RP506K Series

2A* PWM/VFM Step-down DC/DC Converter with Synchronous Rectifier

The RP506K Series are low supply current CMOS-based PWM/VFM step-down DC/DC converters with synchronous rectifier. RP506K can be selected from two control types by input signal to the MODE pin - forced PWM control or PWM/VFM auto switching control in which mode automatically switches to high-efficiency VFM mode in low output current. The xx1A/B/D/E version with an internally fixed output voltage type and the 001C/F version with an externally adjustable output voltage type are available. RP506K includes a soft start circuit, an under-voltage lockout circuit (UVLO), thermal shutdown circuit and a latch protection circuit. By simply using an inductor, (resistors) and capacitors as external components, a high-efficiency step-down DC/DC converter can be easily configured. The oscillator frequency can be selected from 1.2MHz or 2.25MHz.The soft start time is Typ. 0.15ms, and by connecting an external capacitor to TSS pin, soft start time is adjustable. V_{OUT}/V_{FB} pin voltage is monitored, and the output voltage errors can be output from PG pin. The PG pin is N-channel open drain output type. The DFN(PLP)2527-10 package is available.

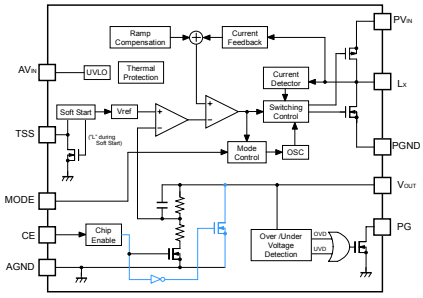
FEATURES

- Supply Current (I_{DD1})..... Typ. 600µA (V_{IN}=V_{CE}=5.5V, V_{OUT}=V_{SET}×0.8V)
- Supply Current (I_{DD2})..... Typ. 48µA (V_{IN}=V_{CE}=V_{OUT}=5.5V, V_{MODE}=0V)
- Standby Current ($I_{standby}$) ..... Max. 5µA (V_{IN}=5.5V, V_{CE}=0V)
- Input Voltage Range (V_{IN})..... 2.5V to 5.5V**
- Output Voltage Range (V_{OUT})..... 0.8V to 3.3V** (internally fixed, A/B Version)
  0.6V to 3.3V** (internally fixed, D/E Version)
  0.8V to 3.3V** (externally adjustable, C Version)
  0.6V to 3.3V** (externally adjustable, F Version)
  (Feedback voltage : 0.6V)
- Output Voltage Accuracy ..... ±1.5%
- Output Current (I_{OUT})..... 2A*
- Oscillator Frequency (f_{osc})..... 1.2MHz (D/E/F Version), 2.25MHz (A/B/C Version)
- Oscillator Maximum Duty Cycle (Maxduty)... Min. 100%
- UVLO Detect Voltage (V_{UVLO})... Typ. 2.2V
- Soft Start Time (t_{start}) ..... Typ. 0.15ms/ Set with external resistors.
- Thermal Shutdown Circuit ..... Stops at 150°C.
- Coil-current Limit Circuit ..... Current limit Typ. 2.8A
- Latch Protection Circuit..... Delay time for protection Typ. 1.5ms
- Auto-Discharge function ..... B/E Version
- MODE Pin ..... "H": forced PWM,
  "L": PWM/VFM automatic shift
- Package..... DFN(PLP)2527-10

*) This is an approximate value, because output current depends on conditions and external parts. **) For details, please refer to the datasheet.

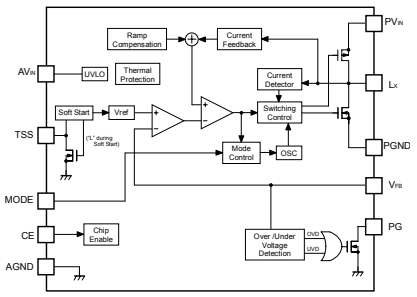
BLOCK DIAGRAMS

RP506Kxx1A/B/D/E
(Internally fixed output voltage type)



Blue Lline : only RP506Kxx1B/E

RP506K001C/F
(Externally adjustable output voltage type)



SELECTION GUIDE

Halogen Free	Package	Q'ty per Reel	Part No.
H/F	DFN(PLP)2527-10	5,000 pcs	RP506Kxx1*-TR
H/F	DFN(PLP)2527-10	5,000 pcs	RP506K001$-TR

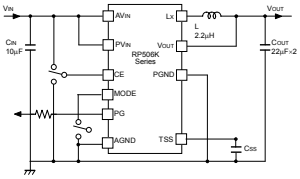
xx : Specify the output voltage within the range of 0.6V (06) to 3.3V (33) in 0.1V steps. (For externally adjustable output voltage type (00))

* : Specify a combination of the auto-discharge function and the oscillator frequency.
(Fixed output voltage type)
(A) without auto-discharge function, 2.25MHz
(B) with auto-discharge function, 2.25MHz
(D) without auto-discharge function, 1.2MHz
(E) with auto-discharge function, 1.2MHz

$:Specify a combination of the auto-discharge function and the oscillator frequency.
(Externally adjustable output voltage type)
(C) without auto-discharge function, 2.25MHz
(F) without auto-discharge function, 1.2MHz

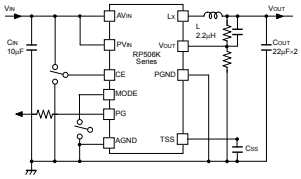
TYPICAL APPLICATIONS

RP506Kxx1A/B/D/E
With Power good function, setting soft- start time for 30ms



Symbol		Recommendation components
CIN	10µF	C1608JB0J106M (TDK)
		JMK107BJ106MA (TAIYO YUDEN)
COUT	22µF × 2	C2012JB0J226M (TDK)
	10µF × 3	C1608JB0J106M (TDK)
		JMK107BJ106MA (TAIYO YUDEN)

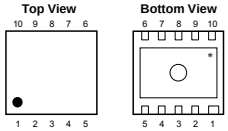
RP506K001C/F
Without using Power good function, setting soft-start time for 0.15ms



Symbol		Recommendation components
L	2.2µH	SLF6045T-2R2N3R3 (TDK)
		CLF6045-2R2N (TDK)
		FDSD0415-2R2M (TOKO)
		RLF7030T-2R2M5R4 (TDK)

PACKAGE

DFN(PLP)2527-10



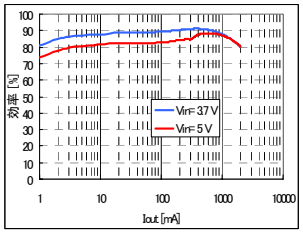
1	PVIN	6	TSS
2	AVIN	7	VOUT or VFB
3	PG	8	AGND
4	CE	9	LX
5	MODE	10	PGND

*) The tab is substrate level (GND).

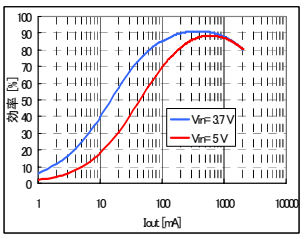
TYPICAL CHARACTERISTIC

RP506K (V_{OUT}=1.8V) Efficiency vs. Output Current

PWM/VFM auto switching



Fixed PWM



APPLICATIONS

- Power source for battery-powered equipment
- Power source for Wireless LAN terminals
- Power source for hand-held communication equipment, cameras, and VCRs

2A* PWM/VFM Step-down DC/DC Converter with Synchronous Rectifier

RP50x Series 1A to 2A (Single channel)
Step-down DC/DC Converter Comparison

	RP506K Series	RP505K Series	RP501K Series
Control (It can be switched by MODE pin)	Forced PWM/ PWM/VFM automatic shift	←	Fixed PWM/ PWM/VFM automatic shift
Output Current*	2A	1A	1A
Supply Current (PWM Mode)	Typ. 600μA	Typ. 500μA	Typ. 450μA
Supply Current (VFM Mode)	Typ. 48μA	Typ. 40μA	Typ. 140μA
Input Voltage Range	2.5V to 5.5V	2.3V to 5.5V	2.5V to 5.5V
Output Voltage Range**	0.6V to 3.3V (A/B) 0.6V to 3.3V (D/E) Ext. adjustable between 0.8V to 3.3V (C) Ext. adjustable between 0.6V to 3.3V (F)	0.8V to 3.3V (A/B) Ext. adjustable between 0.8V to 3.3V (C)	1.0V to 3.3V
Oscillator Frequency	Typ. 1.2MHz (D/E/F) Typ. 2.25MHz (A/B/C)	Typ. 2.25MHz	Typ. 2.25MHz
UVLO Detect Voltage	Typ. 2.2V	Typ. 2.0V	Typ. 2.2V
Soft-start Time	Typ. 0.15ms / Ext. adjustable	Typ. 0.15ms	Typ. 0.14ms
Coil-current Limit Circuit	Typ. 2.8A	Typ. 1.7A	Typ. 1.5A
Package	DFN(PLP)2527-10	DFN(PLP)2020-8	DFN(PLP)2527-10
Others	With Power good output pin, Built-in Thermal shutdown circuit	Built-in Thermal shutdown circuit	-
Version	**Fixed output voltage type** **A Version** Without auto-discharge function, 2.25MHz **B Version** With auto-discharge function, 2.25MHz **D Version** Without auto-discharge function, 1.2MHz **E Version** With auto-discharge function, 1.2MHz **Adjustable output voltage type** **C Version** Without auto-discharge function, 2.25MHz **F Version** Without auto-discharge function, 1.2MHz	**Fixed output voltage type** **A Version** Without auto-discharge function **B Version** With auto-discharge function **Adjustable output voltage type** **C Version** Without auto-discharge function	**Only fixed output voltage type** **A Version** Without auto-discharge function **B Version** With auto-discharge function

*) This is an approximate value, because output current depends on conditions and external parts. **) For details, please refer to the datasheet.

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■ **Ricoh presented with the Japan Management Quality Award for 1999.**
Ricoh continually strives to promote customer satisfaction, and shares the achievements of its management quality improvement program with people and society.

■ **Ricoh awarded ISO 14001 certification.**
The Ricoh Group was awarded ISO 14001 certification, which is an international standard for environmental management systems, at both its domestic and overseas production facilities. Our current aim is to obtain ISO 14001 certification for all of our business offices.

RoHS Compliant
Ricoh completed the organization of the Lead-free production for all of our products. After Apr. 1, 2006, we will ship out the lead free products only. Thus, all products that will be shipped from now on comply with RoHS Directive.

http://www.ricoh.com/LSI/

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