

LTM4645 25A DC/DC Step-Down µModule Regulator

DESCRIPTION

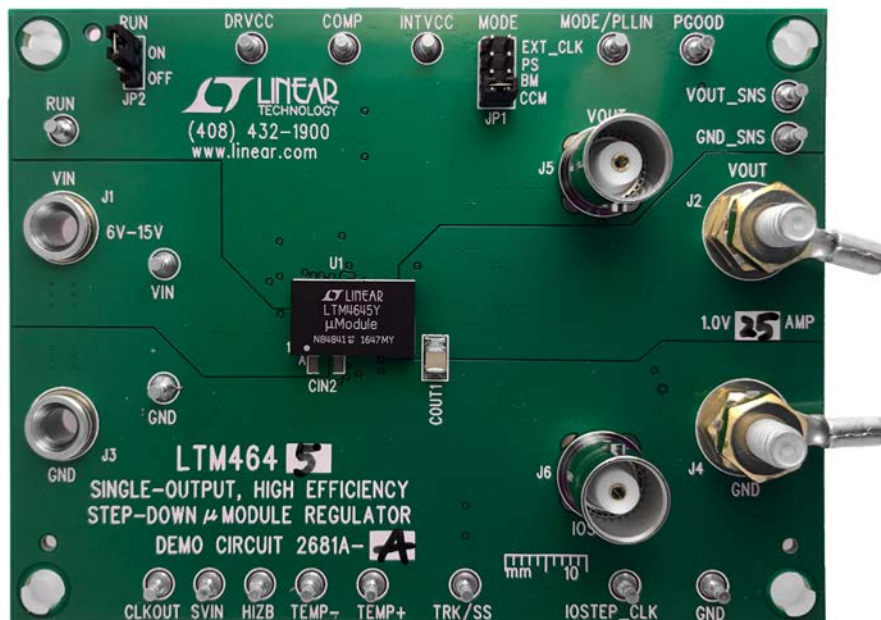
Demonstration circuit 2681A-A features the [LTM®4645EY](#), a 25A high efficiency, switch mode step-down power µModule® regulator. The input voltage range is from 6V to 15V. To use DC2681A-A for input voltage range from 4.7V to 6V, connect INTV_{CC} to SV_{IN} (change R22 from OPT to 0Ω), DRV_{CC} to V_{IN} (change R21 from 0Ω to OPT, R28 from OPT to 0Ω). The output voltage range is 0.6V to 1.8V. Derating is necessary for certain V_{IN}, V_{OUT}, frequency and thermal conditions. The DC2681A-A offers the TRK/SS pin allowing the user to program output tracking or soft-start period. The board operates in continuous conduction mode in heavy load conditions. For high efficiency at low load currents, the MODE_PLLIN jumper selects

pulse-skipping mode for noise sensitive applications or burst mode operation in less noise sensitive applications. The MODE_PLLIN pin also allows the LTM4645 to synchronize to an external clock signal (between 400kHz and 800kHz). DC2681A-A has the option of choosing both internal and external compensation circuit for LTM4645. Tying the PHASMD pin to different voltage generates certain phase difference between MODE_PLLIN and CLKOUT. The LTM4645 data sheet must be read in conjunction with this demo manual prior to working on or modifying demo circuit DC2681A-A.

[Design files for this circuit board are available.](#)

All registered trademarks and trademarks are the property of their respective owners.

BOARD PHOTO



PERFORMANCE SUMMARY

PARAMETER	CONDITIONS/NOTES	VALUE
Input Voltage Range		6V to 15V
Output Voltages		1.0V \pm 1.0%
Maximum Continuous Output Current	Derating is Necessary for Certain Operating Conditions. See Data Sheet for Details	25ADC
Operating Frequency		600kHz
Efficiency	$V_{IN} = 12V, V_{OUT} = 1.0V, I_{OUT} = 25A$	84.6% Figure 2
Load Transient $V_{OUT(P-P)}$	$V_{IN} = 12V, V_{OUT} = 1.0V, I_{STEP} = 0A \text{ to } 12.5A$	128mV Figure 3

QUICK START PROCEDURE

Demonstration circuit DC2681A-A is an easy way to evaluate the performance of the LTM4645EY. Please refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions for a typical application:

MODE	RUN
CCM	ON

2. With power off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and V_{IN} supply to 12V.
3. Turn on the power supply at the input. The output voltage should be 1.0V \pm 1.0% (0.99V to 1.01V).

4. Vary the input voltage from 6V to 15V and adjust the load current from 0A-25A. Observe the output voltage regulation, ripple voltage, efficiency, and other parameters.
5. (Optional) For optional load transient test, apply an adjustable pulse signal between IOSTEP_CLK and GND test points. The pulse amplitude sets the load step current amplitude. Keep the pulse width short (<1ms) and pulse duty cycle low (<5%) to limit the thermal stress on the load transient circuit.
6. (Optional) LTM4645 can be synchronized to an external clock signal. Place the JP1 jumper on EXT_CLK and apply a clock signal (0V to 5V, square wave) on the MODE_PLLIN test point.

QUICK START PROCEDURE

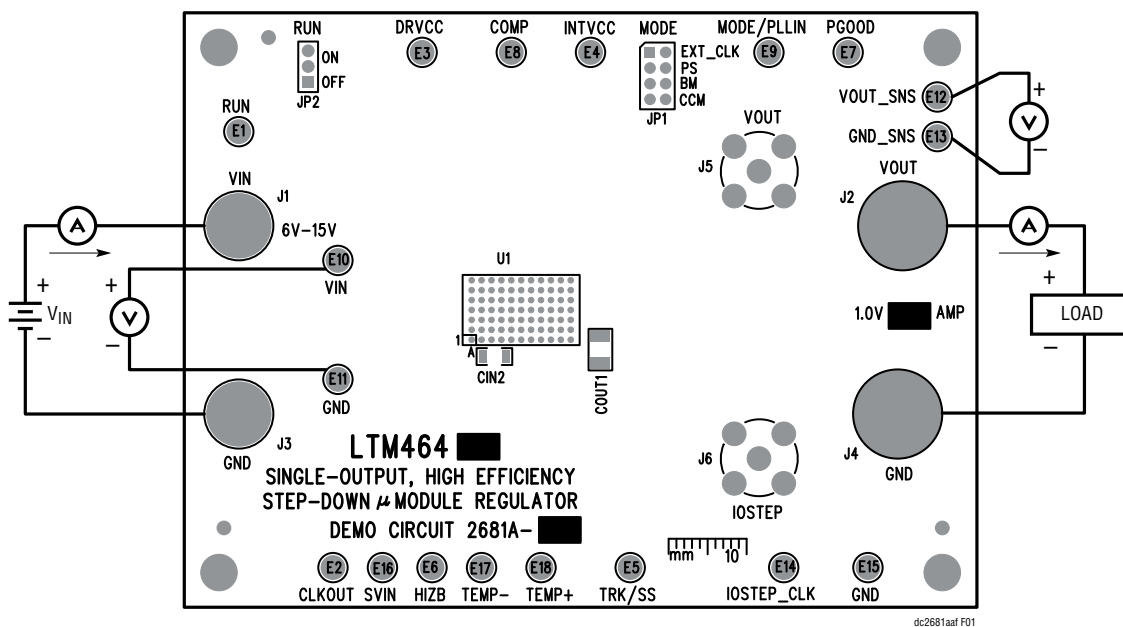


Figure 1. Measurement Setup of DC2681A-A

QUICK START PROCEDURE

12V_{IN}, 600kHz Efficiency Sweeps

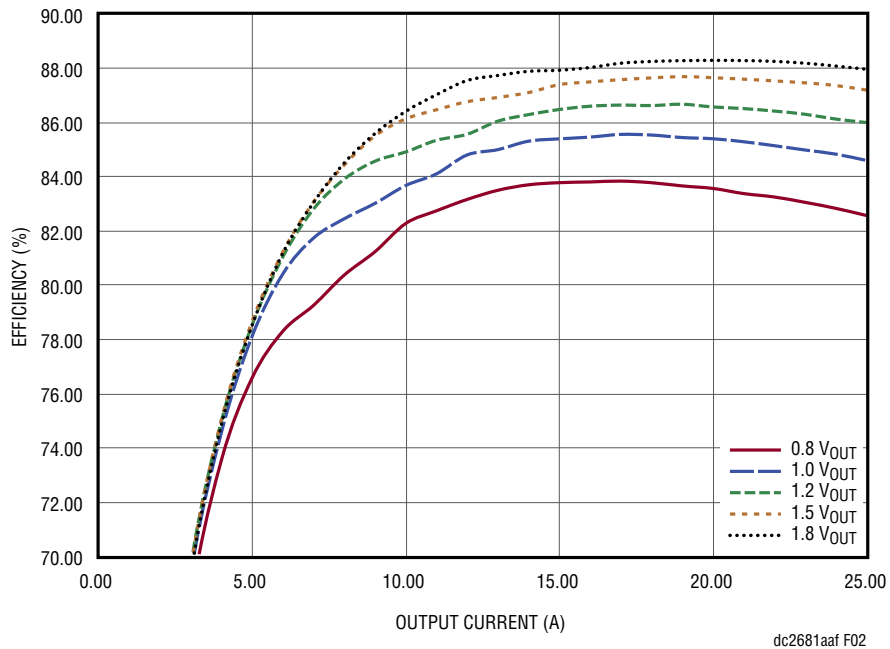


Figure 2. Measured Efficiency at V_{IN} = 12.0V, f_{SW} = 600kHz, CCM

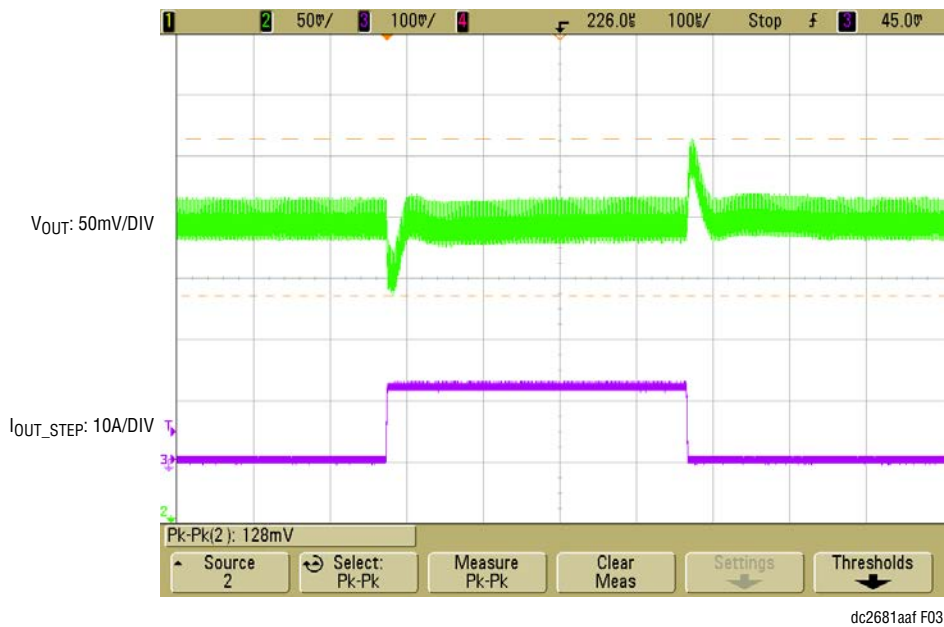


Figure 3. Measured Load Transient

QUICK START PROCEDURE

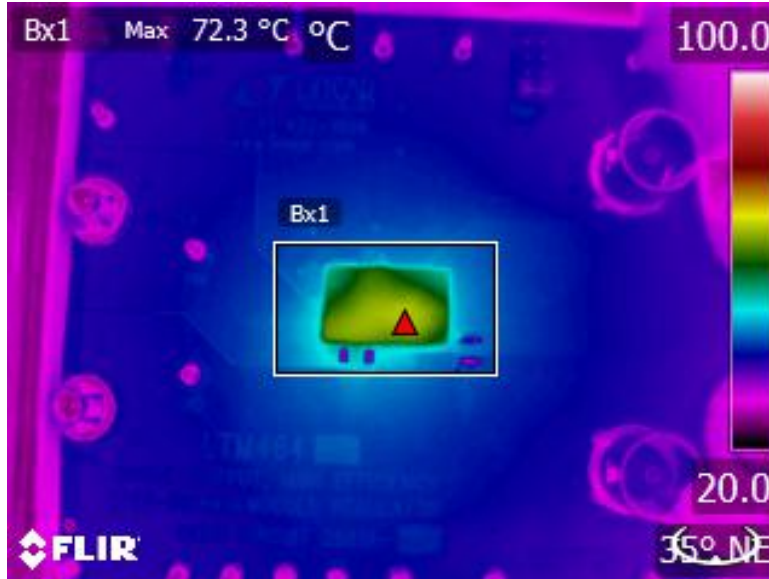


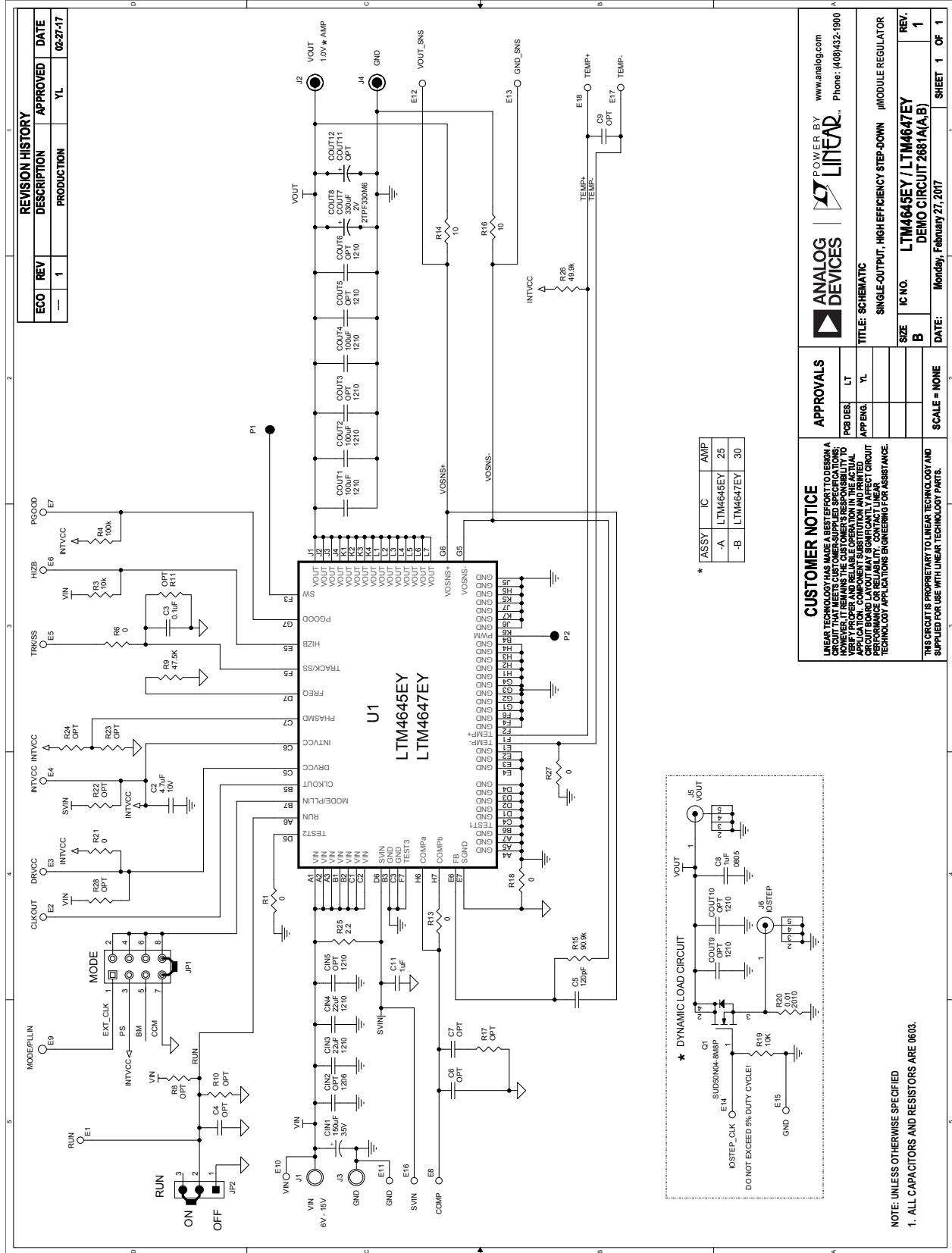
Figure 4. Thermal Image of LTM4645
 $V_{IN} = 12V$, $V_{OUT} = 1.0V$, $I_{LOAD} = 25A$
Ambient Temperature = 25.0°C, No Forced Air Flow

DEMO MANUAL DC2681A-A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	CIN1	CAP., ALUM., 150µF, 35V, 20%, HVH	SUN ELECTRONIC INDUSTRIES CORP, 35HVH150MT
2	3	CIN3, CIN4	CAP., 22µF, X5R, 25V, 20%, 1210	MURATA, GRM32ER61E226ME15L
3	3	COUT1, COUT2, COUT4	CAP., 100µF, X5R, 6.3V, 20%, 1210	MURATA, GRM32ER60J107ME20L
4	2	COUT7, COUT8	CAP., POSCAP, 330µF, 2V, D2E	PANASONIC, 2TPF330M6
5	1	C2	CAP., 4.7µF, X5R, 10V, 10%, 0603	AVX, 0603ZD475KAT2A
6	1	C3	CAP., 0.1µF, X7R, 16V, 10%, 0603	AVX, 0603YC104KAT2A
7	1	C5	CAP., 120pF, X7R, 50V, 10%, 0603	YAGEO, CC0603KRX7R9BB121
8	1	C8	CAP., 1µF, X7R, 50V, 10%, 0805	MURATA, GRM21BR71H105KA12L
9	1	C11	CAP., 1µF, X7R, 50V, 10%, 0603	TAIYO YUDEN, UMK107AB7105KA-T
10	1	Q1	XSTR., MOSFET, N-CH, 40V, TO-252	VISHAY, SUD50N04-8M8P-4GE3
11	2	R3, R19	RES., 10k, 1/10W, 1%, 0603	VISHAY, CRCW060310K0FKEA
12	1	R4	RES., 100k, 1/10W, 1%, 0603	VISHAY, CRCW0603100KFKEA
13	1	R9	RES., 47.5k, 1/10W, 1%, 0603	VISHAY, CRCW060347K5FKEA
14	2	R14, R16	RES., 10Ω, 1/10W, 5%, 0603	VISHAY, CRCW060310R0JNEA
15	1	R15	RES., 90.9k, 1/10W, 1%, 0603	VISHAY, CRCW060390K9FKEA
16	1	R20	RES., SENSE, 0.01Ω, 1/2W, 1%, 2010	VISHAY, WSL2010R0100FEA
17	1	R25	RES., 2.2Ω, 1/10W, 5%, 0603	VISHAY, CRCW06032R2JNEA
18	1	R26	RES., 50k, 1/10W, 1%, 0603	VISHAY, CRCW060350K0FKEA
19	1	U1	IC, LTM4645EY#PBF BGA77-15x9-5.01	ANALOG DEVICES, LTM4645EY#PBF
Additional Demo Board Circuit Components				
1	0	CIN2	CAP., OPTION, 1206	MURATA, GRM31CR6YA106KA12L
2	0	CIN5, COUT3, COUT5, COUT6, COUT9, COUT10	CAP., OPTION, 1210	OPT
3	0	COUT11, COUT12	CAP., OPTION, D3L	OPT
4	0	C4, C6, C7, C9	CAP., OPTION, 0603	OPT
5	6	R1, R6, R13, R18, R21, R27	RES., 0Ω, 1/10W, 0603	VISHAY, CRCW06030000Z0EA
6	0	R8, R10, R11, R17, R22, R23, R24, R28	RES., OPTION, 0603	OPT
Hardware: For Demo Board Only				
1	18	E1-E18	TESTPOINT, TURRET, .062"	MILL-MAX, 2308-2-00-80-00-00-07-0
2	1	JP1	CONN., HEADER, 2x4, 2mm	SULLINS, NRPNO42PAEN-RC
3	1	JP2	CONN., HEADER, 1x3, 2mm	SULLINS, NRPNO31PAEN-RC
4	2	J1, J3	CONN., BANANA JACK	KEYSTONE, 575-4
5	2	J2, J4	STUD, TESTPIN	PEM, KFH-032-10
6	4	J2, J4 (x2)	NUT, BRASS 10-32	ANY, #10-32M/S BR PL
7	2	J2, J4	RING, LUG #10	KEYSTONE, 8205
8	2	J2, J4	WASHER, TIN PLATED BRASS	ANY, #10 EXT BZ TN
9	2	J5, J6	CONN, BNC, 5 PINS	CONNEX, 112404
10	2	XJP1, XJP2	SHUNT, 2mm	SAMTEC, 2SN-BK-G
11	4	MTGS. at 4 CORNERS	STAND-OFF, NYLON, SNAP-ON, 0.50" TALL	KEYSTONE, 8833 (SNAP ON)

SCHEMATIC DIAGRAM





ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for [Power Management IC Development Tools](#) category:

Click to view products by [Analog Devices](#) manufacturer:

Other Similar products are found below :

[EVAL-ADM1168LQEBZ](#) [EVB-EP5348UI](#) [MIC23451-AAAYFL EV](#) [MIC5281YMME EV](#) [DA9063-EVAL](#) [ADP122-3.3-EVALZ](#) [ADP130-0.8-EVALZ](#) [ADP130-1.2-EVALZ](#) [ADP130-1.5-EVALZ](#) [ADP130-1.8-EVALZ](#) [ADP1714-3.3-EVALZ](#) [ADP1716-2.5-EVALZ](#) [ADP1740-1.5-EVALZ](#) [ADP1752-1.5-EVALZ](#) [ADP1828LC-EVALZ](#) [ADP1870-0.3-EVALZ](#) [ADP1871-0.6-EVALZ](#) [ADP1873-0.6-EVALZ](#) [ADP1874-0.3-EVALZ](#) [ADP1882-1.0-EVALZ](#) [ADP199CB-EVALZ](#) [ADP2102-1.25-EVALZ](#) [ADP2102-1.875EVALZ](#) [ADP2102-1.8-EVALZ](#) [ADP2102-2-EVALZ](#) [ADP2102-3-EVALZ](#) [ADP2102-4-EVALZ](#) [ADP2106-1.8-EVALZ](#) [ADP2147CB-110EVALZ](#) [AS3606-DB](#) [BQ24010EVM](#) [BQ24075TEVM](#) [BQ24155EVM](#) [BQ24157EVM-697](#) [BQ24160EVM-742](#) [BQ24296MEVM-655](#) [BQ25010EVM](#) [BQ3055EVM](#) [NCV891330PD50GEVB](#) [ISLUSBI2CKIT1Z](#) [LM2744EVAL](#) [LM2854EVAL](#) [LM3658SD-AEV/NOPB](#) [LM3658SDEV/NOPB](#) [LM3691TL-1.8EV/NOPB](#) [LM4510SDEV/NOPB](#) [LM5033SD-EVAL](#) [LP38512TS-1.8EV](#) [EVAL-ADM1186-1MBZ](#) [EVAL-ADM1186-2MBZ](#)