

PWM/VFM Step-up DC/DC Converter with Synchronous Rectifier

The RP402x Series are min. 0.6V input, CMOS-based PWM/VFM step-up DC/DC converters with synchronous rectifier. The RP402x have three switching control types, or PWM control, forced PWM control, and PWM/VFM auto change control. The RP402xxxx includes a soft start circuit, a bypass switch, shutdown switch, an anti-ringing switch. By simply using with an inductor, a capacitor, and resistors (for output voltage adjustable type) as external components, a high-efficiency step-up DC/DC converter can be realized. The output voltage can be selected from the internally fixed type or externally adjustment is possible. In addition to SOT-23-5 package, a 2.0mm square DFN(PLP)2020-8 package is available. The RP402x are ideal for the applications powered by one-cell or two-cell alkaline, nickel-metal-hydride (NiMH) or one-cell Lithium-ion (Li+) batteries.

FEATURES

- Supply Current (I_{DD1}) Typ. 1.6mA (Switching)
- Supply Current (I_{DD2}) Typ. 21μA (No switching)
- Standby Current (I_{standby}) Typ. 0.2μA (Shutdown Mode)
Typ. 1.2μA (Bypass Mode)
- Input Voltage Range (V_{IN}) 0.6V to 4.8V (Fixed Output Voltage Type, Absolute maximum rating: 6.5V)
0.6V to 4.6V (Adjustable Output Voltage Type, Absolute maximum rating: 6.5V)
- Low voltage Start-up Typ. 0.7V
- Hold-on Voltage (V_{HOLD}) Min. 0.6V
- Output Voltage Range (V_{OUT}) 1.8V to 5.5V (Fixed Output Voltage Type)
1.8V to 5.5V (Recommend Range, Adjustable Output Voltage Type)
(Feedback voltage : 1.0V, RP402K00xx)
- Output Voltage Accuracy ± 1.5%
- Switch ON Resistance TYP. 0.20 Ω (NMOS/PMOS, V_{OUT} = 5.0V)
- Oscillator Frequency (f_{osc}) 1.0MHz (xx2/002), 1.2MHz (xx1/001)
- Oscillator Maximum Duty Cycle (Maxduty) Typ. 88%
- OVLO Detector Threshold Typ. 5.1V
- OVP Detector Threshold Typ. 6.0V
- Coil-current Limit Circuit Current Limit Typ.1.5A*
- Soft Start Time (t_{start}) Typ. 0.5ms
- Latch Protection Circuit Delay time for protection
Typ. 3.3ms (xx1/001)
Typ. 4.1ms (xx2/002)
- MODE pin "H": fixed PWM control,
"L": PWM/VFM auto switching control (xx1/001),
"H": forced PWM control (xx2/002)
- Built-in Anti-ringing Switch EMI Suppression (xx1/001)
- Built-in Shutdown Switch xxxA/B/E/F
- Built-in Bypass Switch xxxC/D/G/H
- Voltage Regulation at V_{IN} > V_{OUT}
- Zero Input Complete Shutdown at V_{IN} = 0V (or V_{IN}=OPEN)
- Package DFN(PLP)2020-8, SOT-23-5

* This is an approximate value, because ON duty depends on conditions.
(The above shows specification at Ta=25°C. Design assurance value at -40°C ≤ Ta ≤ 85°C is also available. For details, please refer to the datasheet.)

SELECTION GUIDES

Halogen Free	Package	Q'ty per Reel	Part No.
H/F	DFN(PLP)2020-8	5,000 pcs	RP402Kxx#\$-TR RP402K00#\$-TR
H/F	SOT-23-5	3,000 pcs	RP402Nxx#\$-TR-FE

- xx : Specify the output voltage within the range of 1.8V (18) to 5.5V (55) in 0.1V steps.
- 00 : Specify the output voltage external adjustable within the recommendation range of 1.8V to 5.5V.
- # : Select from (1) Normal PWM control ⇔ PWM/VFM auto switching control, (2) Forced PWM control
- \$: Specify the combination of the shutdown option, the MODE pin option and the latch function.

Version	Switching Options at	MODE pin	Latch Function	Notes
A	Complete Output Disconnect	Yes	Yes	DFN(PLP)2020-8
B	Complete Output Disconnect	Yes	No	xx1A/B, 001A/B, xx2A/B, 002A/B
C	Input-to Output Bypass	Yes	Yes	DFN(PLP)2020-8
D	Input-to Output Bypass	Yes	No	xx1C/D, 001C/D
E	Complete Output Disconnect	No	Yes	SOT-23-5
F	Complete Output Disconnect	No	No	Only fixed Output Voltage type
G	Input-to Output Bypass	No	Yes	Only PWM/VFM auto switching control
H	Input-to Output Bypass	No	No	xx1E/F/G/H

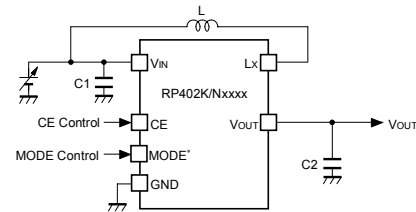
For details, please refer to the datasheet.

PACKAGES

DFN(PLP)2020-8				SOT-23-5			
Top View		Bottom View					
1	MODE	5	V _{OUT}	1	Lx		
2	NC	6	V _{IN}	2	GND		
3	GND	7	NC/V _{FB}	3	CE		
4	Lx	8	CE	4	V _{IN}		
*) The tab is substrate level (GND).				5	V _{OUT}		

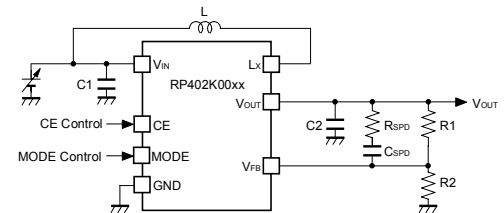
TYPICAL APPLICATIONS

RP402K/Nxxxx Typical Application (Fixed Output Voltage Type)



*) MODE pin : only RP402Kxxxx.

RP402K00xx Typical Application (Adjustable Output Voltage Type)

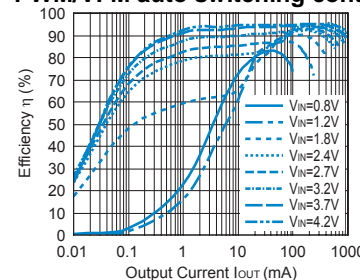


- L : VLF403215MT-2R2M, 2.2 μH, TDK
- C1 : GRM188R60J106ME84, 10 μF, MURATA
- C2 : GRM188R60J106ME84, 10 μF x 2, MURATA

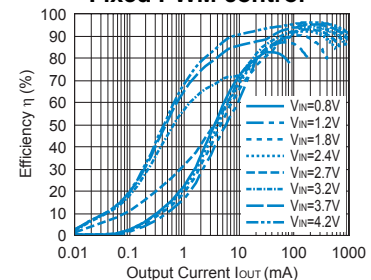
TYPICAL CHARACTERISTICS

RP402x501x / RP402K501x (V_{OUT}=5.0V) Efficiency vs. Output current

PWM/VFM auto switching control



Fixed PWM control



APPLICATION

- PDAs such as MP3 players and digital voice recorders
- Digital consumer electronics such as digital cameras and video cameras
- LCD bias power supply
- Personal medical equipment
- Wireless Handset
- GPS



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