

### 30 V Input 2 A Buck DC/DC Converter Evaluation Board

NO.EEV-206-S001C050-200708

R1243S001C050-EV is the evaluation board for R1243 which has the below features, benefits and specifications.

#### OUTLINE

The R1243S is a CMOS-based step-down DC/DC converter with internal Nch high-side Tr. ( $0.175\ \Omega$ ), which can provide the maximum 2 A output current. Internally, the R1243S consists of an oscillator, a PWM control circuit, a reference voltage unit, an error amplifier, phase compensation circuits, a slope circuit, a soft-start circuit, protection circuits, internal voltage regulators and a switch for bootstrap circuit. A step-down DC/DC converter can be configured by only adding an inductor, resistors, a diode and capacitors to the R1243S.

The R1243S is a current mode operating type DC/DC converter that does not require external current sense resistor. It has high-speed response time and is high efficiency and compatible with ceramic capacitors.

The oscillator frequency of the R1243S001C is fixed 330 kHz. The R1243S has a cycle-by-cycle peak current limit function, a short protection function, a thermal shutdown function and an UVLO as protection features. The R1243S001C has a latch protection with 2 ms delay time. The R1243S has a built-in soft-start time (Typ. 0.4 ms). In addition to this, the soft-start time is adjustable by adding an external capacitor. The R1243S has the FLG pin, which mainly monitors the FB pin voltage and gives a flag output by the Nch open drain if the abnormal condition is detected.

#### FEATURES

- Operating Voltage Range ..... 4.5 V to 30 V
- Standby Current..... Max. 10  $\mu$ A ( $V_{IN} = 30\text{ V}$ ,  $CE = L$ )
- Supply Current..... Typ. 0.7 mA ( $V_{IN} = 30\text{ V}$ ,  $V_{FB} = 1.0\text{ V}$ )
- Output Voltage ..... 5.0 V, Adjustable with external resistors
- Feedback Voltage ..... 0.5 V with 1.4% accuracy
- Output Current ..... Max. 2 A<sup>(1)</sup>
- Peak Current Limiting ..... Typ. 3.8 A
- Internal Nch MOSFET Driver ..... Typ. 175 m $\Omega$
- Maximum Duty Cycle ..... Min. 85%
- Oscillator Frequency ..... 330 kHz
- Latch Type Protection ..... Typ. 2 ms
- Internal Soft-start Time ..... Typ. 0.4 ms, TSS = Open
- External Soft-start Time ..... Typ. 12 ms,  $C_{SS} = 0.1\ \mu$ F
- Flag Output ..... Typ. 0.25 ms, FLG "OFF" delay time
- UVLO Released Voltage..... Typ. 4.0 V
- Thermal Shutdown..... Typ. 160°C, Hysteresis = 35°C
- Package ..... HSOP-8E
- For more details on R1243 IC, please refer to  
<https://www.n-redc.co.jp/en/pdf/datasheet/r1243-ea.pdf>

<sup>(1)</sup> This is an approximate value, because output current depends on conditions and external parts.

## PART NUMBER INFORMATION

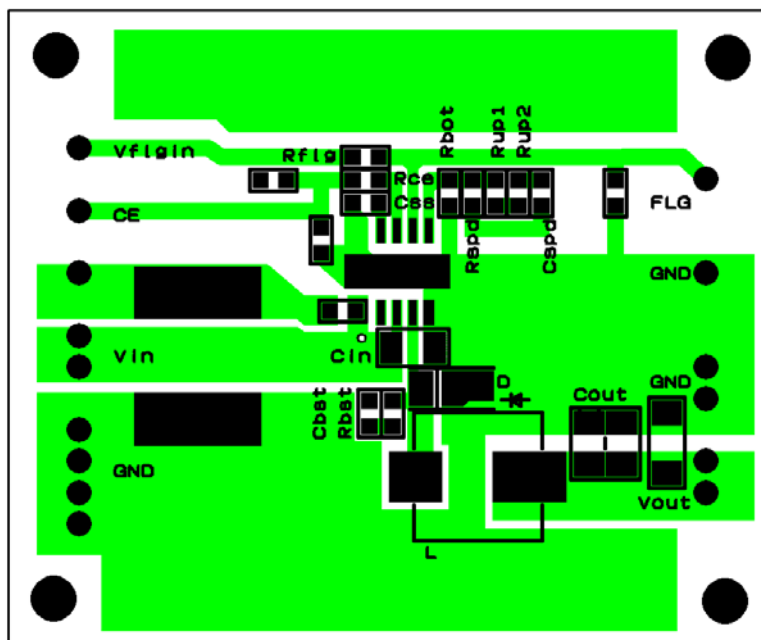
Product Name	Package
R1243S001C050	HSOP-8E

001C: 300 kHz, Fixed Frequency / Latch Type (2 ms)

050: 5.0 V, Output Voltage

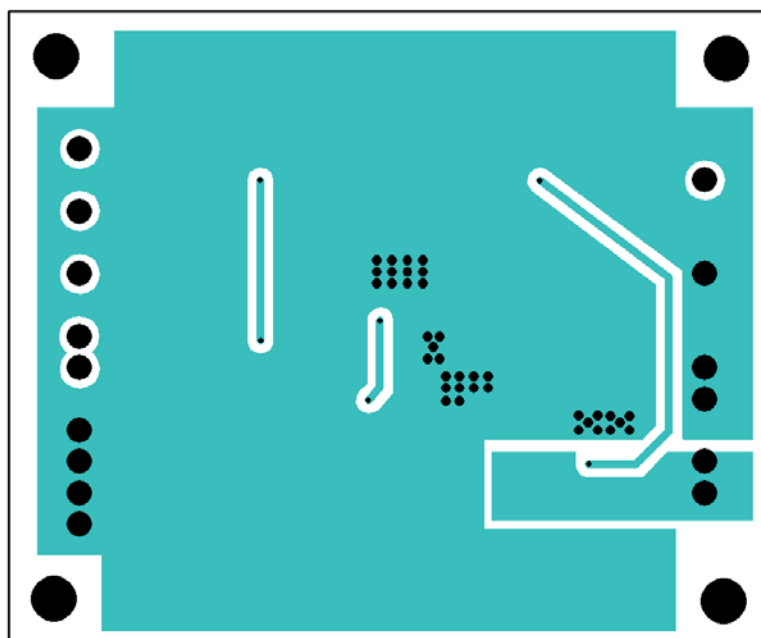
## PCB LAYOUT

R1243S001C Evaluation Board TOP VIEW

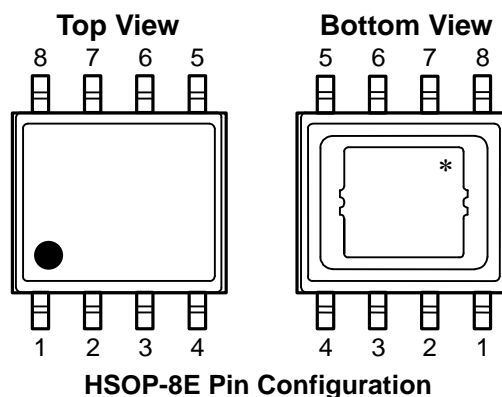


(The broad land of Lx section enables a connection with large inductors and diodes).

R1243S001C Evaluation Board TOP VIEW



## PIN DESCRIPTION



\* The tab is substrate level (GND). It must be connected to the GND level.

### R1243S Pin Description

Pin No	Symbol	Pin Description
1	BST	Bootstrap Pin
2	VIN	Power Supply Pin
3	LX	LX Switching Pin
4	GND	Ground Pin
5	FB	Feedback Pin
6	FLG	Flag Output Pin
7	CE	Chip Enable Pin, Active with "H"
8	TSS	Soft-start Pin

## ABSOLUTE MAXIMUM RATINGS

### Absolute Maximum Ratings

(GND = 0 V)

Symbol	Parameter	Rating			Unit
V <sub>IN</sub>	Input Voltage	-0.3 V to 32 V			V
V <sub>BST</sub>	Boost Pin Voltage	V <sub>LX</sub> - 0.3 V to V <sub>LX</sub> + 6 V			V
V <sub>LX</sub>	LX Pin Voltage	-0.3 V to V <sub>IN</sub> + 0.3			V
V <sub>CE</sub>	CE Pin Input Voltage	-0.3 V to V <sub>IN</sub> + 0.3			V
V <sub>FB</sub>	VFB Pin Voltage	-0.3 V to 6 V			V
V <sub>FLG</sub>	FLG Pin Voltage	-0.3 V to 6 V			V
V <sub>TSS</sub>	TSS Pin Voltage	-0.3 V to 6 V			V
P <sub>D</sub>	Power Dissipation <sup>(1)</sup>	HSOP-8E	JEDEC STD. 51-7	2900	mW
T <sub>j</sub>	Junction Temperature Range	-40 to 125			°C
T <sub>stg</sub>	Storage Temperature Range	-55 to 125			°C

### ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause permanent damage and may degrade the life time and safety for both device and system using the device in the field.  
The functional operation at or over these absolute maximum ratings are not assured.

## RECOMMENDED OPERATING CONDITIONS

### Recommended Operating Conditions

Symbol	Parameter	Rating	Unit
V <sub>IN</sub>	Operating Input Voltage	4.5 to 30	V
T <sub>a</sub>	Operating Temperature Range	-40 to 85	°C

### RECOMMENDED OPERATING CONDITIONS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

<sup>(1)</sup> Refer to *DATASHEET POWER DISSIPATION* for detailed information.

## ELECTRICAL CHARACTERISTICS

$V_{IN} = 12\text{ V}$ , unless otherwise noted.

### Electrical Characteristics

( $T_a = 25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions/Comments	Min.	Typ.	Max.	Unit
Istandby	Standby Current	$V_{IN} = 30\text{ V}$ , $V_{CE} = 0\text{ V}$		0	10	$\mu\text{A}$
$I_{SS}$	Supply Current	$V_{IN} = 30\text{ V}$ , $V_{FB} = 1.0\text{ V}$		0.7	1.0	mA
$V_{UVLO1}$	UVLO Detector Threshold	Falling	3.6	3.8	4.0	V
$V_{UVLO2}$	UVLO Released Voltage	Rising	3.8	4.0	4.2	V
$V_{UVLOHYS}$	UVLO Hysteresis	$V_{UVLO2} - V_{UVLO1}$		0.2		V
$V_{FB}$	Feedback Voltage		0.493	0.500	0.507	V
$\Delta V_{FB}/\Delta T_a$	Feedback Voltage Temperature Coefficient	$-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$		$\pm 100$		ppm/ $^\circ\text{C}$
fosc	Oscillator Frequency		290	330	370	kHz
Maxduty	Oscillator Maximum Duty Cycle	$V_{IN} = 6\text{ V}$	85	90	95	%
$I_{TSS}$	TSS Pin Current	$V_{TSS} = 0\text{ V}$		4.0		$\mu\text{A}$
tss1	Soft-start Time 1	TSS = open	0.2	0.4	0.8	ms
tss2	Soft-start Time 2	$C_{SS} = 0.1\text{ }\mu\text{F}$	6	12	18	ms
tDLY	Latch Protection Delay Time	$V_{IN} = 5.0\text{ V}$		2.0		ms
$I_{LXHOFF}$	Highside Switch Leakage Current	$V_{IN} = 30\text{ V}$ , $V_{CE} = 0\text{ V}$		0	10	$\mu\text{A}$
$R_{LXH}$	Highside Switch ON Resistance	$V_{BST} - V_{LX} = 4.5\text{ V}$		175		m $\Omega$
$I_{LIMLXH}$	Highside Switch Limited Current	$V_{BST} - V_{LX} = 4.5\text{ V}$	2.8	3.8		A
$V_{CEH}$	CE "H" Input Voltage	$V_{IN} = 30\text{ V}$	1.4			V
$V_{CEL}$	CE "L" Input Voltage	$V_{IN} = 30\text{ V}$			0.4	V
$I_{CEH}$	CE "H" Input Current	$V_{IN} = 30\text{ V}$ , $V_{CE} = 30\text{ V}$	-1.0	0	1.0	$\mu\text{A}$
$I_{CEL}$	CE "L" Input Current	$V_{IN} = 30\text{ V}$ , $V_{CE} = 0\text{ V}$	-1.0	0	1.0	$\mu\text{A}$
$I_{FBH}$	FB "H" Input Current	$V_{FB} = 2.0\text{ V}$	-1.0	0	1.0	$\mu\text{A}$
$I_{FBL}$	FB "L" Input Current	$V_{FB} = 0\text{ V}$	-1.0	0	1.0	$\mu\text{A}$
$T_{TSD}$	Thermal Shutdown Detect Temperature	Hysteresis $35^\circ\text{C}$		160		$^\circ\text{C}$
$V_{FLGL}$	FLG "L" Voltage	$I_{FLG} = 1\text{ mA}$			0.4	V
$I_{FLGOFF}$	FLG "OFF" Current	$V_{FLG} = 5.5\text{ V}$		0.0	1.0	$\mu\text{A}$
tFLGOFF	FLG "OFF" Delay Time		0.05	0.25	0.60	ms
$V_{OVD}$	Overvoltage Detection Voltage	$V_{FB}$	0.55	0.60	0.65	V
$V_{UVD}$	Undervoltage Detection Voltage	$V_{FB}$	0.35	0.40	0.45	V



## TECHNICAL NOTES ON PCB LAYOUT PATTERN

1. The exposed pad on the bottom of the package enhances the thermal performance and is electrically connected to GND inside the package. It is recommended that the exposed pad be connected to the ground plane on the board with thermal vias if possible.
2. Connect shortest possible: “a wiring between the  $V_{IN}$  pin of input capacitor ( $C_{IN}$ ) and the  $V_{IN}$  pin of IC” and “a wiring between the GND pin of input capacitor ( $C_{IN}$ ) and the GND pin of IC”.  
Connect as short as possible: “a wiring among the Lx pin of IC, the Lx pin of diode, the GND pin of diode, and the GND pin of input capacitor ( $C_{IN}$ )”.  
These are recommended to wire without intermediary of a through hole.
3. Wire the Lx pin short so that the parasitic capacitance would not be provided. It is recommended to implement without intermediary of a through hole.
4. Connect between the GND pin of  $C_{OUT}$  and the GND pin of diode as short as possible. It is recommended to wire without intermediary of a through hole.
5. The FB pin side of  $R_{UP}$ ,  $R_{BOT}$ ,  $C_{SPD}$ , and  $R_{SPD}$  should be designed to keep a distance from inductor, BST pin, and Lx pin in order to avoid the high impedance and noise effect. These can be wired via through hole.
6. For  $V_{OUT}$  wiring to  $R_{UP}$ , the feed-back must be made as close as possible from the output capacitor ( $C_{OUT}$ ). This can be wired via through hole.
7. For the GND wiring to the soft-start time adjusting capacitor ( $C_{SS}$ ), avoid the current path of parts including input capacitors ( $C_{IN}$ ) and diodes. This can be wired via through hole.





1. The products and the product specifications described in this document are subject to change or discontinuation of production without notice for reasons such as improvement. Therefore, before deciding to use the products, please refer to Ricoh sales representatives for the latest information thereon.
2. The materials in this document may not be copied or otherwise reproduced in whole or in part without prior written consent of Ricoh.
3. Please be sure to take any necessary formalities under relevant laws or regulations before exporting or otherwise taking out of your country the products or the technical information described herein.
4. The technical information described in this document shows typical characteristics of and example application circuits for the products. The release of such information is not to be construed as a warranty of or a grant of license under Ricoh's or any third party's intellectual property rights or any other rights.
5. The products listed in this document are intended and designed for use as general electronic components in standard applications (office equipment, telecommunication equipment, measuring instruments, consumer electronic products, amusement equipment etc.). Those customers intending to use a product in an application requiring extreme quality and reliability, for example, in a highly specific application where the failure or misoperation of the product could result in human injury or death (aircraft, spacevehicle, nuclear reactor control system, traffic control system, automotive and transportation equipment, combustion equipment, safety devices, life support system etc.) should first contact us.
6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, fire containment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
7. Anti-radiation design is not implemented in the products described in this document.
8. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
9. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
10. There can be variation in the marking when different AOI (Automated Optical Inspection) equipment is used. In the case of recognizing the marking characteristic with AOI, please contact Ricoh sales or our distributor before attempting to use AOI.
11. Please contact Ricoh sales representatives should you have any questions or comments concerning the products or the technical information.



**Ricoh is committed to reducing the environmental loading materials in electrical devices with a view to contributing to the protection of human health and the environment.**

Ricoh has been providing RoHS compliant products since April 1, 2006 and Halogen-free products since April 1, 2012.

**RICOH** RICOH ELECTRONIC DEVICES CO., LTD.

**Official website**

<https://www.n-redc.co.jp/en/>

**Contact us**

<https://www.n-redc.co.jp/en/buy/>

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Ricoch Electronics:](#)

[R1243S001C050-EV](#)