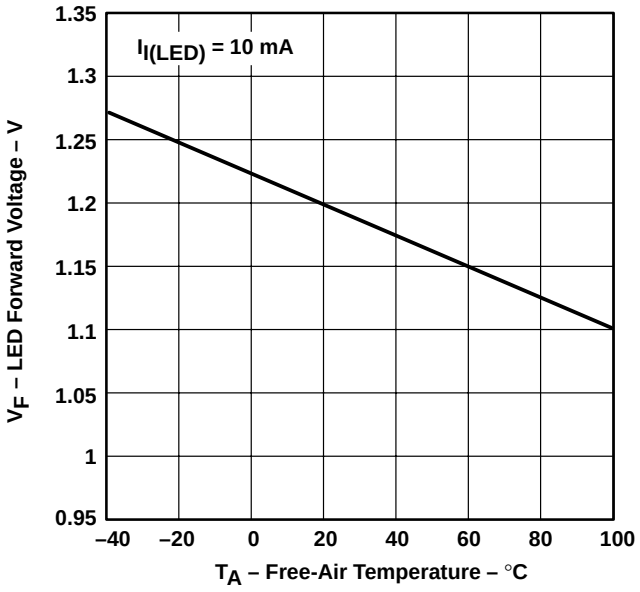


Figure 6

INPUT REFERENCE VOLTAGE vs FREE-AIR TEMPERATURE

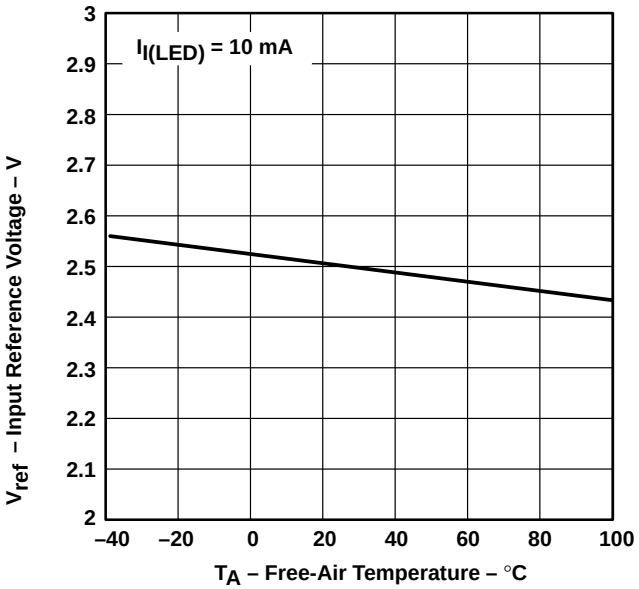


Figure 7

FEEDBACK INPUT CURRENT vs FREE-AIR TEMPERATURE

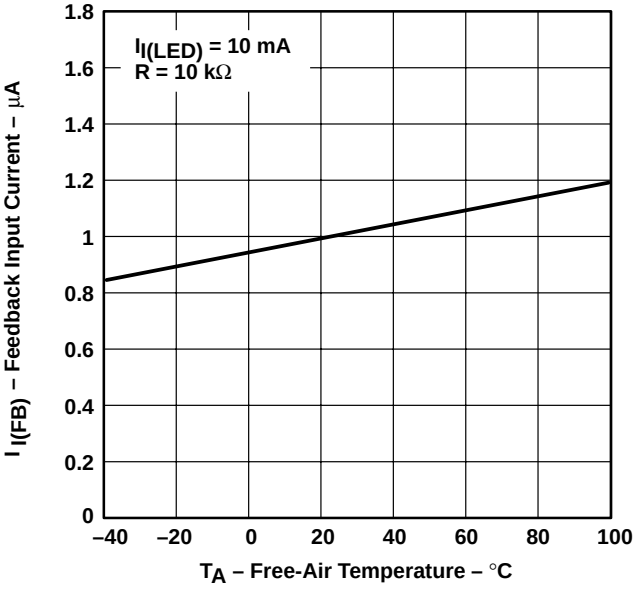


Figure 8

ON-STATE SUPPLY CURRENT vs FREE-AIR TEMPERATURE

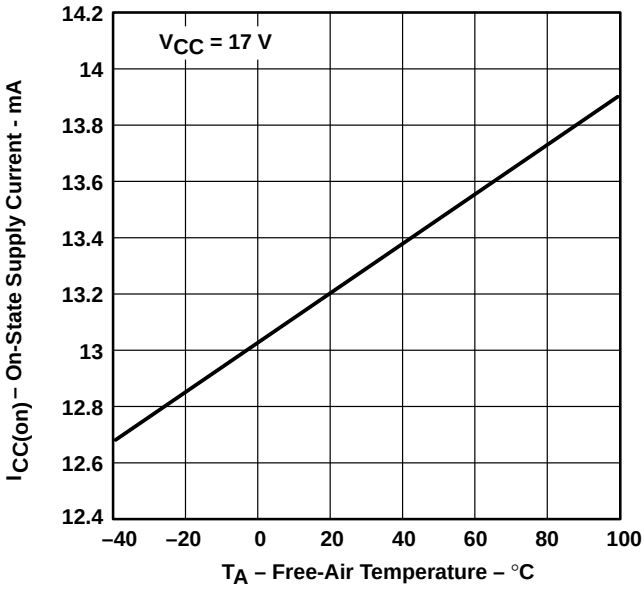


Figure 9

TYPICAL CHARACTERISTICS

PWM REFERENCE VOLTAGE vs FREE-AIR TEMPERATURE

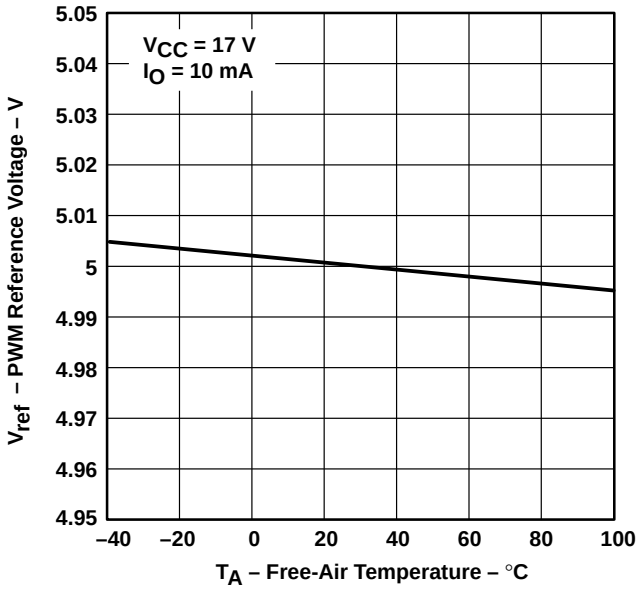


Figure 10

PWM REGULATOR VOLTAGE vs FREE-AIR TEMPERATURE

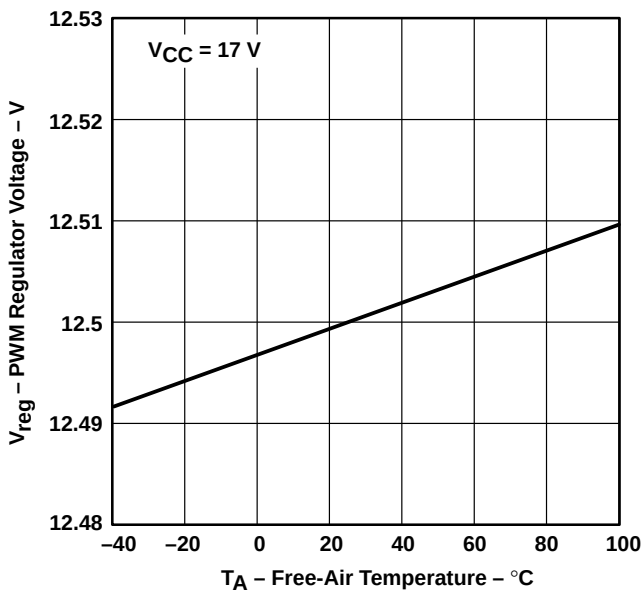


Figure 11

PWM RELATIVE OSCILLATOR FREQUENCY vs FREE-AIR TEMPERATURE

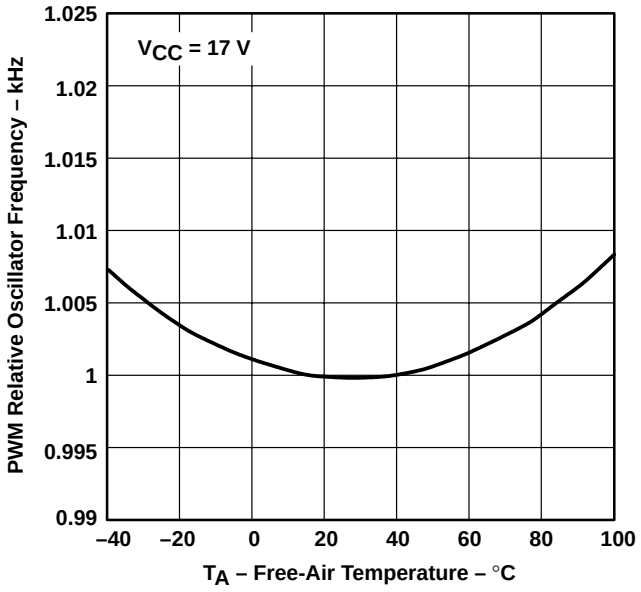


Figure 12

INTEGRATING CAPACITOR CURRENT vs FREE-AIR TEMPERATURE

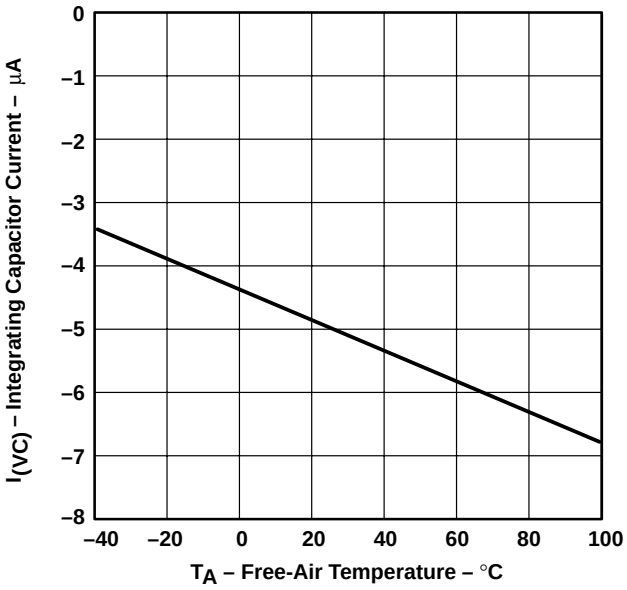


Figure 13

TYPICAL CHARACTERISTICS

PHOTODIODE CURRENT SOURCE vs FREE-AIR TEMPERATURE

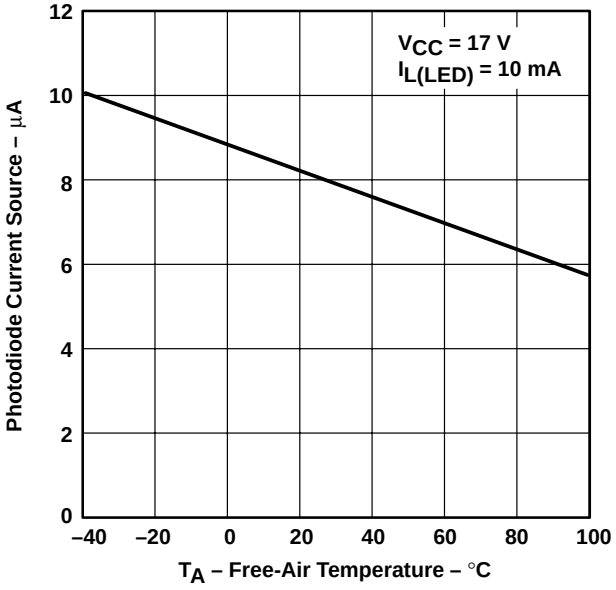


Figure 14

SENSE CURRENT SOURCE vs FREE-AIR TEMPERATURE

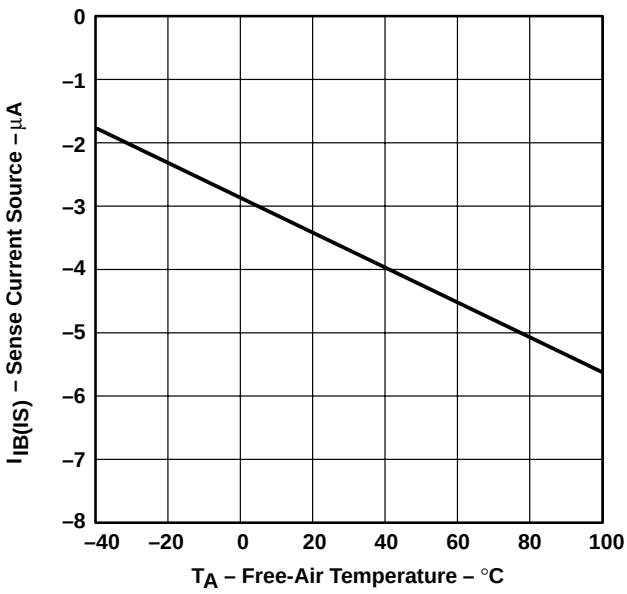


Figure 15

PWM DEAD TIME vs FREE-AIR TEMPERATURE

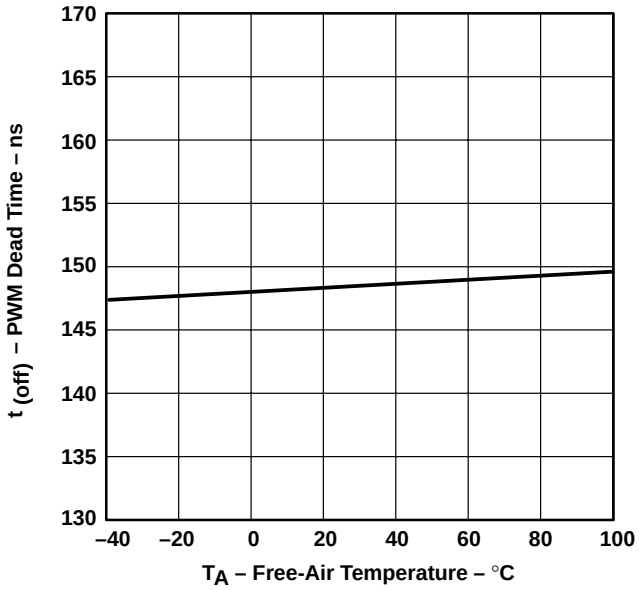


Figure 16

PWM REGULATOR SHORT-CIRCUIT CURRENT vs FREE-AIR TEMPERATURE

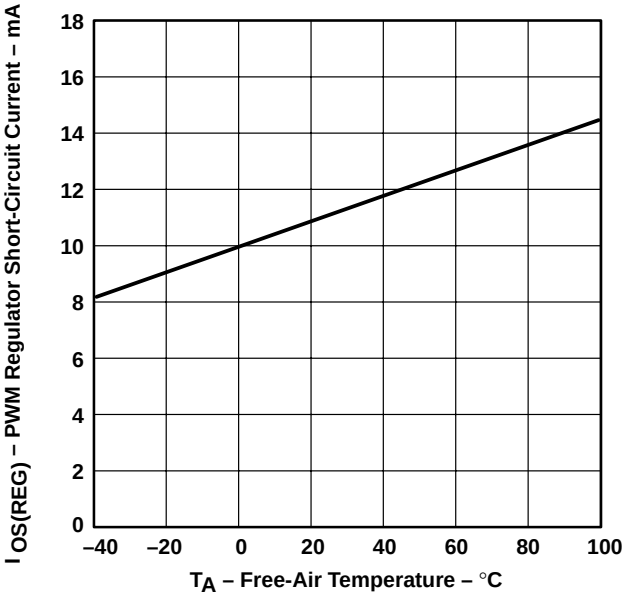


Figure 17

TYPICAL CHARACTERISTICS

LOW-STATE OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

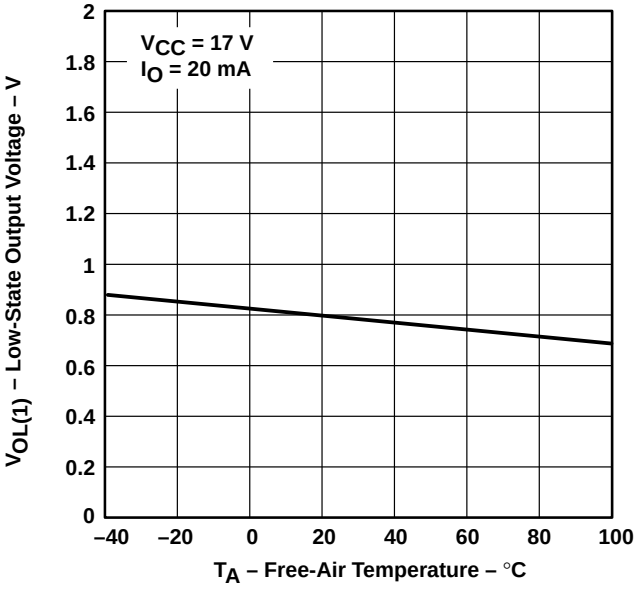


Figure 18

LOW-STATE OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

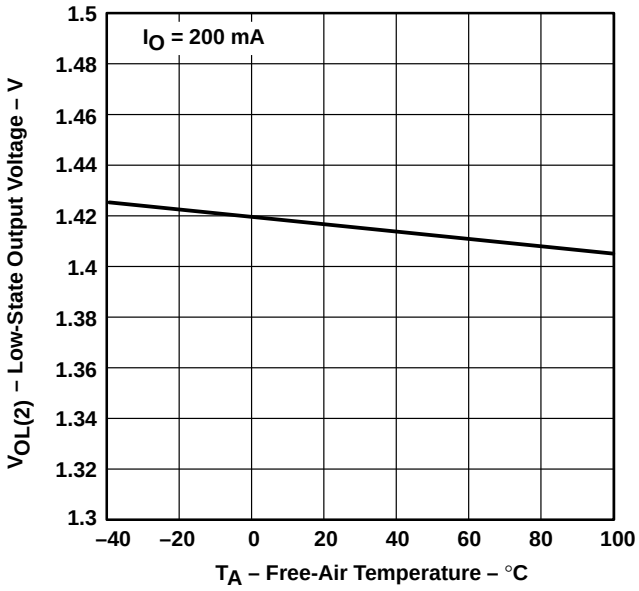


Figure 19

PWM TURN-ON THRESHOLD VOLTAGE vs FREE-AIR TEMPERATURE

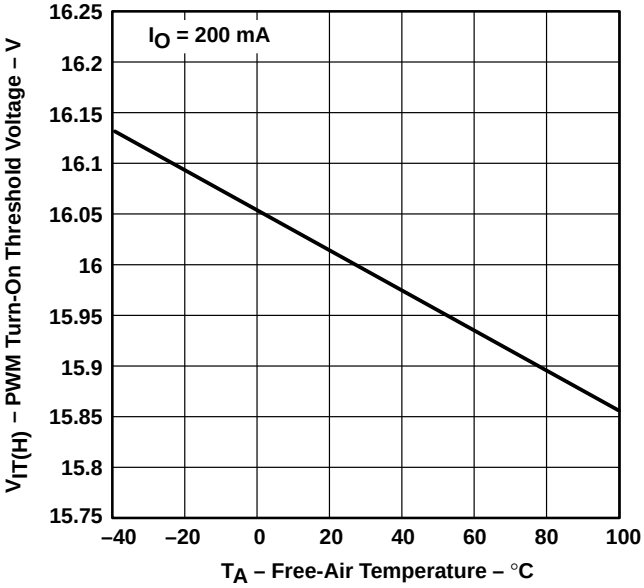


Figure 20

PWM TURN-OFF THRESHOLD VOLTAGE vs FREE-AIR TEMPERATURE

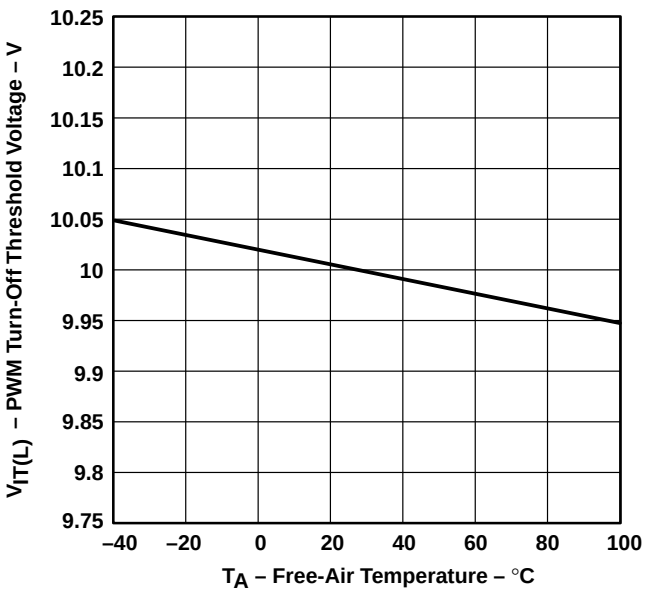


Figure 21

TYPICAL CHARACTERISTICS

PWM THRESHOLD VOLTAGES SHOWING HYSTERESIS vs FREE-AIR TEMPERATURE

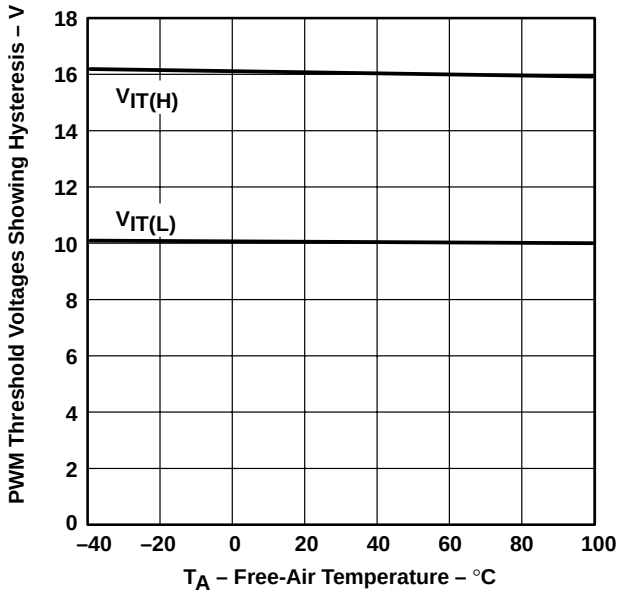


Figure 22

APPLICATION INFORMATION

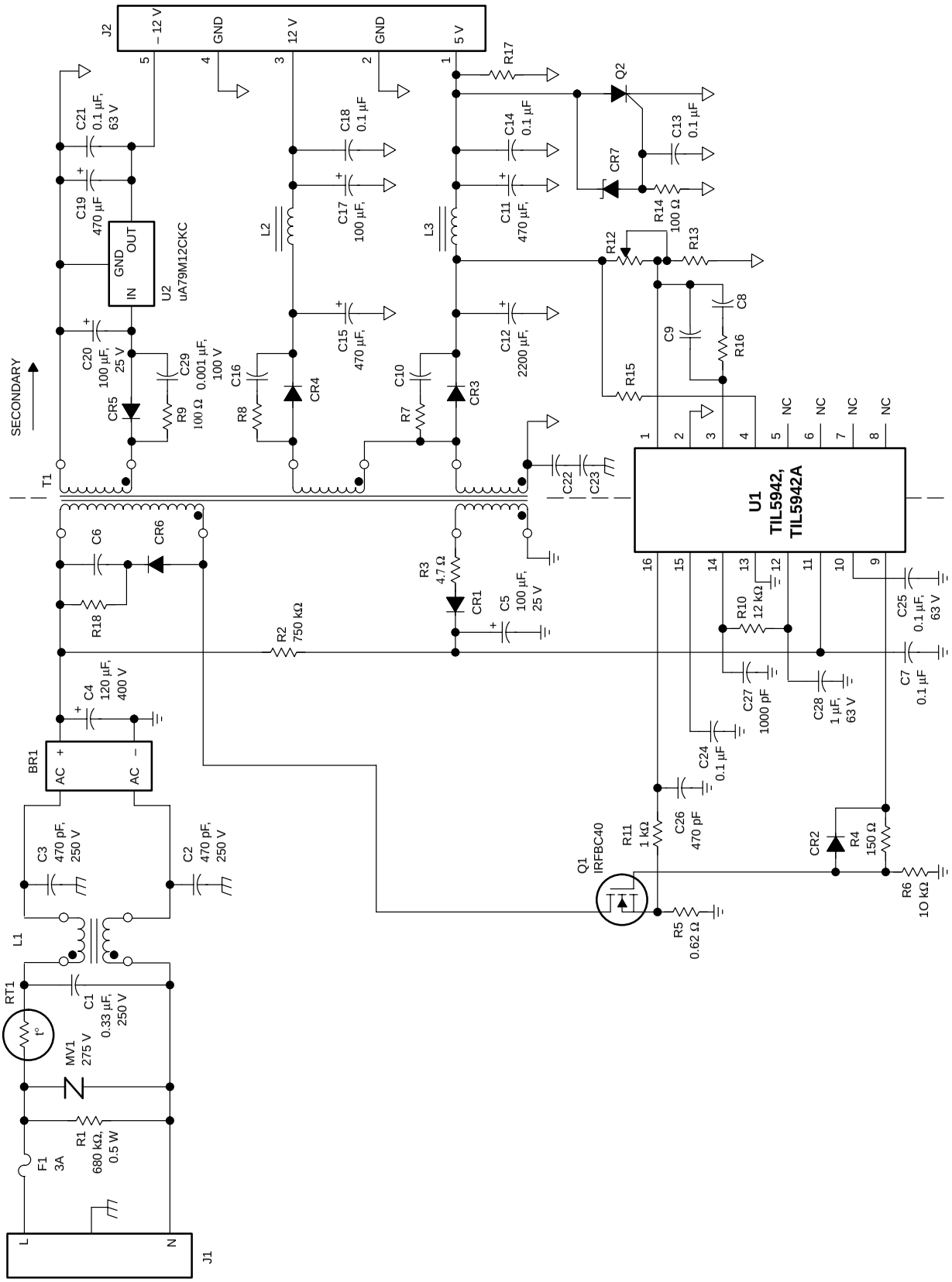


Figure 23. Off-Line Power-Supply Application

TEXAS INSTRUMENTS
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Table 1. Bill of Materials for TIL5942 and TIL5942A Off-Line Power-Supply

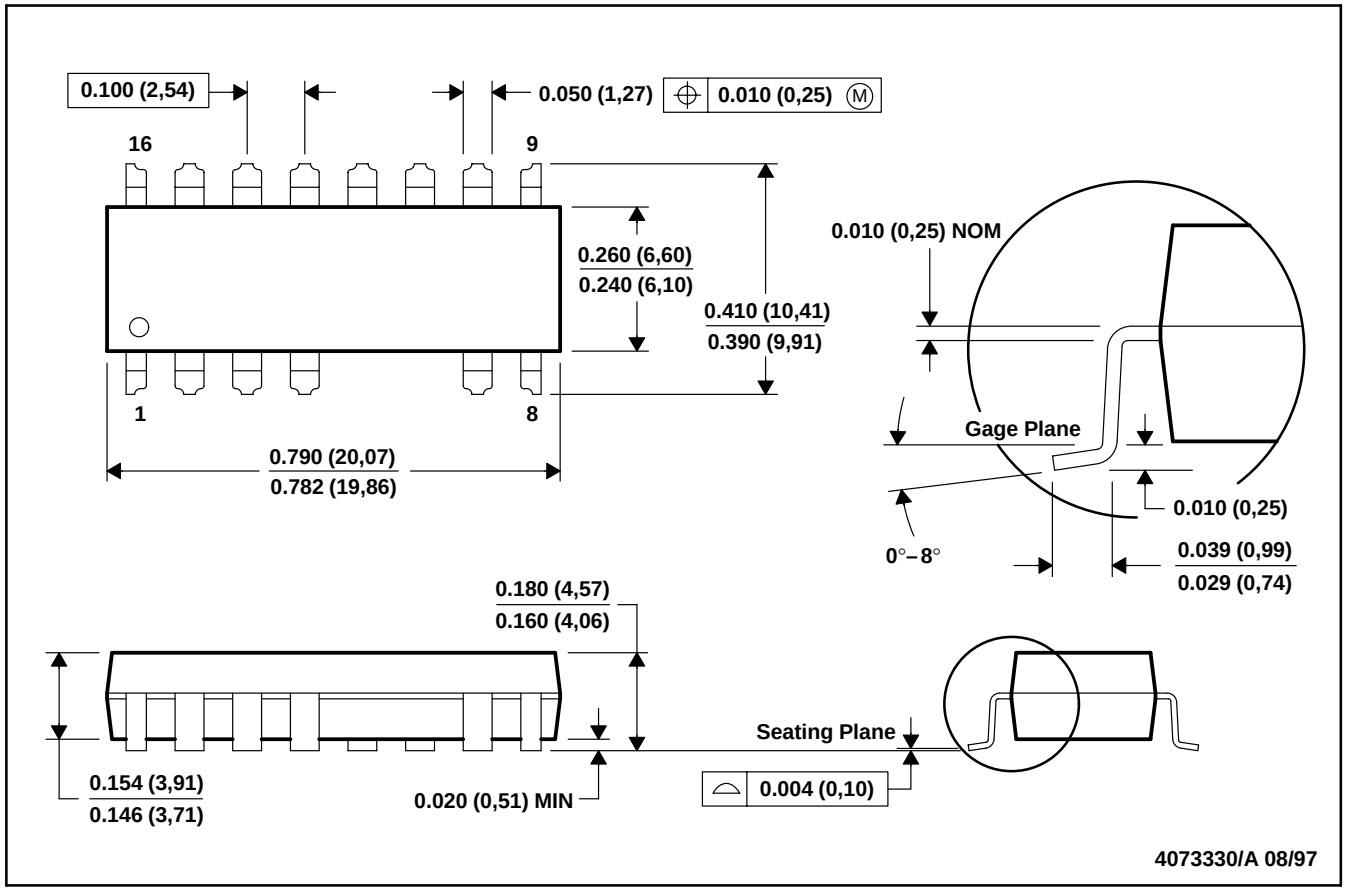
ITEM NO.	REF DES	PART NUMBER	DESCRIPTION	VENDOR
1	U1	TIL5942NFC	IC, PWM controller	Texas Instruments
2	U2	uA79M12CKC	IC, voltage regulator	Texas Instruments
3	Q1	IRFBC40	N-ch MOSFET 8A/600 V	International Rectifier (IR)
4	Q2	S4015L	SCR 100 V	Teccor Electronics
5	MV1	ERZ-V10D431	MOV, 275 V	Panasonic
6	BD1	BR86D	Bridge, 2A/600 V	Diodes, Inc.
7	RT1	CL–80	Thermistor	Keystone
8	CR1	1N4148CT	Rectifier, 100mA/100 V	Diodes, Inc.
9	CR2	1N4148CT	Rectifier, 100mA/100 V	Diodes, Inc.
10	CR3	6TQ045	Rectifier, 7.5A/45 V	International Rectifier (IR)
11	CR4	31DF2	Rectifier, 3A/200 V	International Rectifier (IR)
12	CR5	11DF2	Rectifier, 1A/200 V	International Rectifier (IR)
13	CR6	BYV26C	Rectifier, 1A/600 V	Philips
14	CR7	1N5232BCT	Zener diode 5.6 V	Diodes, Inc.
15	C1	ECQ-U2A334MV	Capacitor, film, 0.33 µF/250Vac/20%	Panasonic
16	C2	ECK-DGL471MB	Capacitor, film, 470 pF/250Vac/20%	Panasonic
17	C3	ECK-DGL471MB	Capacitor, film, 470 pF/250Vac/20%	Panasonic
18	C4	ECO-S2GP121CA	Capacitor, electrolytic, 120 µF/400 V	Panasonic
19	C5	ECE-A1EFS101	Capacitor, electrolytic, 100 µF/25 V	Panasonic
20	C6	ECK-D3A332KBP	Capacitor, ceramic, 3300 pF/1000 V	Panasonic
21	C7	ECU-S2A104KBA	Capacitor, ceramic, 0.1 µF/100 V	Panasonic
22	C8	ECU-S2A333KBA	Capacitor, ceramic, 0.033 µF/100 V	Panasonic
23	C9	ECU-S2A471KBA	Capacitor, ceramic, 470 pF/100 V	Panasonic
24	C10	ECU-S2A222KBA	Capacitor, ceramic, 2200 pF/100 V	Panasonic
25	C11	ECE-A1AFS471	Capacitor, electrolytic, 470 µF/10 V	Panasonic
26	C12	ECA–1AFQ222	Capacitor, electrolytic, 2200 µF/10 V	Panasonic
27	C13	ECU-S2A104KBA	Capacitor, ceramic, 0.1 µF/100 V	Panasonic
28	C14	ECU-S2A104KBA	Capacitor, ceramic, 0.1 µF/100 V	Panasonic
29	C15	ECE-A1EFS471	Capacitor, electrolytic, 470 µF/25 V	Panasonic
30	C16	ECU-S2A471KBA	Capacitor, ceramic, 470 pF/100 V	Panasonic
31	C17	ECE-A1EFS101	Capacitor, electrolytic, 100 µF/25 V	Panasonic
32	C18	ECU-S2A104KBA	Capacitor, ceramic, 0.1 µF/100 V	Panasonic
33	C19	ECE-A1EFS471	Capacitor, electrolytic, 470 µF/25 V	Panasonic
34	C20	ECE-A1EFS101	Capacitor, electrolytic, 100 µF/25 V	Panasonic
35	C21	ECU-S2A104KBA	Capacitor, ceramic, 0.1 µF/100 V	Panasonic
36	C22	ECK-DGL471MB	Capacitor, film, 470 pF/250Vac	Panasonic
37	C23	ECK-DGL471MB	Capacitor, film, 470 pF/250Vac	Panasonic
38	C24	ECU-S2A104KBA	Capacitor, ceramic, 0.1 µF/100 V	Panasonic
39	C25	ECU-S2A104KBA	Capacitor, ceramic, 0.1 µF/100 V	Panasonic
40	C26	ECU-S2A471KBA	Capacitor, ceramic, 470 pF/100 V	Panasonic
41	C27	ECU-S1J102JCB	Capacitor, ceramic, 1000 pF/63 V	Panasonic

Table 1. Bill of Materials for TIL5942 and TIL5942A Off-Line Power-Supply (Continued)

ITEM NO.	REF DES	PART NUMBER	DESCRIPTION	VENDOR
42	C28	ECU-S1J105MEB	Capacitor, ceramic, 1 μF/63 V	Panasonic
43	C29	ECU-S1J102JCB	Capacitor, ceramic, 1000 pF/100 V	Panasonic
44	R1		Resistor, MF, 680 kΩ, 1/2 W, 5%	
45	R2		Resistor, MF, 750 kΩ, 2 W, 5%	
46	R3		Resistor, MF, 4.7 Ω, 1/4 W, 5%	
47	R4		Resistor, MF, 150 Ω, 1/4 W, 5%	
48	R5		Resistor, MF, 0.62 Ω, 1/4 W, 5%	
49	R6		Resistor, MF, 10 kΩ, 2 W, 5%	
50	R7		Resistor, MF, 47 Ω, 1/4 W, 5%	
51	R8		Resistor, MF, 100 Ω, 1/4 W, 5%	
52	R9		Resistor, MF, 100 Ω, 1/4 W, 5%	
53	R10		Resistor, MF, 12 kΩ, 1/4 W, 5%	
54	R11		Resistor, MF, 100 Ω, 1/4 W, 5%	
55	R12		Resistor, MF, 2.4 kΩ, 1/4 W, 5%	
56	R13	3306F-502-ND	5 kΩ, 1/4 W, POT	Bourns
57	R14		Resistor, MF, 100 Ω, 1 W, 5%	
58	R15		Resistor, MF, 100 Ω, 1/4 W, 5%	
59	R16		Resistor, MF, 150 kΩ, 1/4 W, 5%	
60	R17		Resistor, MF, 1 kΩ, 1/4 W, 5%	
61	R18		Resistor, MF, 4.7 kΩ, 2 W, 5%	
62	T1	CYX01-13940-X4	Transformer, turns ratio	Colitronics
63	L1	0571-0203-01	Common mode filter	Bel
64	L2	PCV-0-0050-10	Inductor, choke	Coilcraft
65	L3	PCV-0-0050-10	Inductor, choke	Coilcraft
66	F1		Fuse, 3AG	Bel
67	FH1	F052-ND	Fuseclip	
68	FH1	F052-ND	Fuseclip	
69	HS1	PF430	Heat sink Q1	Thermalloy
70	HS4	PF430	Heat sink CR3	Thermalloy
71	P1	42R05-3143-150	Connector, input	Power Dynamics
72	P2	WM4403ND	Connector, output	Waldom
73	JMP1		Strap	
74	JMP2		Strap	
75	JMP3		Strap	
76	PWB		PC board	

MECHANICAL DATA

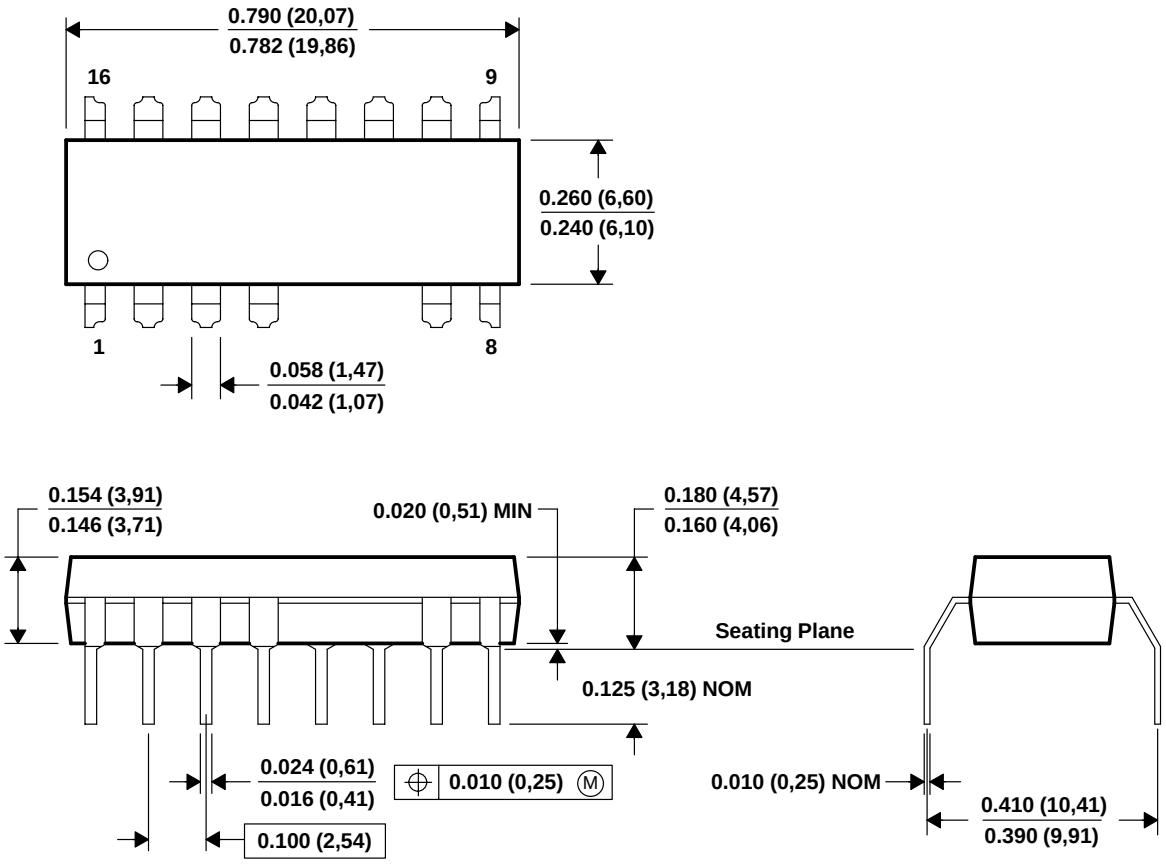
NFD (R-PDSO-G14) **PLASTIC SMALL-OUTLINE PACKAGE**



NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.

MECHANICAL DATA

NFC (R-PDIP-T14) **PLASTIC DUAL-IN-LINE PACKAGE**



NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
TIL5942ANFC	OBSOLETE	PDIP	NFC	16		TBD	Call TI	Call TI
TIL5942ANFD	OBSOLETE	SOP	NFD	16		TBD	Call TI	Call TI
TIL5942NFC	OBSOLETE	PDIP	NFC	16		TBD	Call TI	Call TI
TIL5942NFD	OBSOLETE	SOP	NFD	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), Pb-Free (RoHS Exempt), 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.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
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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