Preliminary

RICOH

R1240x SERIES

1.2A, 30V Step Down DC/DC converter

NO.JA-190-080219

OUTLINE

The R1240x is 30V input voltage Step down DC/DC converter. It contains Nch high side Tr. (350mΩ) to make a simple step down DC/DC to supply maximum 1.2A output current. As a protection function cycle by cycle current limit function limits maximum current to 2.0A. There are two types for short protection, A version is latch protection function with 2ms delay time and B version is fold back protection function.

FEATURES

- Operating Voltage ····· 4.5V~30V
- Internal Nch MOSFET Driver ····· Ron=350Ω Typ.
- Adjustable output voltage with external resistor····· 0.8V~15V
- Feed back voltage····· 0.8V±1.5%
- Peak Current limit function ····· 2.0A Typ.
- UVLO function
- Operating Frequency ····· 1.25MHz (310kHz : fold condition :Ver.B only)
- Short protection function for internal boost regulator
- Short protection for output ····· Ver.A: Latch with 2ms delay or Ver.B: Fold Back
- Ceramic Capacitor compatible
- Stand-by function ····· 0.1μA Typ.
- Package ····· SOT-23-6W & DFN(PLP)2527-10 Package

APPLICATIONS

- Power source for digital home appliance

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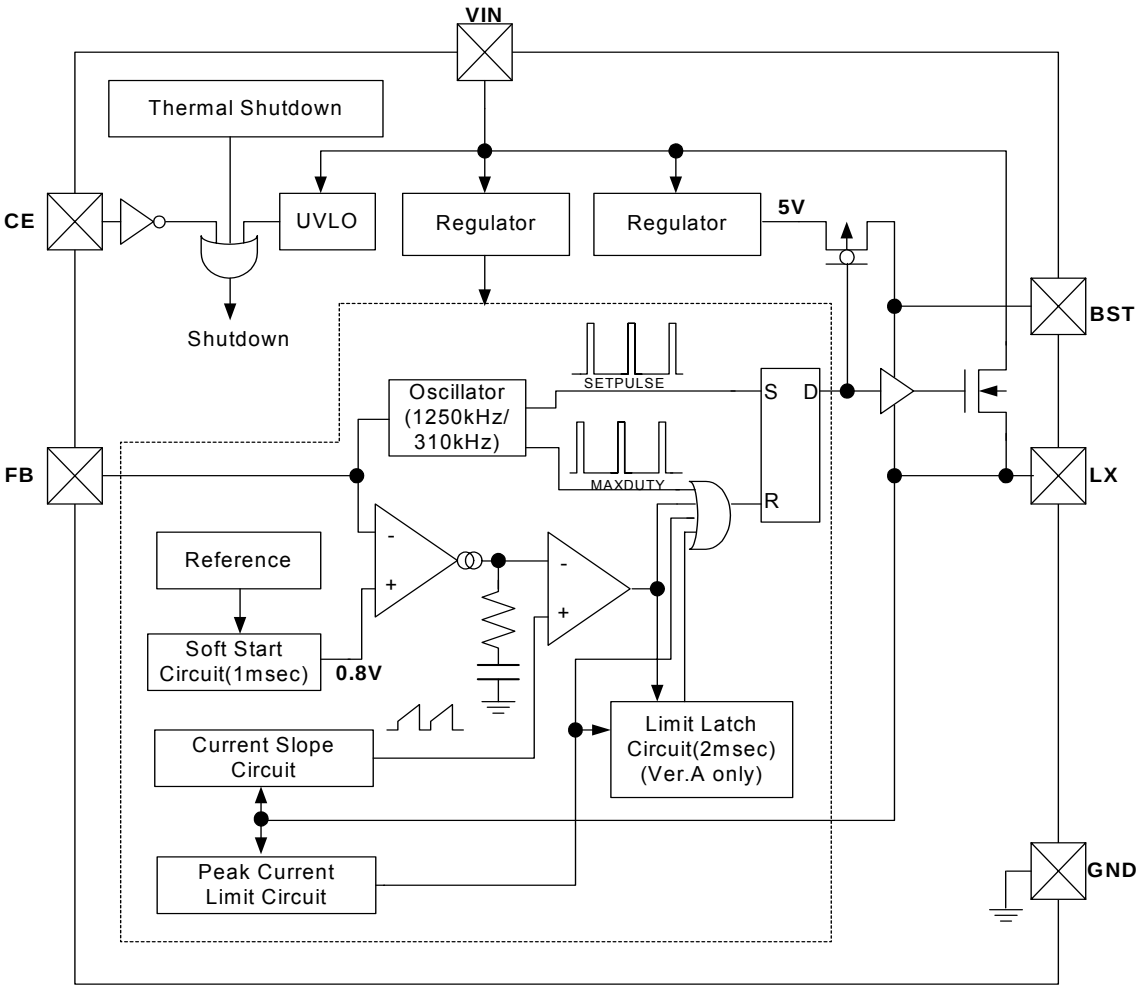
BLOCK DIAGRAMS



SELECTION GUIDE

In the R1240x Series, the Package, type of short protection (Latch or Fold back) can be selected at the user's request. The selection can be made with designating the part number as shown below

R1240x 001 x- TR-x ←Part Number

↑a ↑b ↑c ↑d

Code	Contents
a	Designation of the Package K : DFN(PLP)2527-10 N : SOT-23-6W
b	001: Fixed
c	Designation of Optional Function A : Latch Type protection B : Fold back Type protection
d	-F : Lead free plating (SOT-23-6W) None : Au plating (DFN(PLP)2527-10)

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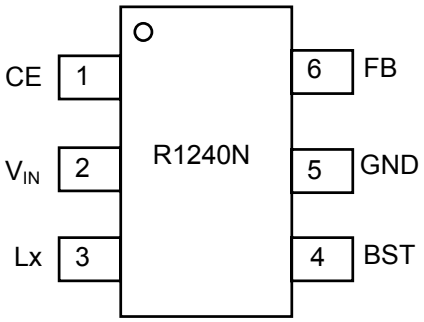
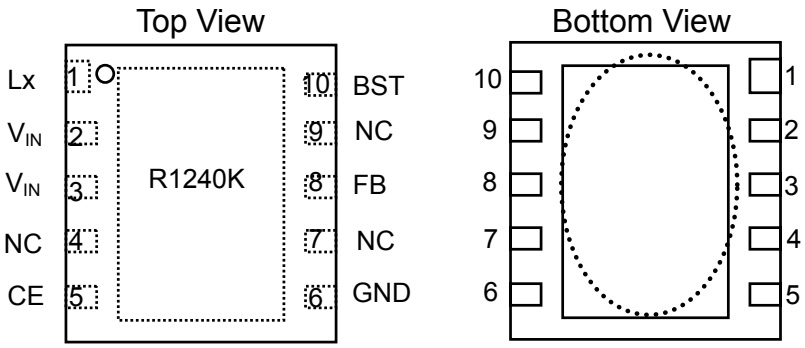
PIN CONFIGURATION

R1240N (SOT-23-6W)



R1240K (DFN(PLP)2527-10)



*Tab lead is GND pin as well.
Please connect to same GND level of Pin No.6 GND pin.

PIN DESCRIPTION

R1240N

Pin No.	Symbol	Description
1	CE	Chip Enable Pin (Active with "H")
2	V_{IN}	Power Supply Pin
3	L_X	Lx Switching Pin
4	BST	Bootstrap Pin
5	GND	Ground Pin
6	FB	Feedback Pin

R1240K

Pin No.	Symbol	Description
1	L_X	Lx Switching Pin
2	V_{IN}	Power Supply Pin
3	V_{IN}	Power Supply Pin
4	NC	No Connection
5	CE	Chip Enable Pin (Active with "H")
6	GND	Ground Pin
7	NC	No Connection
8	FB	Feedback Pin
9	NC	No Connection
10	BST	Bootstrap Pin

*Tab in the ◌ parts have GND level.(They are connected to the back side of this IC.) Do not connect to other wires or land patterns.

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ABSOLUTE MAXMUM RATINGS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	-0.3V~32V	V
V_{BOOST}	Boost Pin Voltage	V_{Lx}-0.3V~V_{Lx}+6V	V
V_{Lx}	Lx Pin Voltage	-0.3V~Vin+0.3	V
I_{Lx}	Lx Pin Current	2	A
V_{CE}	CE Pin input Voltage	-0.3V~Vin+0.3	V
V_{FB}	V_{FB} Pin Voltage	-0.3V~4V	V
P_D	Power Dissipation	Internally Limited	
Topt	Operating Temperature Range	-40~85	ºC
Tstg	Storage Temperature Range	-55~125	ºC

ABSOLUTE MAXIMUM RATINGS

Absolute Maximum ratings are threshold limit values that must not be exceeded ever for an instant under any conditions. Moreover, such values for any two items must not be reached simultaneously. Operation above these absolute maximum ratings may cause degradation or permanent damage to the device. These are stress ratings only and do not necessarily imply functional operation these limits.

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ELECTRICAL CHARACTERISTICS

Otherwise notified in Conditions, Vin= 12V (Topt=25ºC)

Symbol	Item	Conditions	MIN.	TYP.	MAX.	Unit
V_{IN}	Operating Input Voltage		4.5		30	V
I_{IN}	V_{IN} consumption current	V_{IN}=30V, V_{FB}=1.0V		0.5	1.0	mA
$V_{UVLO}1$	UVLO detect voltage	Falling	3.6	3.8	4.0	V
$V_{UVLO}2$	UVLO released voltage	Rising		$V_{UVLO}1$ +0.2	4.2	V
V_{FB}	V_{FB} voltage tolerance		0.788	0.800	0.812	V
ΔVFB/ΔT	V_{FB} voltage temperature coefficient	-40ºC ≤ Topt ≤ 85ºC		±150		ppm/ºC
Fosc	Oscillator frequency		1000	1250	1500	kHz
V_{FLB}	Fold back frequency (Ver.B&D)	V_{FB} <0.56		310		kHz
Maxduty	Max. Duty cycle		75	85	90	%
T_{MIN}	Minimum on time			100		nsec
T_{SS}	Soft Start Time	V_{FB} =0.72V	0.2	0.4	0.6	ms
T_{DLY}	Delay time for latch protection (Ver.A&C)		1	2	4	ms
R_{LXH}	Lx High side switch ON resistance			350		mΩ
I_{LXHOFF}	Lx High side switch leakage current			0	5	μA
I_{LIMLXH}	Lx High side switch limited current			2.0		A
V_{CEL}	CE “L” input voltage				0.3	V
V_{CEH}	CE “H” input voltage		1.6			V
I_{FB}	V_{FB} Input Current		-1.0		1.0	μA
I_{CEL}	CE “L” input current		-1.0		1.0	μA
I_{CEH}	CE “H” input current		-1.0		1.0	μA
T_{TSD}	Thermal Shutdown Detect Temperature	Hysteresis 30ºC		160		ºC
I_{STB}	Standby Current	V_{IN}=30V		0.1	5	μA

*On Resistance of High side switch and Thermal Shutdown are guaranteed by design , not production tested.

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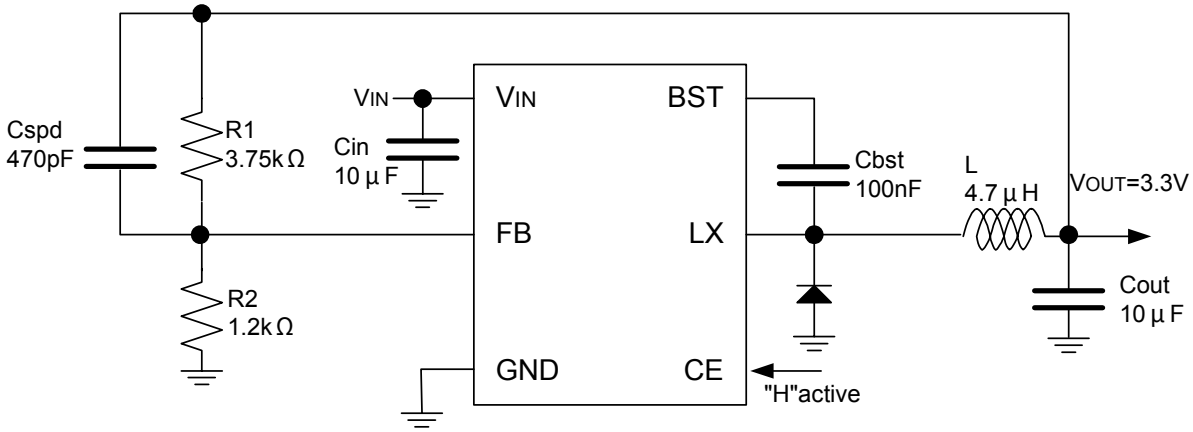
TYPICAL APLICATION



(external parts)

C_{IN}	10μF KTS500B106M55N0T00 (Nippon Chemi-Con)
Cout	10μF GRM31CR71E106K (muRata)
Cbst	0.1μF GRM21BB11H104KA01L (muRata)
L	4.7μH SLF7045T-4R7M2R0-PF (TDK)
D	MA24D60 (Panasonic)

Notes concerning external parts

- Please put external parts as much as possible near IC, and shorten wiring. Especially, please wire for the capacitor connected between V_{IN}-GND by the beeline. When the impedance of the power supply wiring and the ground wiring is high, potential in IC might change according to the switching current and operation become unstable. Please strengthen the power supply wiring and the ground wiring enough. Moreover, because a large current by the switching flows to the power supply wiring, the ground wiring, the inductor, the Lx wiring, and the V_{OUT} wiring, the sufficient consideration is necessary. Moreover, a part of resistance (R1) that sets the output voltage and the wiring between inductors must separate with the wiring connected with the load.
- The capacitor must use the ceramic capacitor that ESR is low. The capacity of the capacitor of C_{IN} connected between V_{IN}-GND will recommend 10μF or more. The capacity of the ceramic capacitor of C_{OUT} will recommend 10μF or more (*1) . Please note the bias dependence characteristic and the temperature change characteristic of the ceramic capacitor enough.

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- Please select the inductor is usual 4.7μH～10μH. As for this IC, an internal phase amends are designed according to the following inductor value and above-mentioned C_{OUT} ceramic capacitor value. (*1) However, please give 2.2μH and the capacity of the output ceramic capacitor to the inductor as 20μF or more when the output voltage is lower than 1.8V and it sets it. Moreover, please select the inductor value properly according to the I/O condition. There is a possibility that the peak value of the current of the switch increases with an increase in the load current, the current reaches the limitation current value, and the overcurrent protection circuit works when the inductor value is small.
- Please note that the overcurrent protection circuit receives the influences of self-generation of heat and the heat radiation environment, etc.
- The diode must use Schottky diode that CJO is small as much as possible. An excessive switching current flows at switch ON, and there is a possibility that the operation of IC becomes unstable.

*The performance of the power supply circuit that uses this IC greatly depends on the circuit in the surrounding.
Please note the setting of parts in the surrounding enough. Especially, please design the circuit in the surrounding so as not to exceed each ratings value (voltage, current, and electric power) of each part, substrate pattern, and this IC.