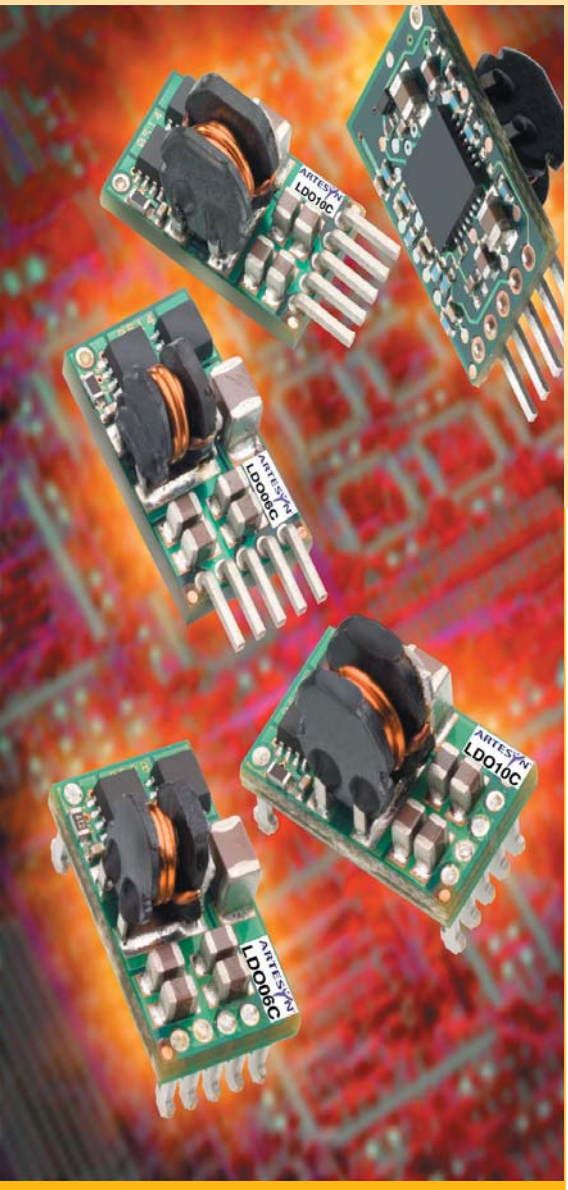
LDO10C SERIES

Single Output



- 10 A current rating
- Input voltage range 3.0-13.8 V
- Adjustable output voltage: 0.59-5.1 V
- Optional 3-pin model factory set
- Optional 5-pin model factory set with power good option
- Excellent transient reponse
- Power enable (5-pin model)
- Minimum airflow
- Small package
- Termination voltage capacity
- RoHS Compliant

The LDO10C is a new high density, open frame, non-isolated converter for space sensitive applications. This model has a wide input range of 3-13.8 V and offers a 0.59-5.1 V adjustable output with 10 A capability. Typical efficiency for this model is 91% (12 Vin, 2.5 Vout, 10 A load). The 5-pin version of this voltage device offers the additional features of enable, and with a default wide adjustable out voltage range or option of power good.

[2 YEAR WARRANTY]

EMERSON Network Power

Stresses in excess of the maximum ratings can cause permanent damage to the device. Operation of the device is not implied at these or any other conditions in excess of those given in the specification. Exposure to absolute maximum ratings can adversely affect device reli-

Absolute Maximum Ratings

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - continuous	$V_{in\ (cont)}$	3.0		13.8	Vdc	Vin(+) - Vin(-)
Enable	$V_{En\ (max}$			3.3 5.0	V V	When Vin < 5 V When Vin > 5 V
Pgood Voltage	$V_{Pgood\ (max)}$			3.3 5.0	V V	When Vin < 5 V When Vin > 5 V
Operating temperature	T_{op}	-40		85	˚C	Measured at thermal reference points, See Note 1. See Derating curves
Storage temperature	$T_{storage}$	-40		125	˚C	
Output current	$I_{out\ (max)}$			10	A	

All specifications are typical at nominal input V_{in} =5 V and 12 V, full load under any resistive load combination at 25 ˚C, unless otherwise stated.

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - operating	V_{in}	3.0		13.8	Vdc	
Input current - no load	I_{in}		80		mA	$V_{in\ (min)}$ - $V_{in\ (max)}$, enabled
Input current - quiescent	$I_{in(off)}$		10		mA	Converter disabled
Input voltage variation	dv/dt		1.0		V/ms	Product was tested at 1.2 V/ms. Much higher dv/dt is possible (>10 V/ms)

Turn On/Off

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - turn on	$V_{in\ (on)}$		2.8		Vdc	See App Note 186 to adjust this point
Input voltage - turn off	$V_{in\ (off)}$		2.5		Vdc	
Turn on delay - enabled, then power applied	T_{delay} (power)		2	3	ms	With the Remote ON/OFF signal asserted, this is the time from when the input voltage reaches the minimum specified operating voltage until V_{out} is in regulation
Turn on delay - power applied, then Remote ON/OFF asserted	T_{delay} (Remote ON/OFF)		2	3	ms	V_{in} = $V_{in(on)}$, then Remote ON/OFF asserted. This is the time taken until V_{out} is in regulation
Rise time	T_{rise}		1.3	2	ms	from 10% to 90%; full resistive load, 0 µF capacitance

Signal Electrical Interface

Characteristic - Signal Name	Symbol	Min	Typ	Max	Units	Notes and Conditions
Remote ON/OFF						See Application Note 186
Control pin open circuit voltage 3.3 V 5 V 12 V	V_{ih}		 0.61 0.92 2.2		Vdc	I_{ih} = 0 µA; open circuit voltage See Notes 2 and 3
High level input current	I_{ih}		1		µA	Current flowing into control pin when pin is pulled high (max. at V_{ih} = 5 V)
High level input voltage	V_{ih}	.502			Vdc	Converter guaranteed on when control pin is greater than Vih (min)
Low level input voltage	V_{il}			0.202	Vdc	Converter guaranteed off when control pin is less than V_{il} (max)
Low level input current 3.3 V 5 V 12 V	I_{il} (max)		 110 166 398		µA	V_{il} = 0 Vdc

Reliability and Service Life

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Mean time between failure	MTBF				Hours	MIL-HDBK-217F V_{in} = V_{in} (nom); I_{out} = I_{out} (max); ambient 25 °C; ground benign environment
Mean time between failure	MTBF	8,220,210			Hours	Telcordia SR-332 Issue 2, ground benign, ambient 40 °C, V_{in} = V_{in} (nom)-I_{out} = I_{out} (max)

Other Specifications

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Switching frequency	F_{sw}		620		kHz	Fixed frequency
Weight			1.899/0.067		g/oz.	

Environmental Specifications

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Thermal performance		0		70	˚C	(See Note 1 and individual derating curves)

Type	Parameter	Reference	Test Level	Notes and Conditions
Air temperature operating Air temperature non-operating	-40 ˚C to 85 ˚C -40 ˚C to 125 ˚C			Max. rate of change is 30 degrees per hour while operating and 20 degrees per hour while non-operating
Relative humidity - operating Relative humidity - non-operating	80% 100%			With non-condensing Excluding rain during parts shipment
Vibration - operating				Sinusoidal vibration, 0.5 G (0 to peak) acceleration.
Vibration - non-operating				Sinusoidal vibration, 1.0 G (0 to peak)
Shock	Accerlation			
Non-operating square wave				40 G, square wave at 200 in/s (508 cm/s); on all six sides
Non-operating half sine				Half sine pulse for 70 in/s (178 cm/s) for 2 ms; on all sides except top
Operating half sine				Half sine pulse for 40 in/s (102 cm/s) for 2 ms; on all sides except top

Safety Agency Approvals

Characteristic	
UL/cUL	UL/cUL60950
TÜV Product Service	IEC 60950

Material Ratings

Characteristic Signal Name	Notes and Conditions
Flammability rating	UL94V-0
Material type	FR4 PCB

Model Numbers

Model Number	Input Voltage	Output Voltage	Output Current (Max.)	Efficiency at Full Load	Max. Load Regulation
LDO10C-005W05-SXJ*	3.0-13.8 V	0.59-5.1 V	10 A	92%	±0.5%
LDO10C-005W05-HXJ*	3.0-13.8 V	0.59-5.1 V	10 A	92%	±0.5%
LDO10C-005W05-VXJ*	3.0-13.8 V	0.59-5.1 V	10 A	92%	±0.5%

X = Custom Option

RoHS Compliance Ordering Information

The ‘J’ at the end of the part number indicates that the part is Pb-free (RoHS 6/6 compliant). TSE RoHS 5/6 (non PB-free) compliant versions may be available on special request, please contact your local sales representative for details.

EMERSON Network Power

File Name: lf_ldo10.pdf Rev: (01) 11 Sep 2008

3.3 V, 5 V, 12 V Model
0.9 V Setpoint

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating						
(Source) (3.3 V) (Sink) (3.3 V) (Source) (5 V) (Sink) (5 V) (Source) (12 V) (Sink) (12 V)	I_{in} I_{in} I_{in} I_{in} I_{in} I_{in}		3.47 -2.00 2.24 -1.35 0.98 -0.55		Adc Adc Adc Adc Adc Adc	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out}$ (max)
Input capacitance - internal filter	C_{input}		22		µF	
Input capacitance - external filter	C_{bypass}		1		µF	Recommended customer added capacitance

3.3 V, 5 V, 12 V Model
0.9 V Setpoint

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	$V_{o\ (nom)}$	0.891	0.9	0.909	Vdc	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (nom)}$
Line regulation				±0.2	%	$I_{out} = I_{out\ (nom)}$; $V_{in\ (min)}$ to $V_{in\ (max)}$
Load regulation				±0.5	%	$V_{in} = V_{in\ (nom)}$; Iout (min) to Iout (max)
Output current - continuous	I_{out}	0		10.0	Adc	Minus indicates sink mode
Output current - short circuit	I_{sc}		20.6		Apk	Continuous, unit auto recovers See Application Note 186 for more information
Output voltage - noise (3.3 V) 0.9 V (5.0 V) 0.9 V (12 V) 0.9 V	 V_{p-p} V_{p-p} V_{p-p}			 15 15 25	 mV pk-pk mV pk-pk mV pk-pk	 Measurement band width 20 MHz See Application Note 186 for details

3.3 V, 5 V, 12 V Model
0.9 V Setpoint

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Load transient response - peak deviation	$V_{dynamic}$		100	100	mV	Peak deviation for 50% to 100% step load, di/dt = 10 A/µs
Load transient response - recovery	$T_{recovery}$			20	µs	Settling time to within 1% of output set-point voltage for 50% to 75% step load
External load capacitance (3.3 V)	C_{ext}		0	8400	µF	See Application Note 186 for output capacitance vs. stability

3.3 V, 5 V, 12 V Model
0.9 V Setpoint

Protection and Control Features

Characteristic	*Symbol*	*Min*	*Typ*	*Max*	*Units*	*Notes and Conditions*
Overcurrent limit inception	I_{oc}		17		Adc	Vo = 90% of Vo (nom)

3.3 V, 5 V, 12 V Model
0.9 V Setpoint

Efficiency

Characteristic	*Symbol*	*Min*	*Typ*	*Max*	*Units*	*Notes and Conditions*
Efficiency 3.3 V (source mode) 3.3 V (sink mode)	η	76	78 74		%	Iout = 100% (max) Vin - Vin (nom)
Efficiency 5.0 V (source mode) 5.0 V (sink mode)	η	78	80 75		%	
Efficiency 12 V (source mode) 12 V (sink mode)	η	74	76 72		%	
Efficiency 3.3 V (source mode) 3.3 V (sink mode)	η	84	86 82		%	Iout = 50% (max) Vin - Vin (nom)
Efficiency 5.0 V (source mode) 5.0 V (sink mode)	η	84	86 82		%	
Efficiency 12 V (source mode) 12 V (sink mode)	η	78	80 73		%	

3.3 V, 5 V, 12 V Model
2.5 V Setpoint

Input Characteristics

Characteristic	*Symbol*	*Min*	*Typ*	*Max*	*Units*	*Notes and Conditions*
Input current - operating						
(Source) (3.3 V) (Sink) (3.3 V) (Source) (5 V) (Sink) (5 V) (Source) (12 V) (Sink) (12 V)	I_{in} I_{in} I_{in} I_{in} I_{in} I_{in}		8.27 -6.62 5.48 -4.39 2.34 -1.84		Adc Adc Adc Adc Adc Adc	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (max); Vo = V0 (nom)
Input capacitance - internal filter	C_{input}		22		µF	Internal to converter
Input capacitance - external filter	C_{bypass}		1		µF	Recommended customer added capacitance

3.3 V, 5 V, 12 V Model
2.5 V Setpoint

Electrical Charateristics - O/P

Characteristic	*Symbol*	*Min*	*Typ*	*Max*	*Units*	*Notes and Conditions*
Nominal set-point voltage	V_o (nom)	2.475	2.500	2.525	Vdc	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (nom)
Line regulation				±0.2	%	$I_{out} = I_{out}$ (nom); V_{in} (min) to V_{in} (max)
Load regulation				±0.5	%	$V_{in} = V_{in}$ (nom); Iout (min) to Iout (max)
Output current - continuous	I_{out}	0		10.0	Adc	
Output current - short circuit	I_{sc}		20.6		Apk	Continuous, unit auto recovers from short
Output voltage - noise Vrms (3.3 V) 2.5 V (5.0 V) 2.5 V (12 V) 2.5 V	 V_{p-p} V_{p-p} V_{p-p}			 15 20 30	 mV pk-pk mV pk-pk mV pk-pk	 Measurement band width 20 MHz See Application Note 186 for details

3.3 V, 5 V, 12 V Model
2.5 V Setpoint

Electrical Charateristics - O/P

Characteristic	*Symbol*	*Min*	*Typ*	*Max*	*Units*	*Notes and Conditions*
Load transient response - park deviation	Vdynamic		140		mV	Peak deviation for 50% to 100% step load, di/dt = 10 A/µs
Load transient response - recover	Trecovery		20		µs	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	Cext		0	2300	µF	See Application Notes 186 for output capacitance values vs. stability

3.3 V, 5 V, 12 V Model
2.5 V Setpoint

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Overcurrent limit inception	I_{OC}		16		Adc	Vo = 90% of Vo (nom)

3.3 V, 5 V, 12 V Model
2.5 V Setpoint

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency 3.3 V (source mode) 3.3 V (sink mode)	□	84	91 89		%	Iout = 100% (max) Vin - Vin (nom)
Efficiency 5.0 V (source mode) 5.0 V (sink mode)	□	89	91 88		%	
Efficiency 12 V (source mode) 12 V (sink mode)	□	87	89 93		%	
Efficiency 3.3 V (source mode) 3.3 V (sink mode)	□	93	95 92		%	Iout = 50% (max) Vin - Vin (nom)
Efficiency 5.0 V (source mode) 5.0 V (sink mode)	□	92	94 91		%	
Efficiency 12 V (source mode) 12 V (sink mode)	□	88	90 84		%	

12 V Model
5 V Setpoint

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating			4.48			$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (max); Vo = V0 (nom)
Input capacitance - internal filter	C_{input}		22		µF	Internal to converter
Input capacitance - external filter	C_{bypass}		1		µF	Recommended customer added capacitance

12 V Model
5 V Setpoint

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	V_{o} (nom)	4.95	5.00	5.05	Vdc	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (nom)
Line regulation				±0.2	%	$I_{out} = I_{out}$ (nom); V_{in} (min) to V_{in} (max)
Load regulation				±0.5	%	$V_{in} = V_{in}$ (nom); Iout (min) to Iout (max)
Output current - continuous	I_{out}	0		10.0	Adc	
Output current - short circuit	I_{sc}		20.6		Apk	Continuous, unit auto recovers from short
Output voltage - noise Vrms	V_{p-p}		45		mV pk-pk	Measurement band width 20 MHz See Application Note 186 for details

12 V Model
5 V Setpoint

Electrical Charateristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Load transient response - park deviation	Vdynamic		100		mV	Peak deviation for 50% to 100% step load, di/dt = 10 A/s
Load transient response - recover	Trecovery		10		µs	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	Cext		0	1100	µF	See Application Notes 186 for output capitance values vs. stability

12 V Model
5 V Setpoint

Protection and Control Features

Characteristic	*Symbol*	*Min*	*Typ*	*Max*	*Units*	*Notes and Conditions*
Overcurrent limit inception	I_{oc}		14.5		Adc	Vo = 90% of Vo (nom)

12 V Model
5 V Setpoint

Efficiency

Characteristic	*Symbol*	*Min*	*Typ*	*Max*	*Units*	*Notes and Conditions*
Efficiency (source)		91	93		%	Opit = 100% Iout (max), Vin = Vin (nom)
Efficiency (source)		92	94		%	Iout = 50% Iout (max), Vin = Vin (nom)

0.9 V Setpoint

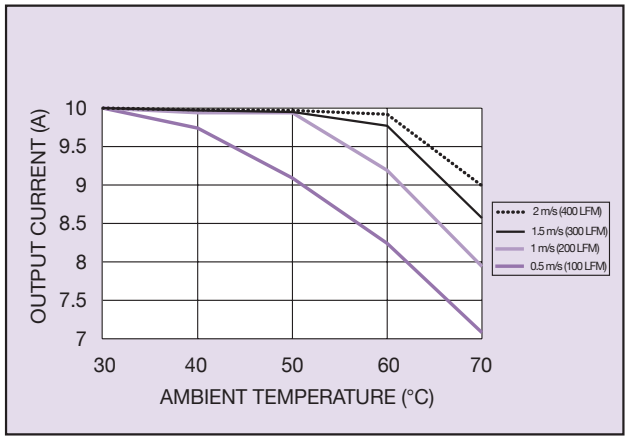


Figure 1: Thermal Derating Curve 3.3 Vin

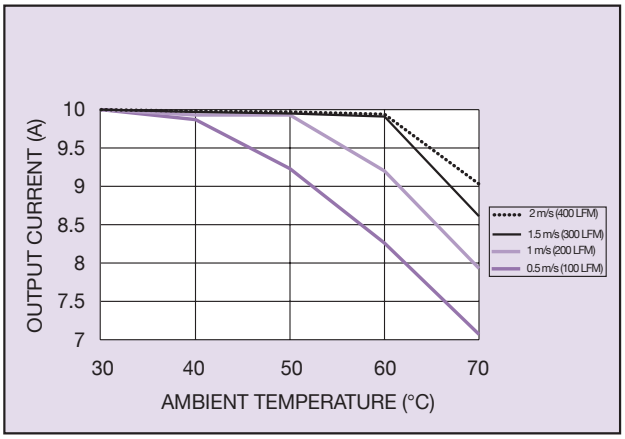


Figure 2: Thermal Derating Curve 5 Vin

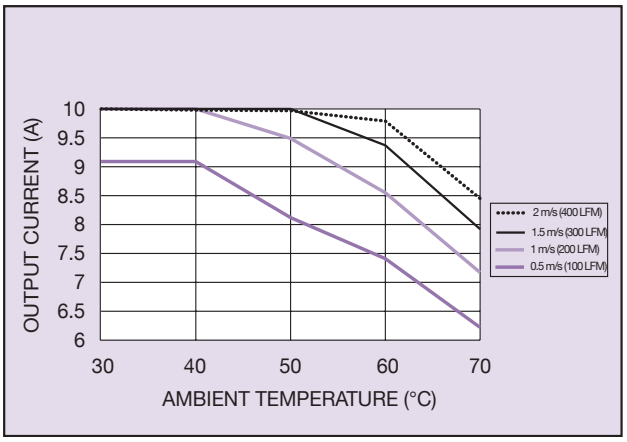


Figure 3: Thermal Derating Curve 12 Vin

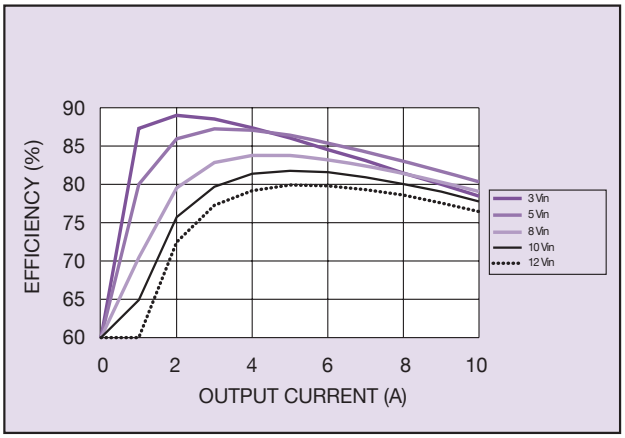


Figure 4: Efficiency vs. Load

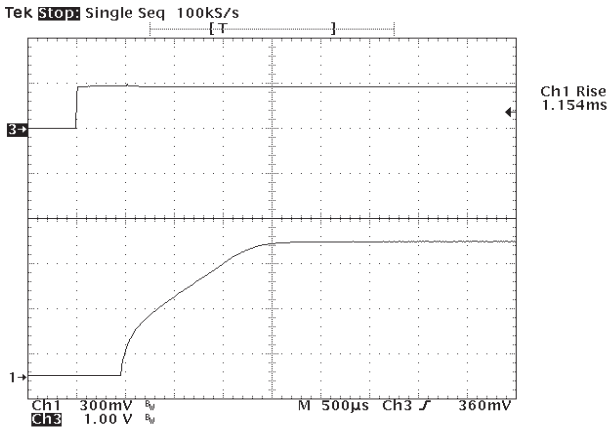


Figure 5: Remote On/Off
(Channel 1: Output Voltage, Channel 3: Enable)

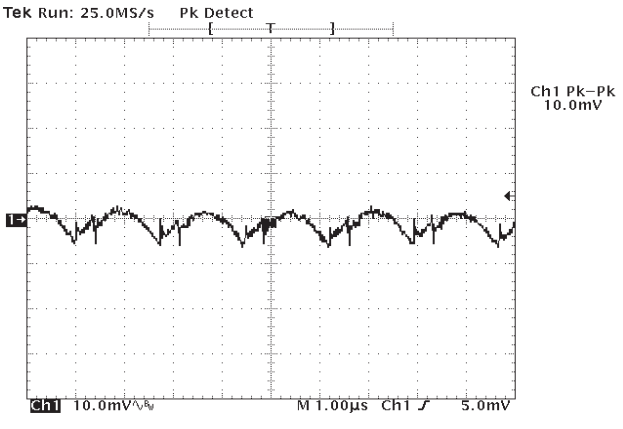


Figure 6: Typical Output Ripple

0.9 V Setpoint

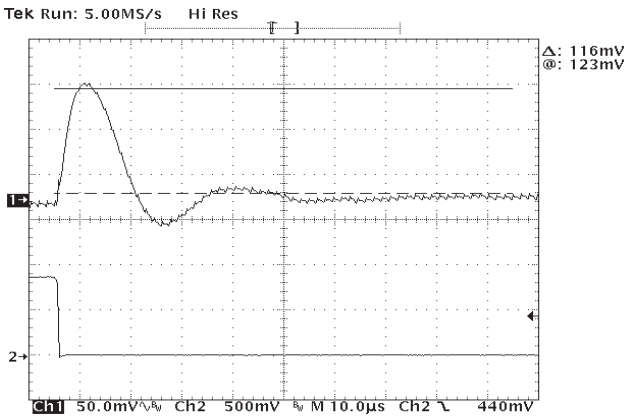


**Figure 7: Transient Response 100% - 70%
(Channel 4: Current Step at 1.7 A/div,
Channel 1: Output Voltage Deviation)**

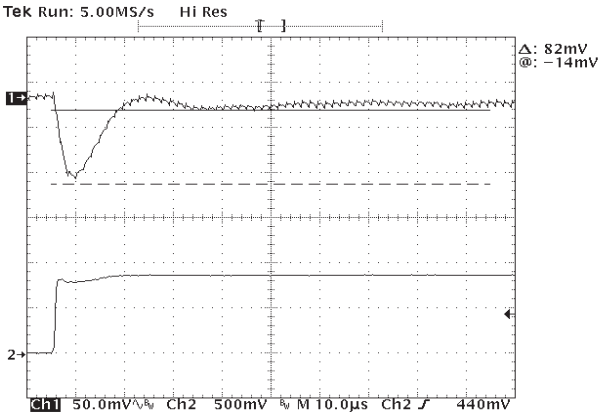


**Figure 8: Transient Response 70% - 100%
(Channel 4: Current Step at 1.7 A/div,
Channel 1: Output Voltage Deviation)**

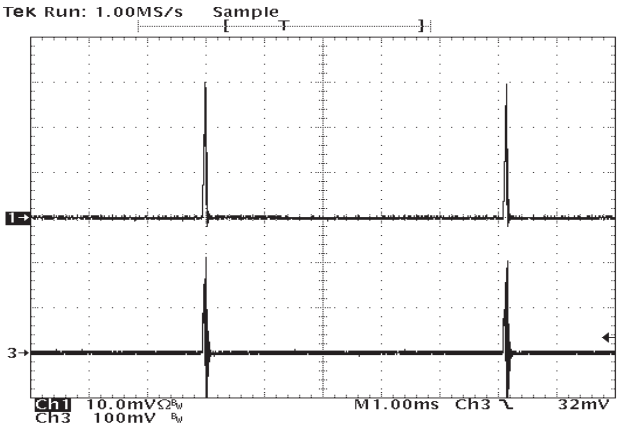


**Figure 9: Short Circuit Characteristic
(Channel 2: Output Current at 10 A/div,
Channel 1: Output Voltage)**

2.5 V Setpoint

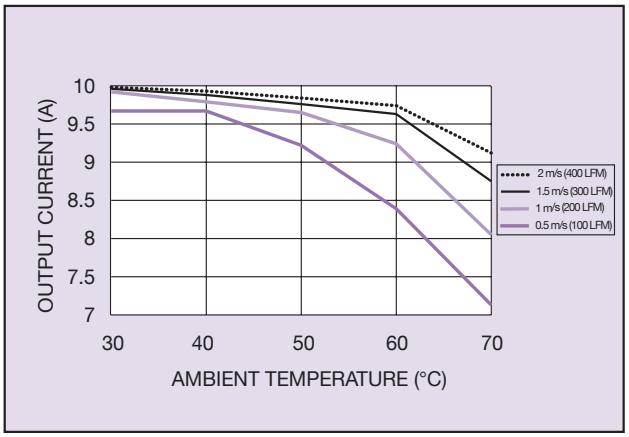


Figure 10: Thermal Derating Curve 3.3 Vin

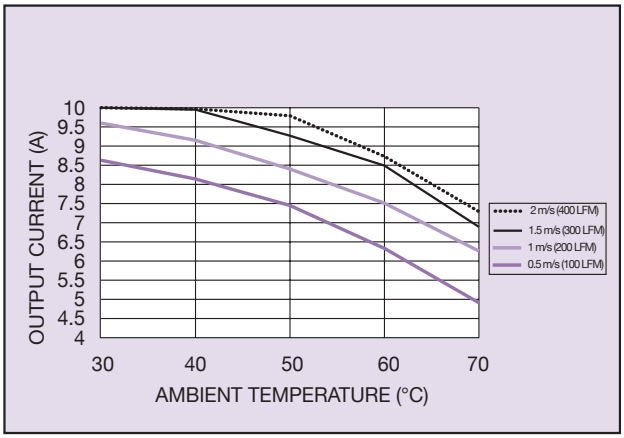


Figure 11: Thermal Derating Curve 5 Vin

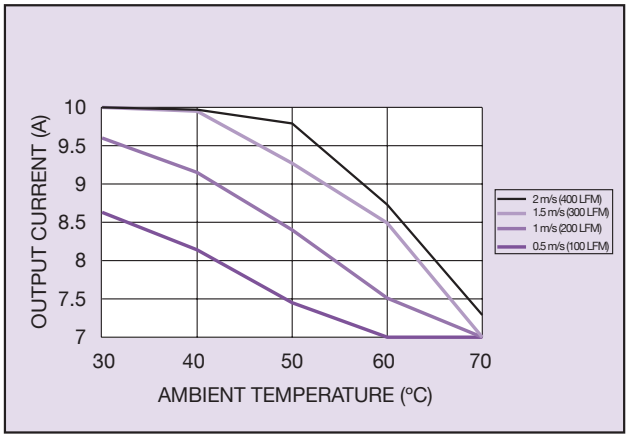


Figure 12: Thermal Derating Curve 12 Vin

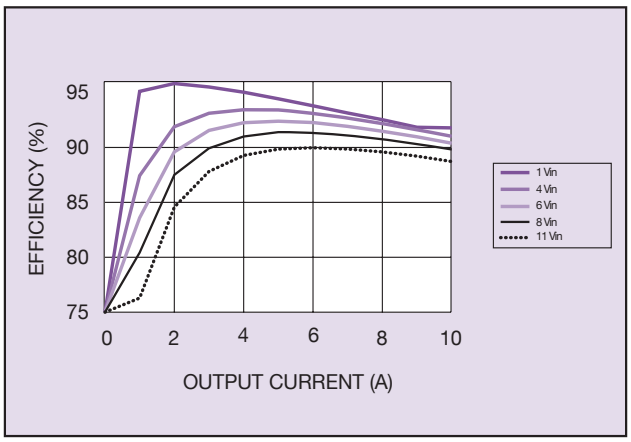


Figure 13: Efficiency vs. Load

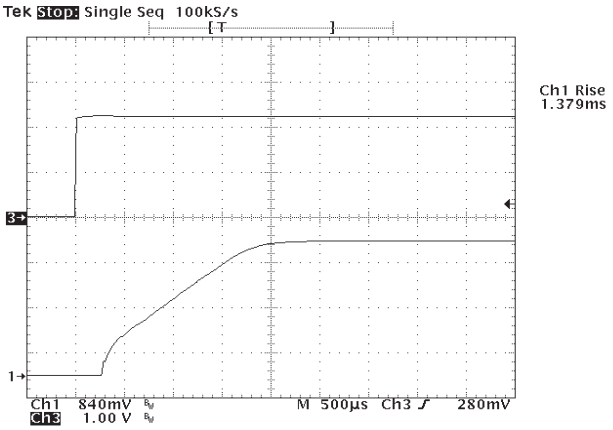


Figure 14: Remote On/Off
(Channel 1: Output Voltage, Channel 3: Enable)

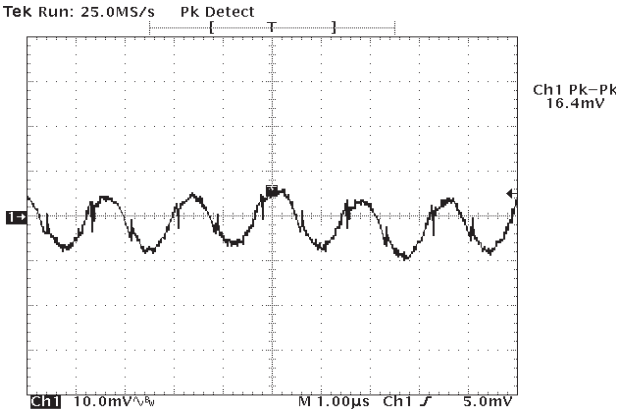


Figure 15: Typical Output Ripple

2.5 V Setpoint

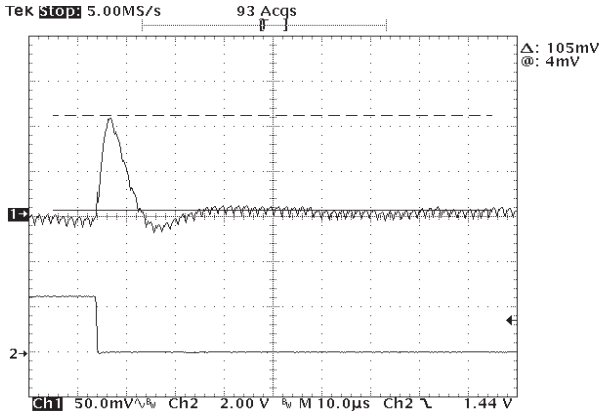


**Figure 16: Transient Response 100% - 50%
(Channel 1: Output Voltage Deviation,
Channel 2: Output Current)**

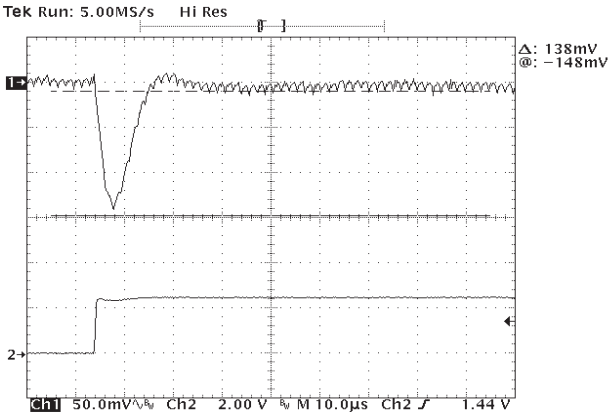


**Figure 17: Transient Respoonse 50% - 100%
(Channel 1: Output Voltage Deviation,
Channel 2: Output Current)**

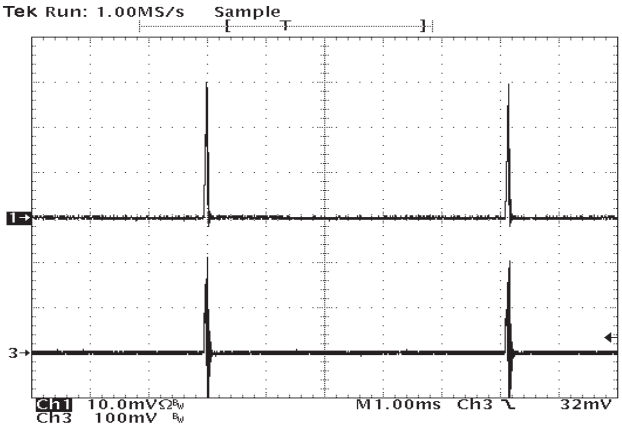


**Figure 18: Short Circuit Characteristic
(Channel 1: Output Current at 10 A/div,
Channel 3: Output Voltage)**

5 V Setpoint

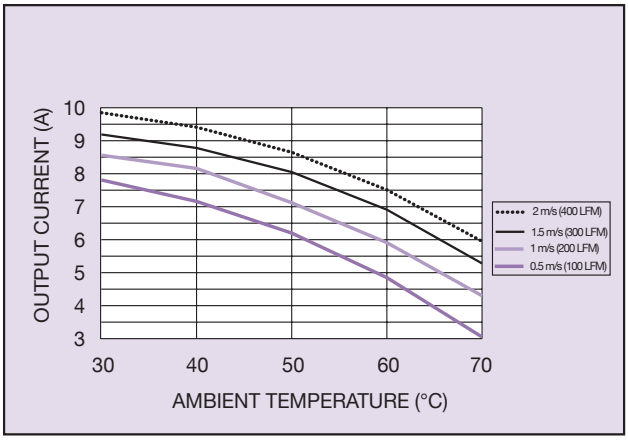


Figure 19: Thermal Derating Curve 12 Vin

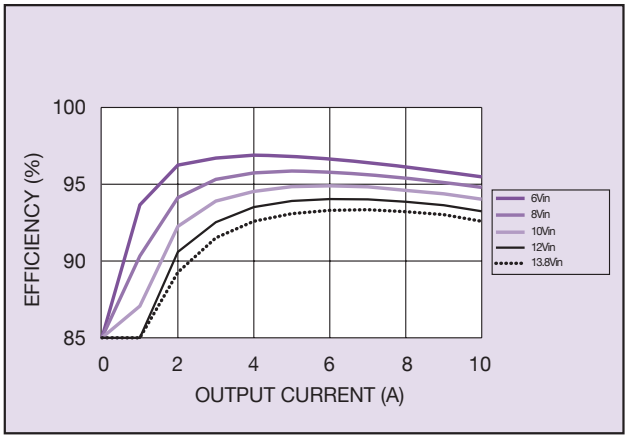


Figure 20: Efficiency vs. Load

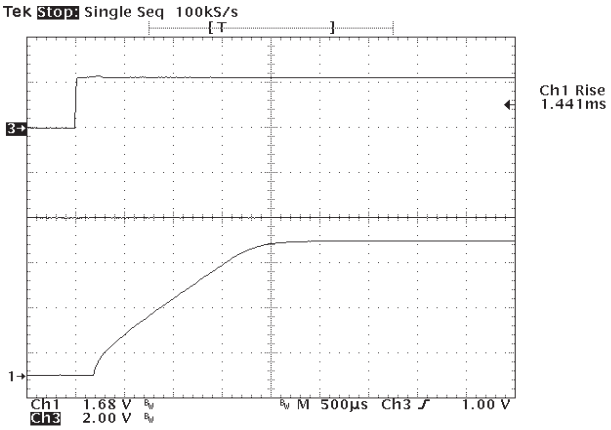


Figure 21: Remote On/Off
(Channel 1: Output Voltage, Channel 3: Enable)

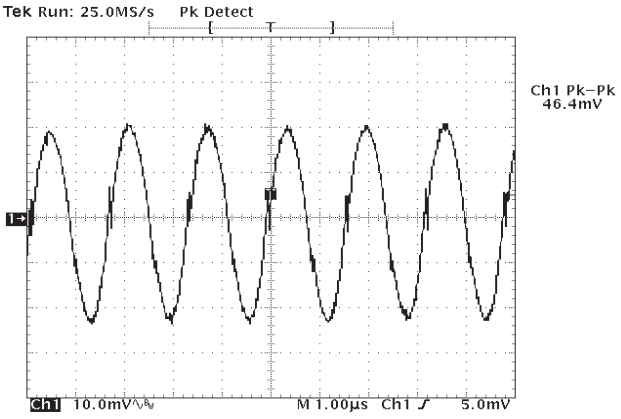


Figure 22: Typical Output Ripple

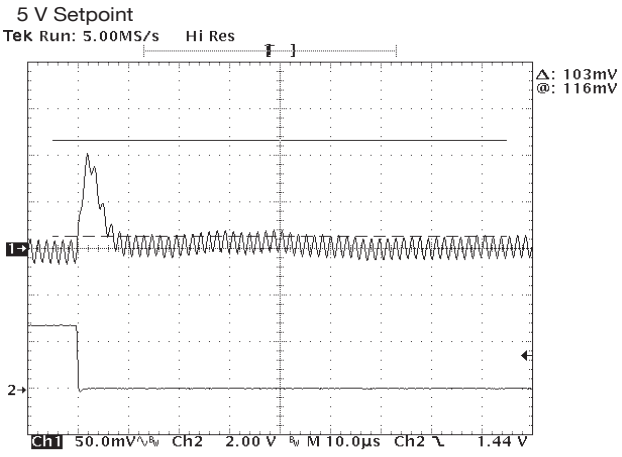


**Figure 23: Transient Response 100% - 70%
(Channel 2: Current Step at 2.5 A/div,
Channel 1: Output Voltage Deviation)**

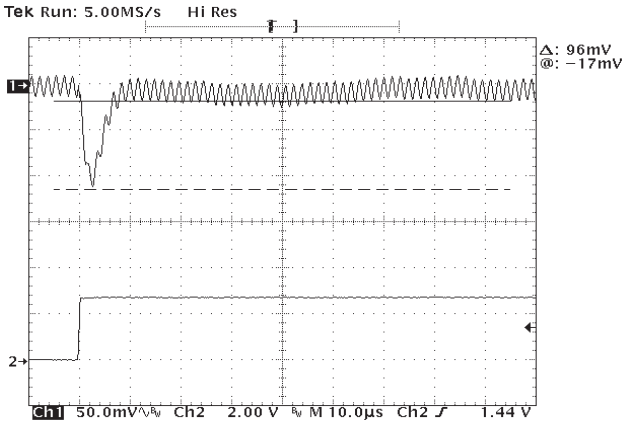


**Figure 24: Transient Response 70% - 100%
(Channel 2: Current Step at 2.5 A/div,
Channel 1: Output Voltage Deviation)**

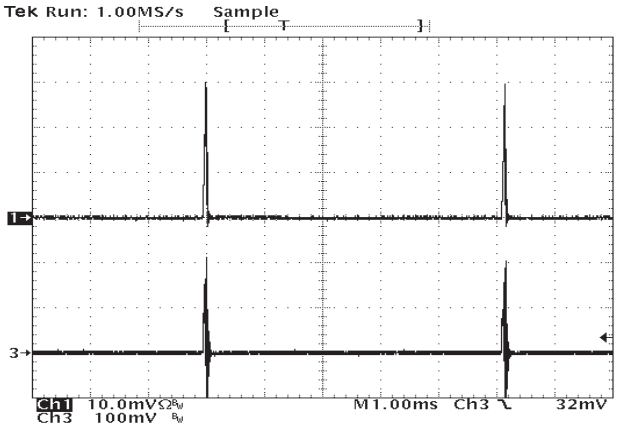


**Figure 25: Short Circuit Characteristic
(Channel 1: Output Current at 10 A/div,
Channel 3: Output Voltage)**

Pin Connections

Pin No.	Function
1	Enable
2	Vin
3	Common / RTN
4	Vout
5	PG / Trim
6	Mech Pin (Horz/SMT only)

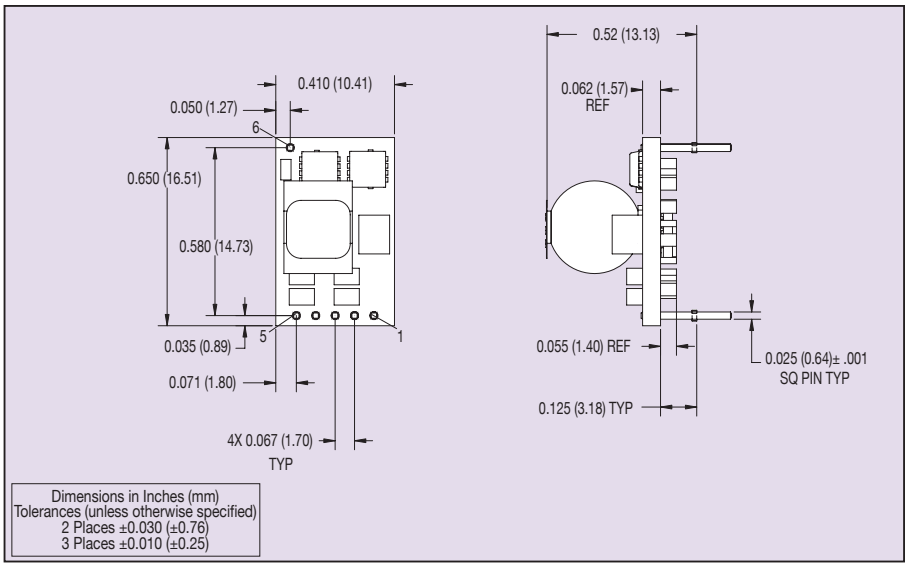


Figure 26: Mechanical Drawing - Horizontal

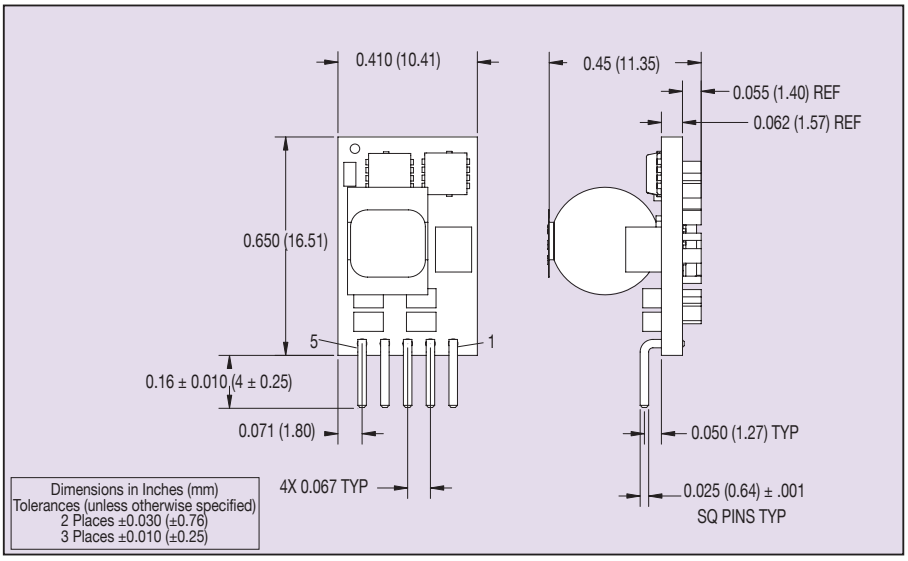


Figure 27: Mechanical Drawing - Vertical

Pin Connections

Pin No.	Function
1	Enable
2	Vin
3	Common / RTN
4	Vout
5	PG / Trim
6	Mech Pin (Horz/SMT only)

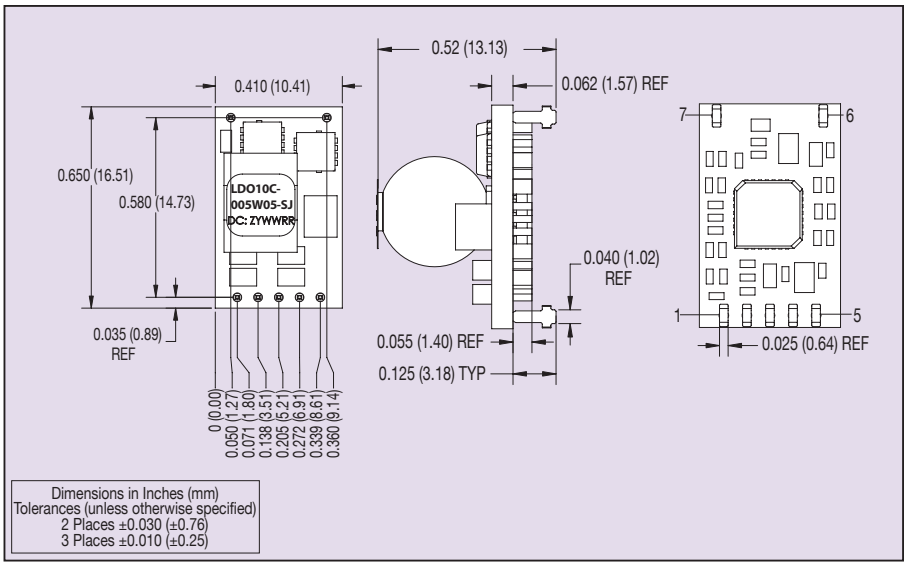


Figure 28: Mechanical Drawing - Surface Mount

Note 1

Thermal reference point is defined as the highest temperature measured at any one of the specified thermal reference points. See Application Note 186.

Note 2

The control pin is referenced to Ground.

Note 3

The LDO10C is supplied as standard with positive logic. Control input pulled low: Unit Disabled
Control input left open: Unit Enabled

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