Data Sheet
October 2001

tyco / Electronics

LW016 Low Dual-Positive Output Voltage Power Modules: 36 Vdc to 75 Vdc Input, 3.3 Vdc and 5.0 Vdc Outputs; 16 W

The LW016 Low Dual-Positive Output Voltage Power Modules use advanced surface-mount technology and deliver high-quality, compact, dc-dc conversion at an economical price.

Applications

- Telecommunications equipment
- Distributed and redundant power architectures
- Workstations
- File servers
- Desktop computers
- Data processing applications
- LAN/WAN applications

Options

- Negative remote on/off logic
- Synchronization
- Case ground pin
- Short pins: 2.79 mm ± 0.25 mm (0.110 in. ± 0.010 in.)

Features

- Small size and low profile: 50.8 mm x 50.8 mm x 9.91 mm (2.00 in. x 2.00 in. x 0.390 in.) with 0.38 mm (0.015 in.) standoffs, 9.53 mm (0.375 in.) with standoffs recessed
- Wide input voltage range: 36 Vdc to 75 Vdc
- Input-to-output isolation: 1500 Vdc
- Operating case temperature range: –40 °C to +105 °C
- Metal case
- Tight tolerance output
- Overcurrent protection
- Remote on/off
- Output overvoltage protection
- Output1 voltage adjustment +3%, –5%
- *UL** 60950 Recognized, *CSA*† C22.2 No. 60950-00 Certified, VDE 0805 (EN60950) Licensed
- CE mark meets 73/23/EEC and 93/68/EEC directives‡
- Within FCC and EN55022 (CISPR 22) Class A radiated limits

* *UL* is a registered trademark of Underwriters Laboratories, Inc.
† *CSA* is a registered trademark of Canadian Standards Association.
‡ This product is intended for integration into end-use equipment. All the required procedures for CE marking of end-use equipment should be followed. (The CE mark is placed on selected products.)

Description

The LW016 Low Dual-Positive Output Voltage Power Modules are isolated dc-dc converters that operate over an input voltage range of 36 Vdc to 75 Vdc and provide two precisely regulated outputs of 3.3 Vdc and 5.0 Vdc. The module has a maximum output current rating of 3 A for output1 and 2.0 for output2, with the sum of the output currents limited to 4 A. In addition, I_{O2} must be ≤ I_{O1} for the power module to maintain tight regulation of the output2 voltage.

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the devices. These are absolute stress ratings only. Functional operation of the devices are not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Input Voltage:				
Continuous	V_I	0	80	Vdc
Transient (100 ms)	$V_{I,\ trans}$	0	100	V
Operating Case Temperature (See Figures 37 and 40.)	T_C	–40	105*	°C
Storage Temperature	T_{stg}	–40	125	°C
I/O Isolation Voltage	—	—	1500	Vdc

* Maximum case temperature varies based on power dissipation. See derating curve, Figure 40, for details.

Electrical Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, resistive load, and temperature conditions.

Table 1. Input Specifications

Parameter	Symbol	Min	Typ	Max	Unit
Operating Input Voltage	V_I	36	48	75	Vdc
Maximum Input Current (V_I = 0 V to $V_{I,\ max}$; I_O = $I_{O,\ max}$; see Figure 1.)	$I_{I,\ max}$	—	—	0.9	A
Inrush Transient	i^2t	—	—	0.1	A^2s
Input Reflected-ripple Current (50 Hz to 20 MHz; 12 µH source impedance; T_C = 25 °C; see Figure 33.)	I_I	—	33	—	mAp-p
Input Ripple Rejection (100 Hz to 120 Hz)	—	—	60	—	dB

Fusing Considerations

CAUTION: This power module is not internally fused. An input line fuse must always be used.

This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of a sophisticated power architecture. To preserve maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse. The safety agencies require a normal-blow fuse with a maximum rating of 5 A (see Safety Considerations section). Based on the information provided in this data sheet on inrush energy and maximum dc input current, the same type of fuse with a lower rating can be used. Refer to the fuse manufacturer’s data for further information.

Electrical Specifications (continued)

Table 2. Output Specifications

Parameter	Device	Symbol	Min	Typ	Max	Unit
Output Voltage Set Point (V_I = 48 V; I_{O1} = 2 A; I_{O2} = 2 A; T_A = 25 °C)	LW016FA	$V_{O1, set}$	3.25	3.30	3.35	Vdc
		$V_{O2, set}$	4.90	5.00	5.10	Vdc
	LW016AF	$V_{O1, set}$	4.92	5.00	5.08	Vdc
		$V_{O2, set}$	3.20	3.30	3.40	Vdc
Output Voltage (Over all operating input voltage, resistive load ($I_{O1} > I_{O2}$), and temperature conditions until end of life; see Figure 35.)	LW016FA	V_{O1}	3.20	—	3.40	Vdc
		V_{O2}	4.80	—	5.20	Vdc
	LW016AF	V_{O1}	4.85	—	5.15	Vdc
		V_{O2}	3.135	—	3.465	Vdc
Output Regulation:						
Line (V_I = 36 V to 75 V)	All	V_{O1}	—	0.2	0.5	%V_O
Load ($I_O = I_{O, min}$ to $I_{O, max}$)	All	V_{O1}	—	0.5	1.0	%V_O
Temperature (T_C = –40 °C to +100 °C)	All	V_{O1}	—	0.5	1.0	%V_O
Output Ripple and Noise Voltage (See Figure 34.):						
RMS	All	—	—	—	20	mVrms
Peak-to-peak (5 Hz to 20 MHz bandwidth)	All	—	—	—	100	mVp-p
Output Current (At $I_{O1} < I_{O1, min}$, the modules may exceed output ripple and regulation specifications. I_{O2} must have the specified minimum load.)	All	I_{O1}	0.5	—	3.0*	A
	All	I_{O2}	0.1	—	2.0*	A
	All	$I_{O1} + I_{O2}$	—	—	4.0*	A
Maximum Output Power	All	—	—	—	16.6*	W
Output Current-limit Inception (V_O = 90% of $V_{O, set}$; I_{O2} = 2 A; see Figure 2.)	LW016FA	I_{O1}	2.0	3.0	3.5*	A
	LW016AF	I_{O1}	2.0	2.75	4.0*	A
Output Short-circuit Current ($V_{O1, 2}$ = 250 mV; I_{O2} = 2 A)	LW016FA	I_{O1}	—	5.0	9.0	A
	LW016AF	I_{O1}	—	3.3	6.0	A
Efficiency (V_I = 48 V; I_{O1} = 3 A, I_{O2} = 1 A; T_A = 25 °C; see Figures 6 and 35.)	LW016FA	η	69	72	—	%
V_I = 48 V; I_{O1} = 3 A, I_{O2} = 0.5 A	LW016AF	η	73	76	—	%
Switching Frequency	All	—	—	265	—	kHz

* This module has somewhat flexible loading capabilities in that drawing less load from one output allows more load to be drawn from the other output. Note that the total output current (I_{01} & I_{02}) or the total output power (I_{01}•V_{01} + I_{02}•V_{02}) should not exceed max conditions under normal operating conditions.

Electrical Specifications (continued)

Table 2. Output Specifications (continued)

Parameter	Device	Symbol	Min	Typ	Max	Unit
Dynamic Response ($\Delta I_O/\Delta t$ = 1 A/10 µs, V_I = 48 V, T_A = 25 °C; see Figures 10 and 12.):						
Load Change from I_O = 50% to 75% of $I_{O,\,max}$:						
Peak Deviation	All	—	—	100	—	mV
Settling Time (V_O < 10% peak deviation)	All	—	—	1	—	ms
Load Change from I_O = 50% to 25% of $I_{O,\,max}$:						
Peak Deviation	All	—	—	100	—	mV
Settling Time (V_O < 10% peak deviation)	All	—	—	1	—	ms

Table 3. Isolation Specifications

Parameter	Min	Typ	Max	Unit
Isolation Capacitance	—	0.002	—	µF
Isolation Resistance	10	—	—	MΩ

General Specifications

Parameter	Min	Typ	Max	Unit
Calculated MTBF (I_O = 80% of $I_{O,\,max}$; T_C = 40 °C)		4,500,000		hours
Weight	—	—	54 (1.9)	g (oz.)

Feature Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, resistive load, and temperature conditions. See Feature Descriptions and Design Considerations for further information.

Parameter	Device	Symbol	Min	Typ	Max	Unit
Remote On/Off Signal Interface (V_I = 0 V to $V_{I, max}$; open collector or equivalent compatible; signal referenced to V_I(–) terminal. See Figure 36 and Feature Descriptions.):						
LW016xx Positive Logic:						
Logic Low—Module Off						
Logic High—Module On						
LW016xx1 Negative Logic:						
Logic Low—Module On						
Logic High—Module Off						
Module Specifications:						
On/Off Current—Logic Low	All	$I_{on/off}$	—	—	1.0	mA
On/Off Voltage:						
Logic Low	All	$V_{on/off}$	–0.7	—	1.2	V
Logic High ($I_{on/off}$ = 0)	All	$V_{on/off}$	—	—	6	V
Open Collector Switch Specifications:						
Leakage Current During Logic High ($V_{on/off}$ = 6 V)	All	$I_{on/off}$	—	—	50	µA
Output Low Voltage During Logic Low ($I_{on/off}$ = 1 mA)	All	$V_{on/off}$	—	—	1.2	V
Turn-on Delay and Rise Times (I_O = 80% of $I_{O, max}$; T_A = 25 °C):						
Case 1: On/Off Input Is Set for Unit On and Then Input Power Is Applied (delay from point at which V_I = 48 V until V_O = 10% of $V_{O, nom}$).	All	T_{delay}	—	6	10	ms
Case 2: 48 V Input Is Applied for at Least One Second, and Then the On/Off Input Is Set to Turn the Module On (delay from point at which on/off input is toggled until V_O = 10% of $V_{O, nom}$).	All	T_{delay}	—	7.5	10	ms
Output Voltage Rise Time (time for V_O to rise from 10% of $V_{O, nom}$ to 90% of $V_{O, nom}$)	All	T_{rise}	—	5.5	7.5	ms
Output Voltage Overshoot (at 80% of $I_{O, max}$; T_A = 25 °C)	All	—	—	0	5	%
Output Voltage Set-point Adjustment Range (output1 only)	All	V_{trim}	95	—	103	$\%V_{O, nom}$
Output Overvoltage Protection (clamp)	LW016FA	$V_{O1, clamp}$	3.8	—	5.0	V
		$V_{O2, clamp}$	5.6	—	7.0	V
	LW016AF	$V_{O1, clamp}$	5.6	—	7.0	V
		$V_{O2, clamp}$	3.8	—	5.0	V

Characteristic Curves

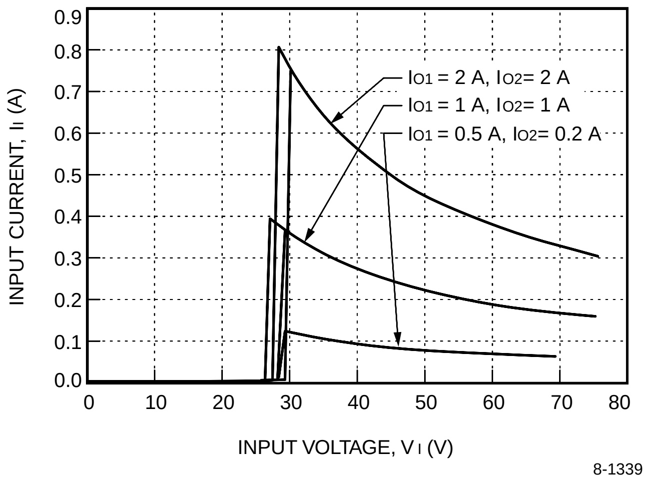

Figure 1. LW016AF and LW016FA Typical Input Characteristics

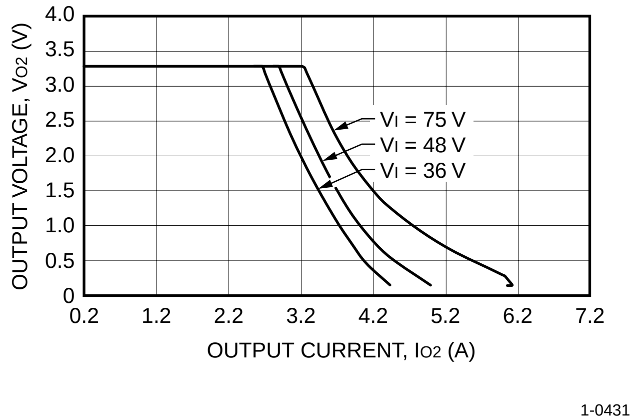

Figure 3. LW016AF Typical Output Characteristics (V_{02} vs. I_{02})

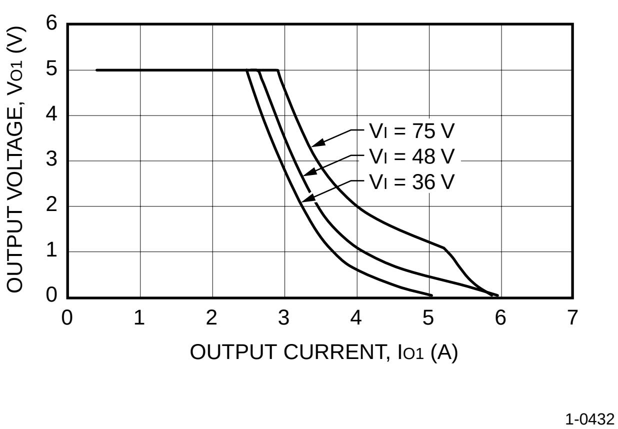

Figure 2. LW016AF Typical Output Characteristics (V_{01} vs. I_{01})

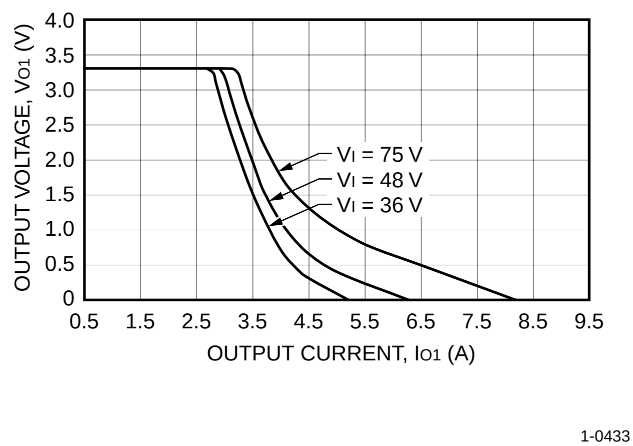

Figure 4. LW016FA Typical Output Characteristics (V_{01} vs. I_{01})

Characteristic Curves (continued)

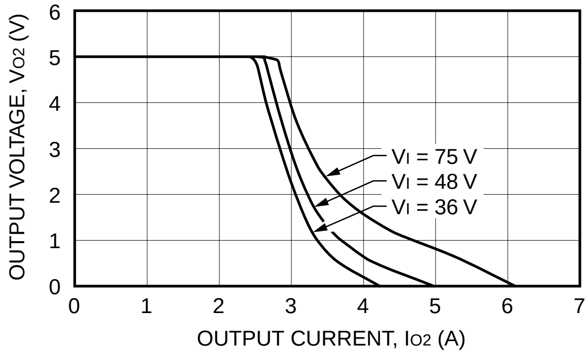

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Figure 5. LW016FA Typical Output Characteristics (V_{O2} vs. I_{O2})

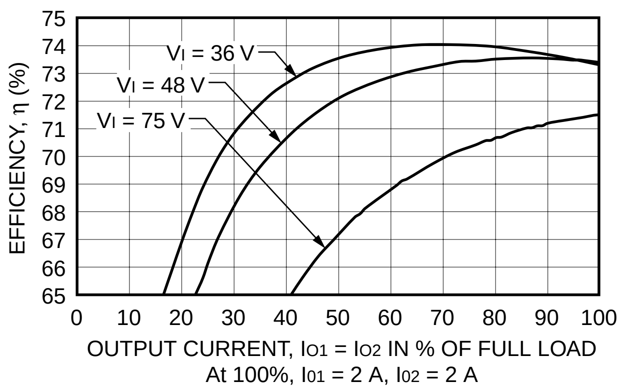

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Figure 6. LW016AF Typical Converter Efficiency vs. Output Current

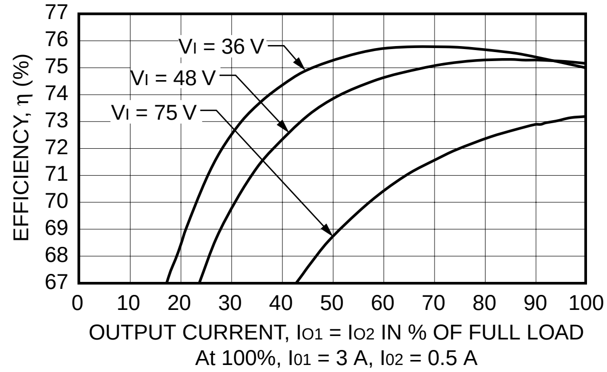

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Figure 7. LW016AF Typical converter Efficiency vs. Output Current

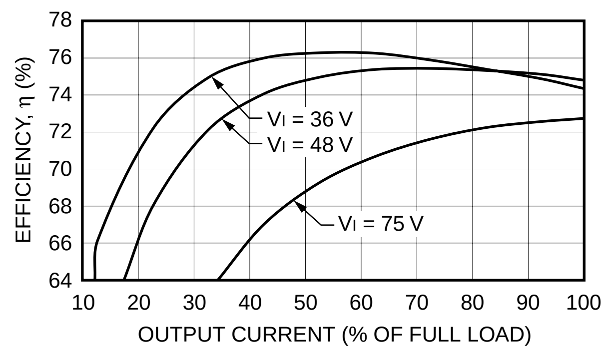

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Figure 8. LW016FA Typical Converter Efficiency vs. Output Current

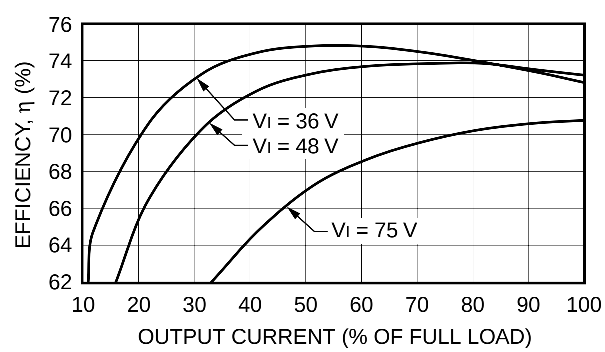

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Figure 9. LW016FA Typical Converter Efficiency vs. Output Current

Characteristic Curves (continued)

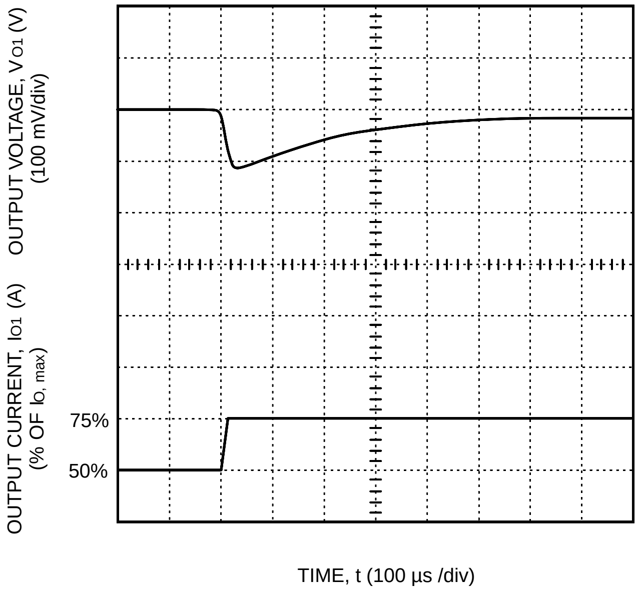

Figure 10.LW016AF Typical Output Voltage for a Step Load Change from 50% to 75%

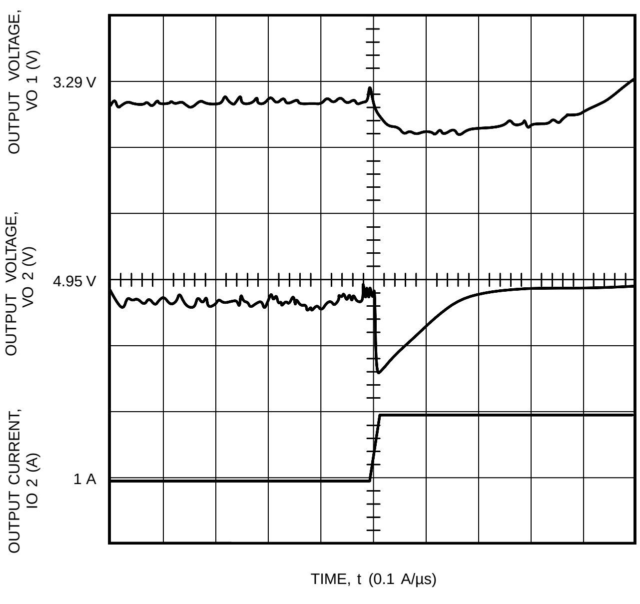

Figure 11.LW016FA Typical Output Voltage for a Step Load Change from 50% to 75%

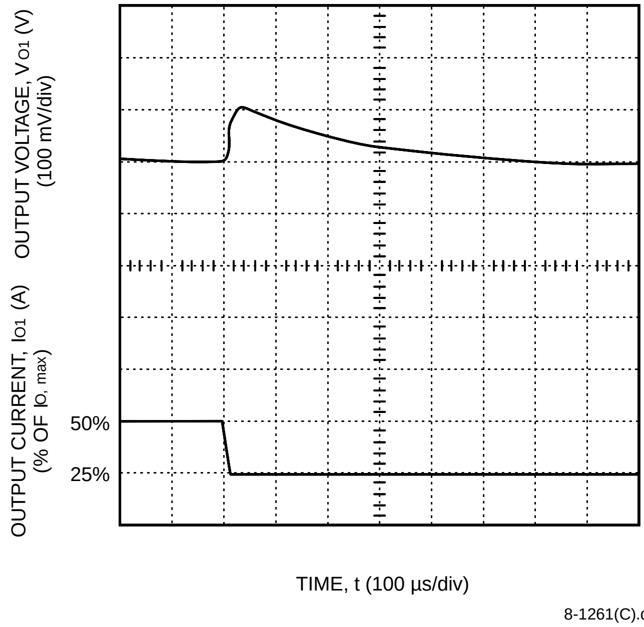

Figure 12.LW016AF Typical Output Voltage for a Step Load Change from 50% to 25%

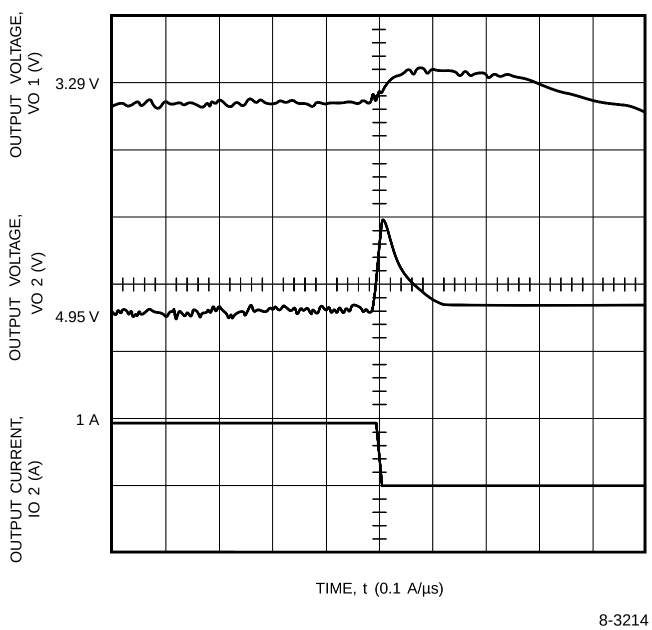

Figure 13.LW016FA Typical Output Voltage for a Step Load Change from 50% to 25%

Characteristic Curves (continued)

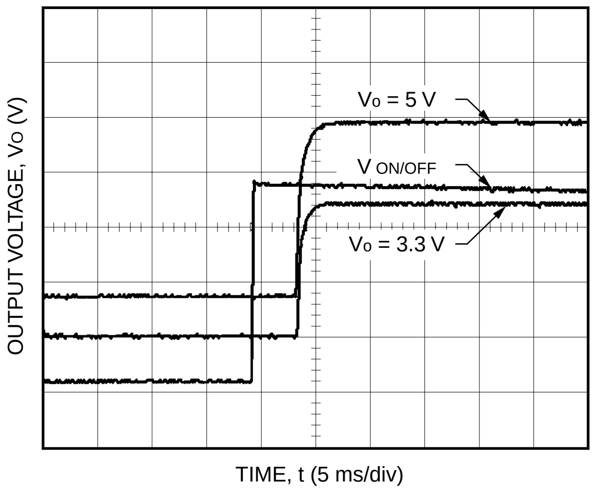

Figure 14.LW016FA Typical Output Voltage Start-Up When Signal Applied to Remote On/Off

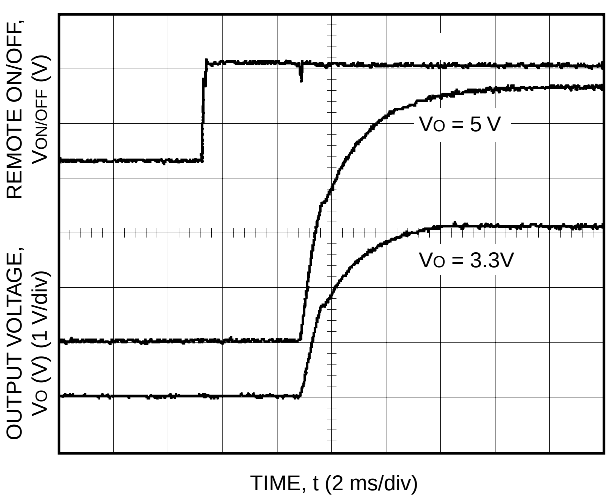

Figure 15.LW016AF Typical Output Voltage Start-Up When Signal Applied to Remote On/Off

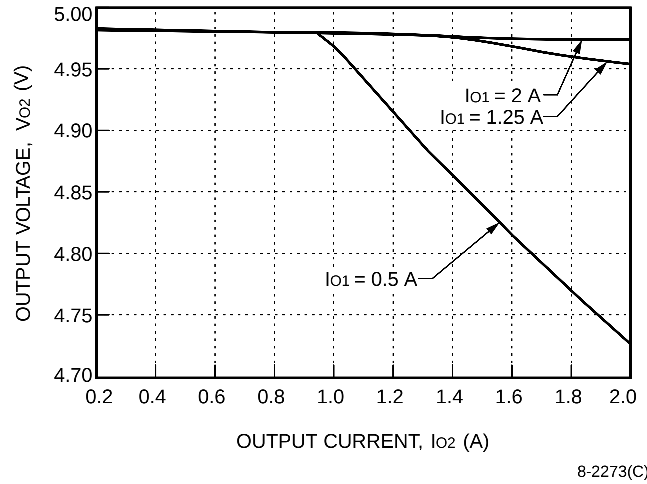

Figure 16. LW016FA Load Regulation (V_{O2})

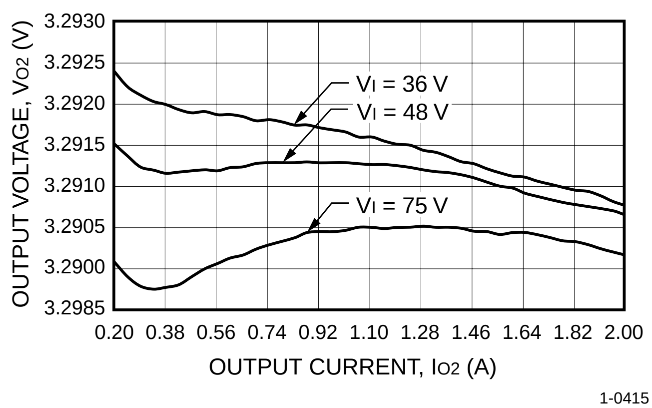

Figure 17.LW016AF Load Regulation V_{02} vs. I_{02} Output Current I_{02} (A) I_{01} = 2 A

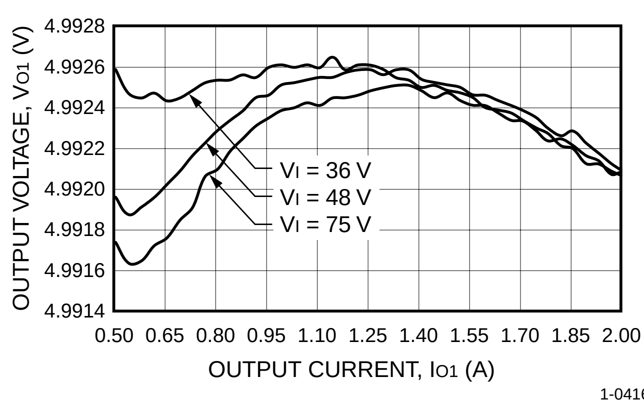

Figure 18.LW016AF Load Regulation V_{01} vs. I_{01} Output Current I_{01} (A) I_{02} = 2 A

Characteristic Curves (continued)

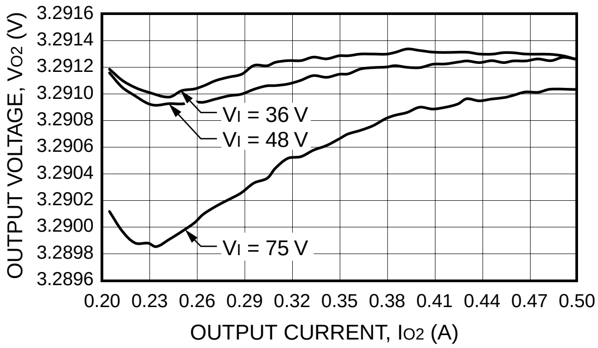

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Figure 19.LW016AF Load Regulation V_{02} vs. I_{02} Output Current I_{02} (A) I_{01} = 3 A

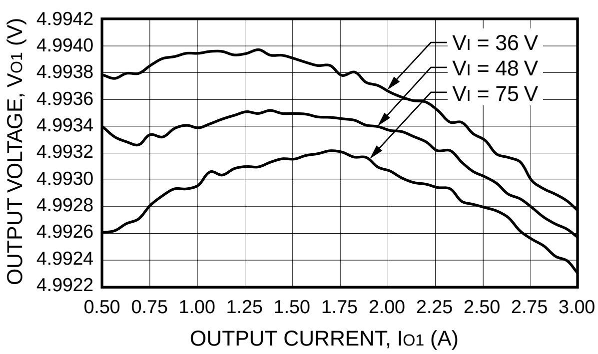

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Figure 20.LW016AF Load Regulation V_{01} vs. I_{02} Output Current I_{01} (A) I_{02} = 0.5 A

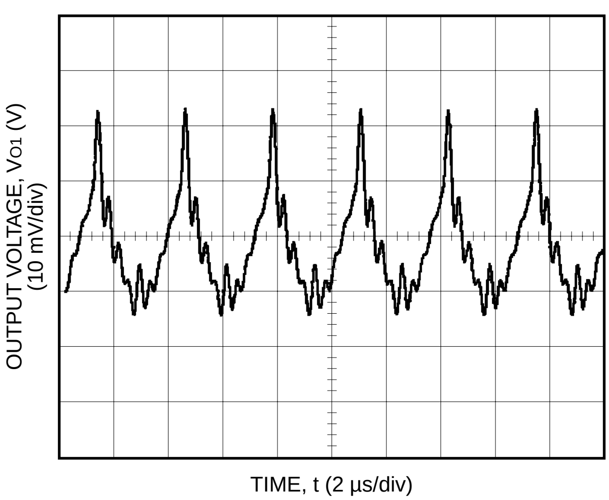

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Figure 21.Typical LW016AF Output Ripple Voltage (V_{01}) at Room Temperature and 36 Vin I_{01} = I_{02} = 2 A

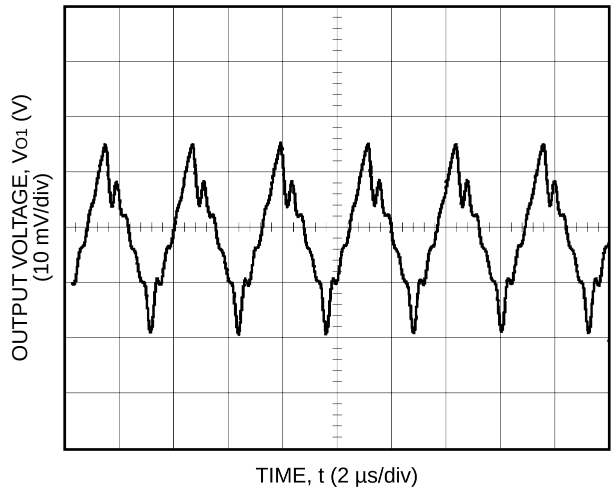

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Figure 22.Typical LW016AF Output Ripple Voltage (V_{O1}) at Room Temperature and 36 V_{IN} I_{O1} = 3 A I_{O2} = 0.5 A

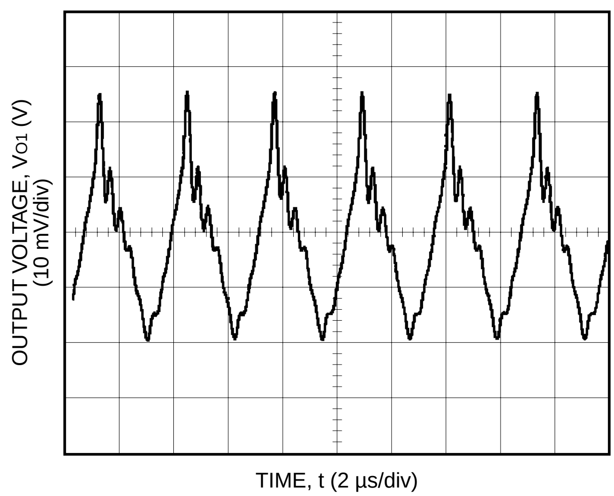

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Figure 23.Typical LW016AF Output Ripple Voltage (V_{O1}) at Room Temperature and 48 V_{IN} I_{O1} = I_{O2} = 2 A

Characteristic Curves (continued)

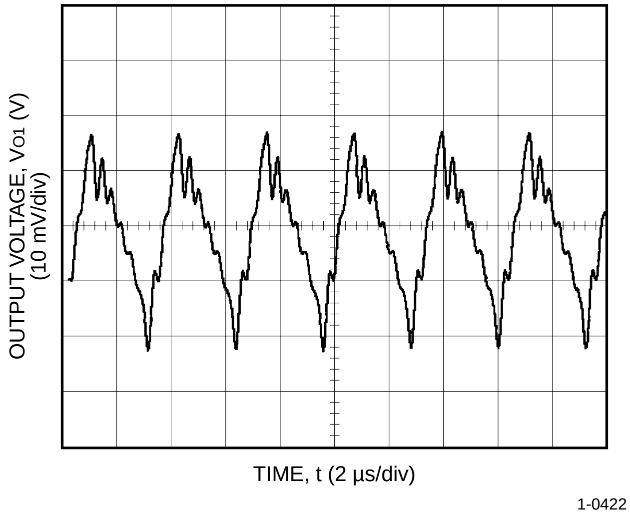

Figure 24.Typical LW016AF Output Ripple Voltage (V_{O1}) at Room Temperature and 48 V_{IN} I_{O1} = 3 A I_{O2} = 0.5 A

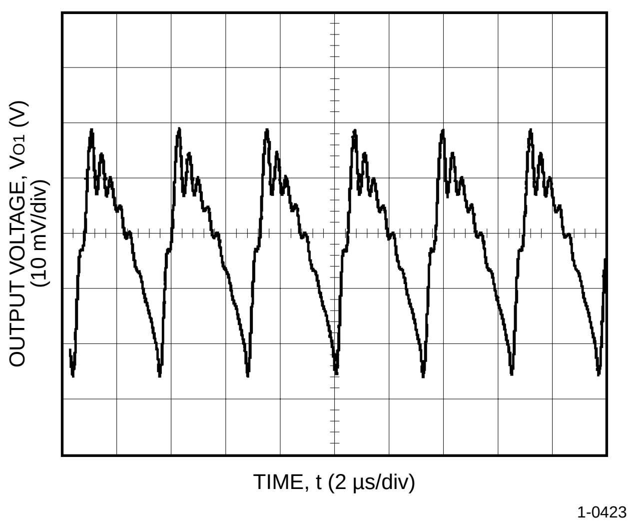

Figure 25.Typical LW016AF Output Ripple Voltage (V_{O1}) at Room Temperature and 75 V_{IN} I_{O1} = I_{O2} = 2 A

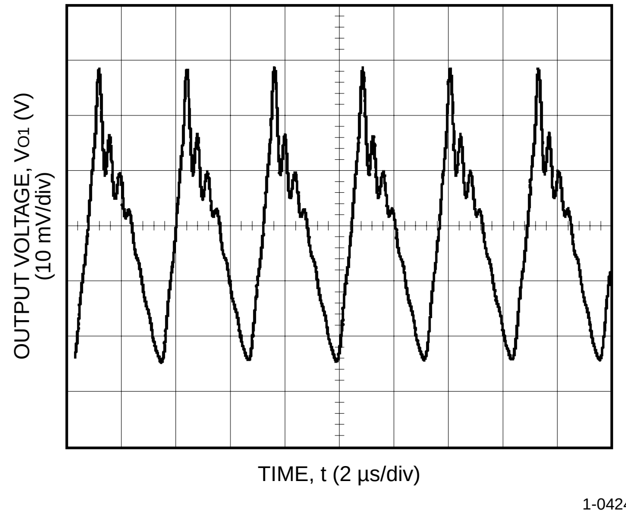

Figure 26.Typical LW016AF Output Ripple Voltage (V_{O1}) at Room Temperature and 75 V_{IN} I_{O1} = 3 A I_{O2} = 0.5 A

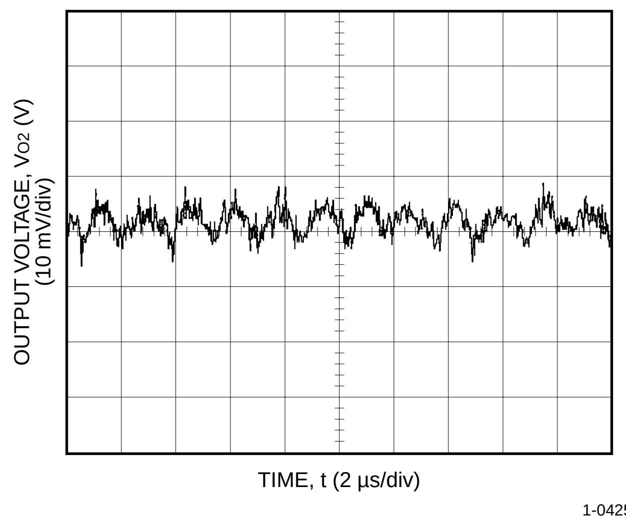

Figure 27.Typical LW016AF Output Ripple Voltage (V_{O2}) at Room Temperature and 36 V_{IN} I_{O1} = 3 A I_{O2} = 0.5 A

Characteristic Curves (continued)

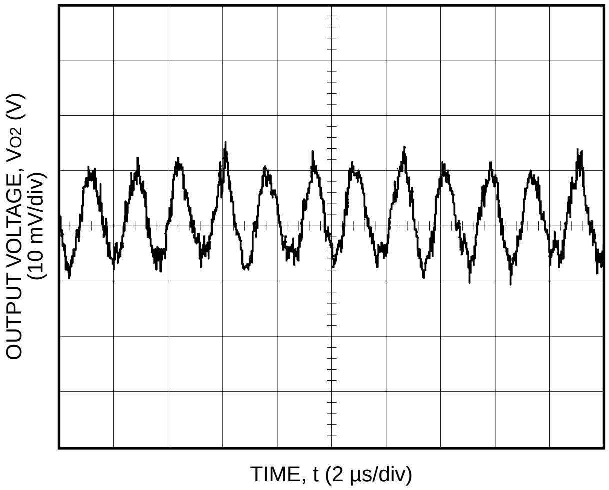

Figure 28.Typical LW016AF Output Ripple Voltage (V_{O2}) at Room Temperature and 36 V_{IN} I_{O1} = I_{O2} = 2 A

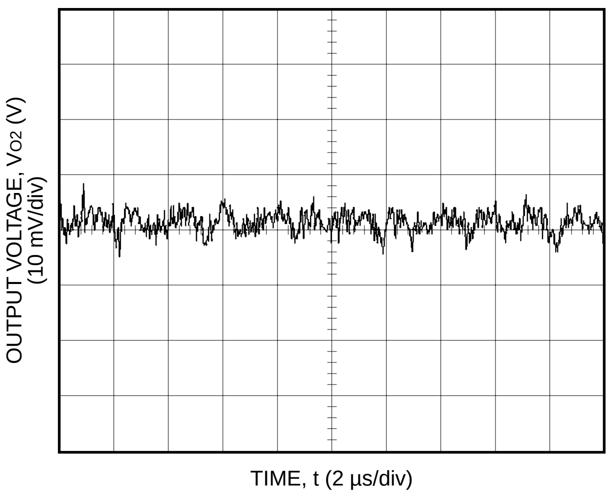

Figure 29.Typical LW016AF Output Ripple Voltage (V_{O2}) at Room Temperature and 48 V_{IN} I_{O1} = 3 A I_{O2} = 0.5 A

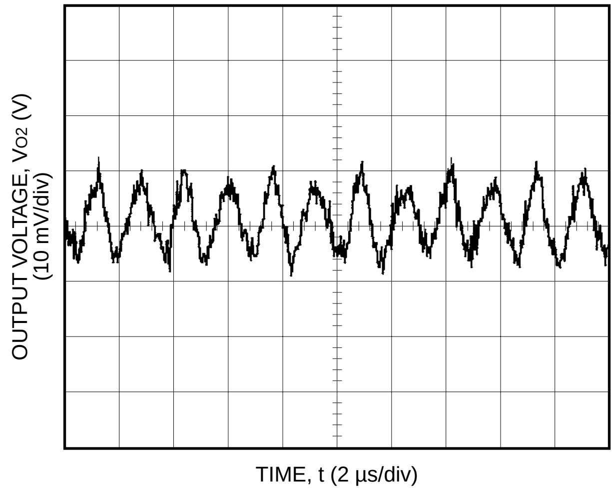

Figure 30.Typical LW016AF Output Ripple Voltage (V_{O2}) at Room Temperature and 48 V_{IN} I_{O1} = I_{O2} = 2 A

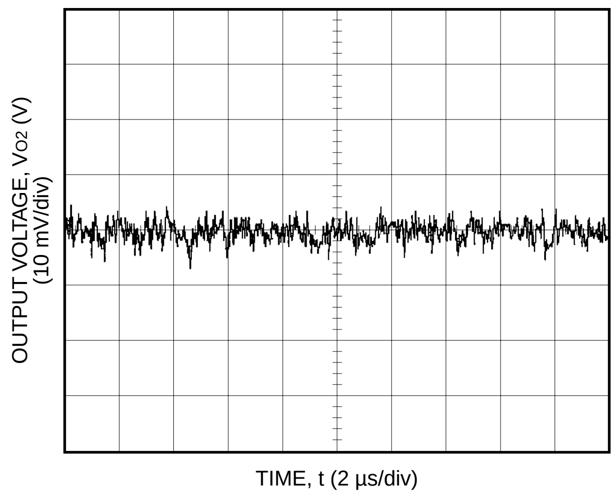

Figure 31.Typical LW016AF Output Ripple Voltage (V_{O2}) at Room Temperature and 75 V_{IN} I_{O1} = 3 A I_{O2} = 0.5 A

Characteristic Curves (continued)

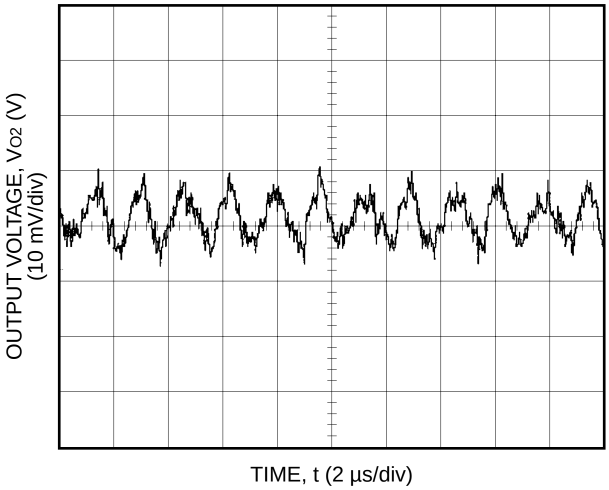

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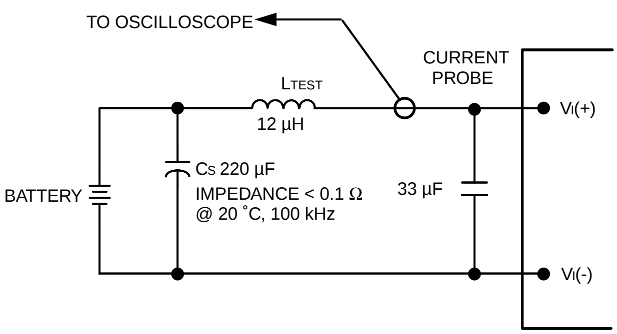
Figure 32.Typical LW016AF Output Ripple Voltage (V_{O2}) at Room Temperature and 75 V_{IN} I_{O1} = I_{O2} = 2 A

Test Configurations



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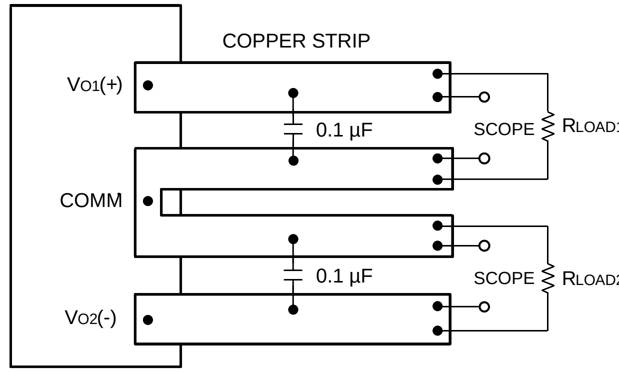
Note: Input reflected-ripple current is measured with a simulated source impedance of 12 µH. Capacitor Cs offsets possible battery impedance. Current is measured at the input of the module.

Figure 33. Input Reflected-Ripple Test Setup



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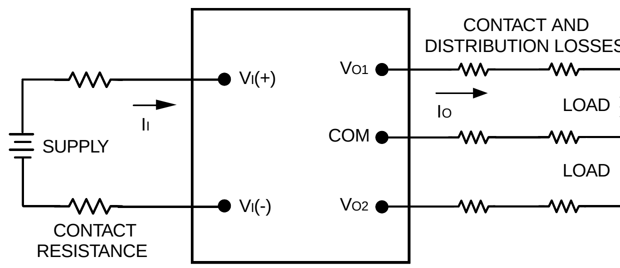
Note: Use a 0.1 µF ceramic capacitor. Scope measurement should be made using a BNC socket. Position the load between 50 mm and 75 mm (2 in. and 3 in.) from the module.

Figure 34.Peak-to-Peak Output Noise Measurement Test Setup



8-863a

Note: All measurements are taken at the module terminals. When socketing, place Kelvin connections at module terminals to avoid measurement errors due to socket contact resistance.

$$\eta = \frac{\sum_{J=1}^{2} \left| [V_{OJ} - COM] I_{OJ} \right|}{[V_I(+) - V_I(-)] I_I} \times 100 \quad \%$$

Figure 35. Output Voltage and Efficiency Measurement Test Setup

Design Considerations

Grounding Considerations

For modules without the case ground pin option, the case is internally connected to the $V_I(+)$ pin. For modules with the case ground pin, device code suffix “7,” the $V_I(+)$ pin is not connected to the case.

Input Source Impedance

The power modules should be connected to low ac-impedance input sources. Highly inductive source impedances can affect the stability of the power modules. For the test configuration in Figure 33, a 33 µF electrolytic capacitor (ESR < 0.7 Ω at 100 kHz) mounted close to the power module helps ensure stability of the unit. For other highly inductive source impedances, consult the factory for further application guidelines.

Safety Considerations

For safety-agency approval of the system in which the power module is used, the power module must be installed in compliance with the spacing and separation requirements of the end-use safety agency standard, i.e., *UL* 60950, *CSA* C22.2 No. 60950-00, and VDE 0805 (EN60950).

If the input source is non-SELV (ELV or a hazardous voltage greater than 60 Vdc and less than or equal to 75 Vdc), for the module's output to be considered meeting the requirements of safety extra-low voltage (SELV), all of the following must be true:

- The input source is to be provided with reinforced insulation from any other hazardous voltages, including the ac mains; and
- One V_I pin and one V_O pin are to be grounded or both the input and output pins are to be kept floating; and
- The input pins of the module are not operator accessible; and
- Another SELV reliability test is conducted on the whole system, as required by the safety agencies, on the combination of supply source and the subject module to verify that under a single fault, hazardous voltages do not appear at the module's output.

Note: Do not ground either of the input pins of the module without grounding one of the output pins. This may allow a non-SELV voltage to appear between the output pins and ground.

The power module has extra-low voltage (ELV) outputs when all inputs are ELV.

The input to these units is to be provided with a maximum 5 A normal-blow fuse in the ungrounded lead.

Feature Descriptions

Overcurrent Protection

To provide protection in a fault (output overload) condition, the units are equipped with internal current-limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the units shift from voltage control to current control. If the output voltage is pulled very low during a severe fault, the current-limit circuit can exhibit either foldback or tailout characteristics (output-current decrease or increase). The units operate normally once the output current is brought back into its specified range.

Remote On/Off

Two remote on/off options are available. Positive logic remote on/off turns the module on during a logic-high voltage on the REMOTE ON/OFF pin, and off during a logic low. Negative logic, device code suffix “1,” remote on/off turns the module off during a logic high and on during a logic low.

To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the $V_I(–)$ terminal ($V_{on/off}$). The switch can be an open collector or equivalent (see Figure 36). A logic low is $V_{on/off}$ = –0.7 V to 1.2 V, during which the module is off. The maximum $I_{on/off}$ during a logic low is 1 mA. The switch should maintain a logic-low voltage while sinking 1 mA.

During a logic high, the maximum $V_{on/off}$ generated by the power module is 6 V. The maximum allowable leakage current of the switch at $V_{on/off}$ = 6 V is 50 µA.

The module has internal capacitance to reduce noise at the ON/OFF pin. Additional capacitance is not generally needed and may degrade the start-up characteristics of the module.

Feature Descriptions (continued)

Remote On/Off (continued)

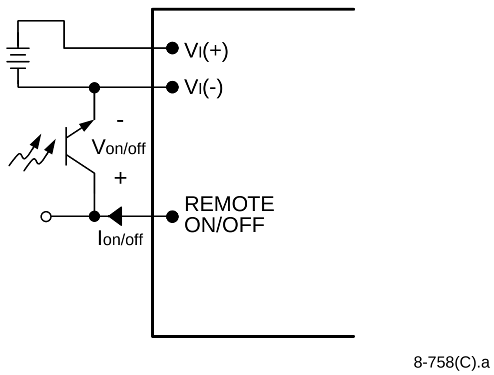


Figure 36. Remote On/Off Implementation

Output Overvoltage Protection

The output overvoltage clamp consists of control circuitry, independent of the primary regulation loop, that monitors the voltage on the output terminals. The control loop of the protection circuit has a higher voltage set point than the primary loop (see Feature Specifications table). In a fault condition, the overvoltage clamp ensures that the output voltage does not exceed $V_{O,\ clamp,\ max}$. This provides a redundant voltage-control that reduces the risk of output overvoltage.

Output Voltage Adjustment (Output1 Only)

Output voltage trim allows the user to increase or decrease the output voltage set point of a module. This is accomplished by connecting an external resistor between the TRIM pin and either the $V_{O1}(+)$ or COM pins. With an external resistor between the TRIM and $V_{O1}(+)$ pins ($R_{adj\text{-}down}$), the output voltage set point ($V_{O1,\ adj}$) decreases. With an external resistor between the TRIM and COM pins ($R_{adj\text{-}up}$), $V_{O1,\ adj}$ increases.

The following equation determines the required external resistor value to obtain an output voltage change of Δ%:

$$R_{adj\text{-}down} = \left[\frac{(Voadj - D) \bullet A}{Vonom - Voadj} - B\right] k\Omega$$

$$R_{adj\text{-}up} = \left[\frac{A \bullet D}{Voadj - (C+D)} - B\right] k\Omega$$

Device	A	B	C	D	–5% V_O $R_{adj\text{-}down}$	+3% V_O $R_{adj\text{-}up}$
LW016AF	33.2	51.1	3.80	1.23	289 kΩ	416 kΩ
LW016FA	14	51.1	2.08	1.23	110 kΩ	142 kΩ

The combination of the output voltage adjustment and sense range and the output voltage given in the Feature Specifications table cannot exceed 103% of the nominal output voltage between the $V_{O1}(+)$ and COM terminals.

The modules have fixed current-limit set points. Therefore, as the output voltage is adjusted down, the available output power is reduced. In addition, the minimum output current is a function of the output voltage. As the output voltage is adjusted down, the minimum required output current can increase.

The second output (V_{O2}) will generally maintain regulation as the first output is trimmed down; however, it may be reduced by the same percentage as the main output. The internal linear regulator for the second output dissipates more power as the first output is trimmed up; therefore, trim increases should be limited to +3%. The decrease should be limited to –5%.

Synchronization (Optional)

The unit is capable of external synchronization from an independent time base with a switching rate of 256 kHz. The amplitude of the synchronizing pulse train is TTL compatible and the duty cycle ranges between 40% and 60%. Synchronization is referenced to $V_I(+)$.

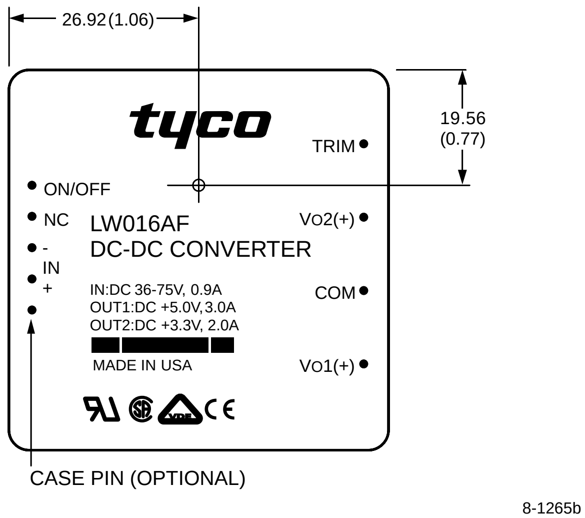
Thermal Considerations

Introduction

The LW016 Low Dual-Positive Output Voltage Power Modules operate in a variety of thermal environments; however, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat-dissipating components inside the unit are thermally coupled to the case. Heat is removed by conduction, convection, and radiation to the surrounding environment. Proper cooling can be verified by measuring the case temperature at the position indicated in Figure 37.

Thermal Considerations (continued)

Introduction (continued)



Note: Dimensions are in millimeters and (inches).

Figure 37. Case Temperature Measurement Location

Note that the view in Figure 37 is of the metal surface of the module—the pin locations shown are for reference. The temperature at this location should not exceed the maximum case temperature indicated in the derating curve shown in Figure 40. The output power of the module should not exceed the rated power for the module as listed in the Ordering Information table.

Heat Transfer

Increasing airflow over the module enhances the heat transfer via convection. Figure 40 shows the maximum power that can be dissipated by the module without exceeding the maximum case temperature versus local ambient temperature (T_A) for natural convection through 3.0 ms^{-1} (600 ft./min.).

Systems in which these power modules may be used typically generate natural convection airflow rates of 0.3 ms^{-1} (60 ft./min.) due to other heat-dissipating components in the system. Therefore, the natural convection condition represents airflow rates of up to 0.3 ms^{-1} (60 ft./min.). Use of Figure 40 is shown in the following example.

Example

What is the minimum airflow necessary for a LW016FA operating at V_I = 75 V, an output current of 1.5 A on each output, and a maximum ambient temperature of 79 °C?

Solution:

Given: V_I = 75 V, I_{O1} = I_{O2} = 1.5 A, T_A = 79 °C
Determine P_D (Figure 38): P_D = 5.5 W
Determine airflow (Figure 40): v = 1.0 ms^{-1}
(200 ft./min.)

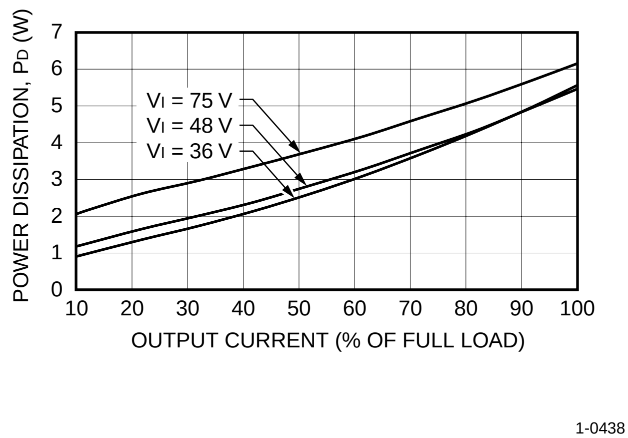


Figure 38. LW016FA Power Dissipation vs. Output Current

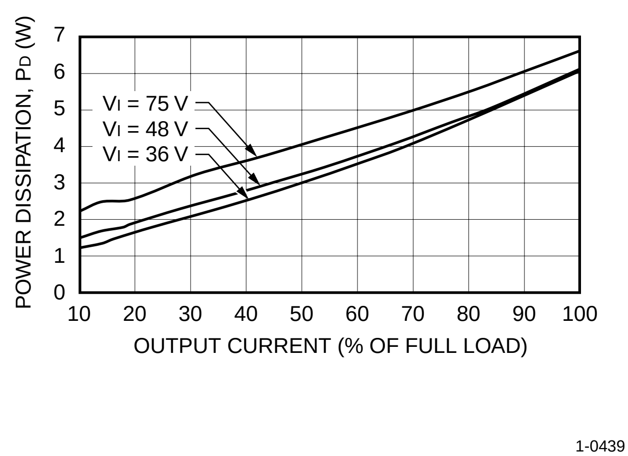
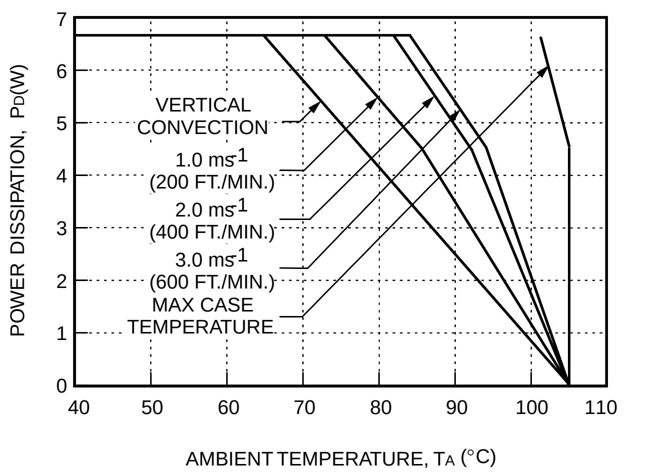


Figure 39. LW016AF Power Dissipation vs. Output Current

Thermal Considerations (continued)

Heat Transfer (continued)

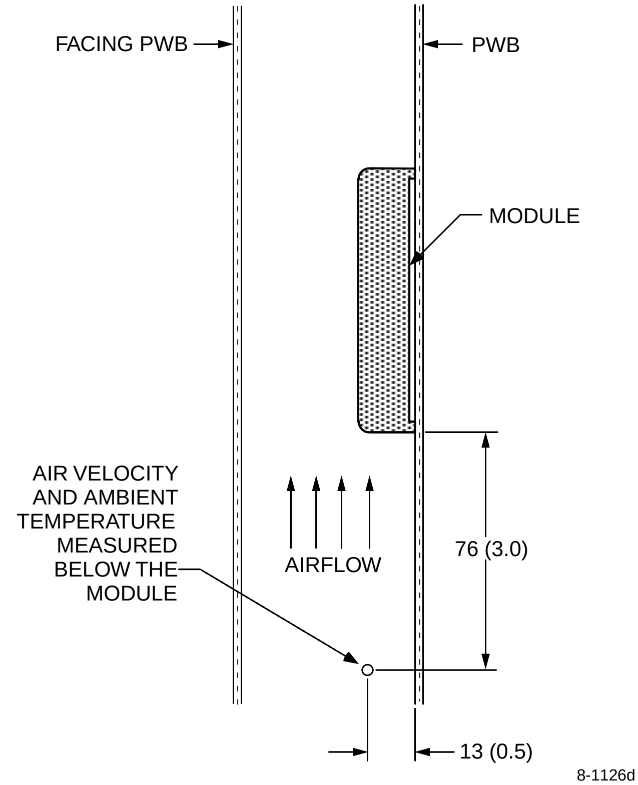


Note: Conversion factor for linear feet per minute to meters per second: 200 ft./min. = 1 ms^{-1}.

Figure 40. LW016AF and LW016FA Power Derating; Either Orientation

Module Derating

The derating curve in Figure 40 was derived from measurements obtained in an experimental apparatus shown in Figure 41. Note that the module and the printed-wiring board (PWB) that it is mounted on are both vertically oriented. The passage has a rectangular cross-section.



Note: Dimensions are in millimeters and (inches).

Figure 41. Experimental Test Setup

Layout Considerations

Copper paths must not be routed beneath the power module standoffs.

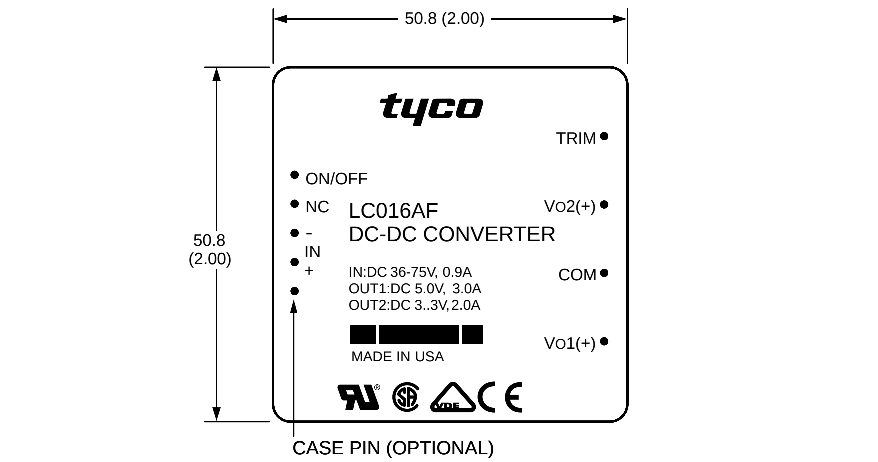
Outline Diagram

Dimensions are in millimeters and (inches).

Tolerances: x.x ± 0.5 mm (0.02 in.), x.xx ± 0.25 mm (0.010 in.); pin-to-pin tolerances are not cumulative.

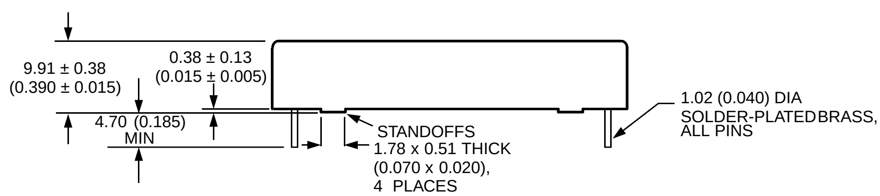
Note: For standard modules, $V_I(+)$ is internally connected to the case.

Top View

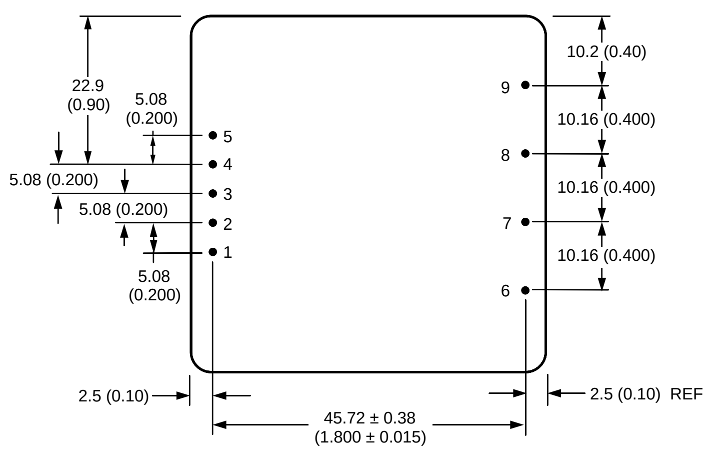


Pin	Function
1	Remote On/Off
2	No Connection (optional sync feature)
3	$V_I(–)$
4	$V_I(+)$
5	CASE Pin (optional)
6	Trim
7	$V_{O2}(+)$
8	Common
9	$V_{O1}(+)$

Side View



Bottom View



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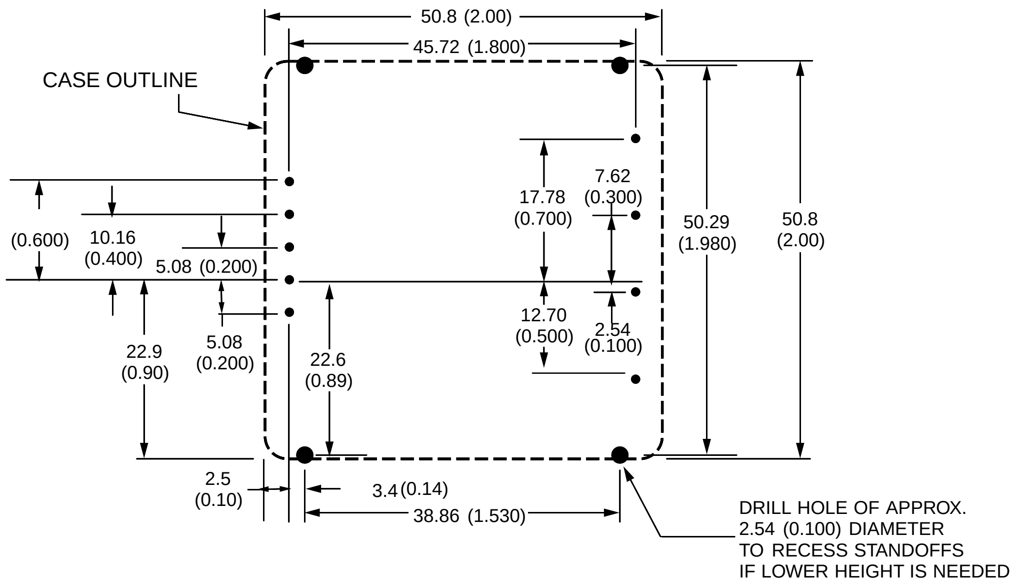
Recommended Hole Pattern

Component-side footprint.

Dimensions are in millimeters and (inches).



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Ordering Information

Table 4. Device Codes

Input Voltage	Output Voltage	Output Power	Device Code	Comcode
48 V	3.3 V, 5 V	16 W	LW016FA	108291071
48 V	5 V, 3.3 V	16 W	LW016AF	108958794

Optional features may be ordered using the device code suffixes shown below. To order more than one option, list suffixes in numerically descending order. Please contact your Tyco Electronics' Account Manager or Field Application Engineer for pricing and availability.

Table 5. Option Codes

Option	Device Code Suffix
Short pins: 2.79 mm ± 0.25 mm (0.110 in. ± 0.010 in.)	8
Case ground pin	7
Synchronization	3
Negative remote on/off logic	1

Notes

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October 2001
DS99-396EPS (Replaces DS98-344EPS)