LOW RIPPLE VOLTAGE REGULATOR WITH EXTERNAL TRANSISTOR

NO. EA-043-111116

OUTLINE

The RN5RF Series are CMOS-based voltage regulator ICs which control external driver transistors with high ripple rejection, high accuracy output voltage, low supply current. Each of these voltage regulator ICs consists of a voltage reference unit, an error amplifier, output voltage setting resistor, short circuit current limiting circuit and chip enable circuit. These ICs are suitable for constructing regulators with ultra low dropout voltage and an output current in the range of several tens of mA and several hundreds mA. In addition to low supply current by CMOS process, chip enable function can be used to conserve battery life during standby.

Furthermore, a supreme ripple rejection and a transient response are suitable for portable communicator such as cell phones, PDAs, walky talkies. SOT23-5 (Mini Mold) package is available.

FEATURES

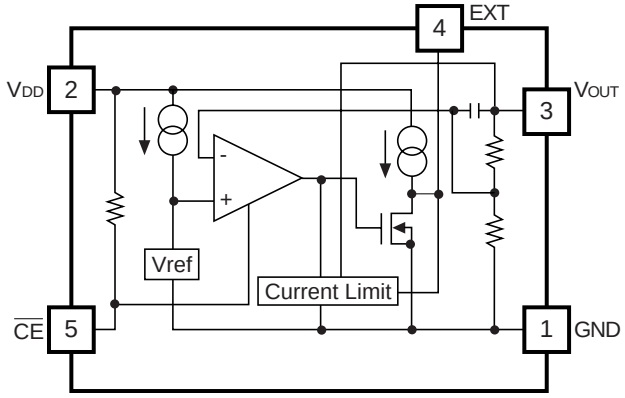
- Supply Current ..... Typ. 30μA
- Supply Current (Standby) ..... Typ. 0.1μA
- Output Voltage Accuracy ..... ±2%
- Ripple Rejection ..... Typ. 60dB (f=1kHz)
- Dropout Voltage ..... Typ. 0.1V (I_{OUT}=100mA, dependent on External Tr.)
- Temperature-Drift Coefficient of Output Voltage ..... Typ. ± 100ppm/°C
- Line Regulation ..... Typ. 0.05%/V
- Output Voltage Range ..... 1.2V to 6.0V (0.1V steps)
  (For other voltages, please refer to MARK INFORMATIONS.)
- Package SOT-23-5
- Current Limit for external Tr. ..... Current limit Typ. 8mA

APPLICATIONS

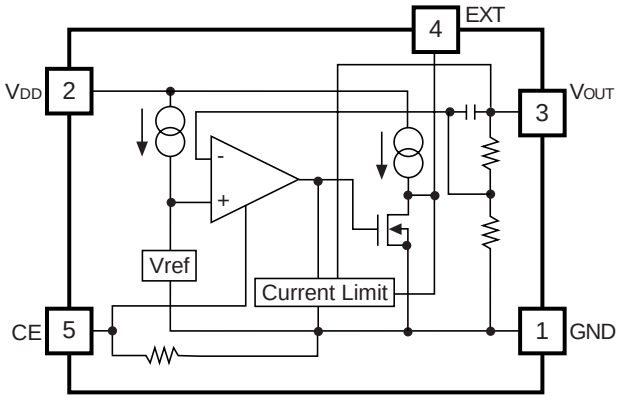
- Power source for battery-powered equipment
- Power source for hand-held communication equipment, cameras, and VCRs
- Power source for home appliances

BLOCK DIAGRAMS

RN5RFxxA



RN5RFxxB



SELECTION GUIDE

The output voltage and CE pin polarity for the ICs can be selected at the user's request.

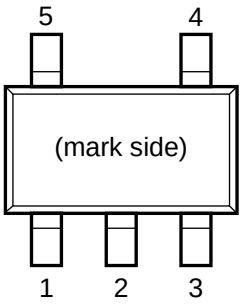
Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
RN5RFxx∗A-TR-FE	SOT-23-5	3,000 pcs	Yes	Yes

xx: The output voltage can be designated in the range from 1.2V (12) to 6.0V (60) in 0.1V steps.
(For other voltages, please refer to MARK INFORMATIONS.)

∗ : CE pin polarity are options as follows
(A) "L" active
(B) "H" active

PIN CONFIGURATION

● **SOT-23-5**



PIN DESCRIPTION

● **SOT-23-5**

Pin No	Symbol	Pin Description
1	GND	Ground Pin
2	V_{DD}	Input Pin
3	V_{OUT}	Output Pin
4	EXT	External Transistor Drive Pin (CMOS Output)
5	$\overline{CE}$ or CE	Chip Enable Pin

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	12.0	V
V_{CE}	Input Voltage ($\overline{CE}$ or CE)	−0.3 to V_{IN}+0.3	V
V_{EXT}	EXT Output Voltage	−0.3 to V_{IN}+0.3	V
I_{EXT}	EXT Output Current	50	mA
P_D	Power Dissipation* (SOT-23-5)	420	mW
Topt	Operating Temperature Range	−40 to 85	°C
Tstg	Storage Temperature Range	−55 to 125	°C

∗) For Power Dissipation, please refer to PACKAGE INFORMATION.

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages 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 is not assured.

RECOMMENDED OPERATING CONDITIONS (ELECTRICAL CHARACTERISTICS)

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 when 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.

ELECTRICAL CHARACTERISTICS

- **RN5RFxxA**

Topt=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	V_{IN}-V_{OUT}=1.0V I_{OUT}=50mA	V_{OUT} ×0.98		V_{OUT} ×1.02	V
I_{OUT}	Output Current	V_{IN}-V_{OUT}=1.0V		1.0[*1]		A
I_{EXT}	EXT Current	V_{IN}=4.0V, V_{EXT}=2.0V	5	8	15	mA
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	V_{IN}-V_{OUT}=1.0V 1mA≤I_{OUT}≤100mA	-60		60	mV
V_{DIF}	Dropout Voltage	I_{OUT}=100mA, I_{OUT}=0mA		0.1	0.2	V
I_{SS}	Supply Current	V_{IN}-V_{OUT}=1.0V		30	50	μA
Istandby	Standby Current	V_{IN}=10.0V	0.01	0.10	1.00	μA
$I_{EXTleak}$	EXT Leakage Current				0.5	μA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	I_{OUT}=50mA V_{OUT}+0.5V≤V_{IN}≤10V	0.00	0.05	0.30	%/V
R_R	Ripple Rejection	f=1kHz, sinusoidal 0.5Vp-p V_{IN}-V_{OUT}=1.0V		60		dB
V_{IN}	Input Voltage				10	V
V_{EXT}	EXT Output Voltage				10	V
$\Delta V_{OUT}/\Delta Topt$	Output Voltage Temperature Coefficient	I_{OUT}=10mA -40°C≤Topt≤85°C		±100		ppm/°C
R_{PU}	Pull up resistance for CE pin			4		MΩ
V_{CEH}	$\overline{CE}$ Input Voltage "H"		1.5		V_{IN}	V
V_{CEL}	$\overline{CE}$ Input Voltage "L"		0.00		0.25	V

*1) The output current depends on the performance of external PNP transistor. Use External PNP transistor of a low saturation type, with an h_{FE} between 100 and 300.

*) With respect to Test Circuit, refer to Typical Application.

- **RN5RFxxB**

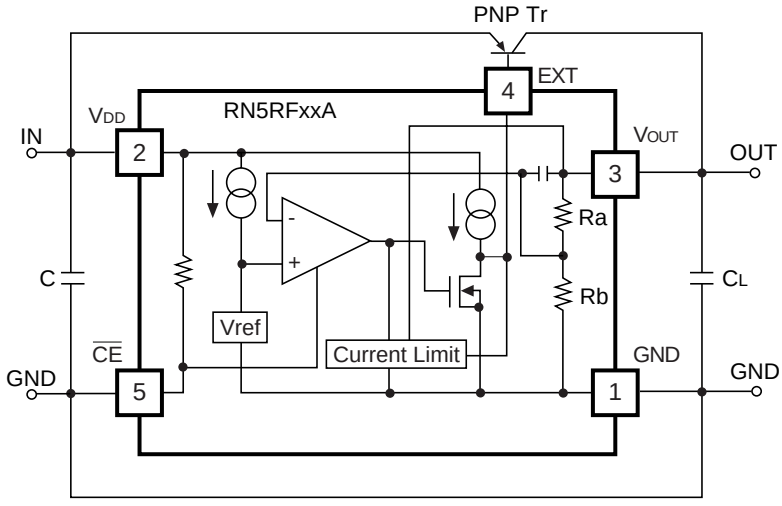
Topt=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	V_{IN}-V_{OUT}=1.0V I_{OUT}=50mA	V_{OUT} ×0.98		V_{OUT} ×1.02	V
I_{OUT}	Output Current	V_{IN}-V_{OUT}=1.0V		1.0[*1]		A
I_{EXT}	EXT Current	V_{IN}=4.0V, V_{EXT}=2.0V	5	8	15	mA
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	V_{IN}-V_{OUT}=1.0V 1mA≤I_{OUT}≤100mA	-60		60	mV
V_{DIF}	Dropout Voltage	I_{OUT}=100mA		0.1	0.2	V
I_{SS}	Supply Current	V_{IN}–V_{OUT}=1.0V I_{OUT}=0mA		30	50	μA
Istandby	Standby Current	V_{IN}=10.0V	0.01	0.10	1.00	μA
$I_{EXTleak}$	EXT Leakage Current				0.5	μA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	I_{OUT}=50mA V_{OUT}+0.5V≤V_{IN}≤10V	0.00	0.05	0.30	%/V
R_R	Ripple Rejection	f=1kHz, sinusoidal 0.5Vp-p V_{IN}–V_{OUT}=1.0V		60		dB
V_{IN}	Input Voltage				10	V
V_{EXT}	EXT Output Voltage				10	V
$\Delta V_{OUT}/\Delta Topt$	Output Voltage Temperature Coefficient	I_{OUT}=10mA -40°C≤Topt≤85°C		±100		ppm/°C
R_{PD}	Pull down resistance for CE pin			4		MΩ
V_{CEH}	CE Input Voltage "H"		1.5		V_{IN}	V
V_{CEL}	CE Input Voltage "L"		0.00		0.25	V

*1) The output current depends on the performance of external PNP transistor. Use External PNP transistor of a low saturation type, with an h_{FE} between 100 and 300.

*) With respect to Test Circuit, refer to Typical Application.

OPERATION

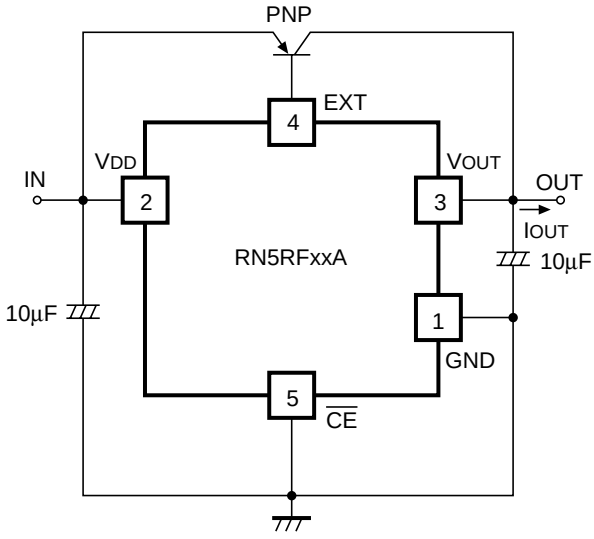


In these ICs, Output Voltage V_{OUT} is detected by feed-back resistors, R_A and R_B and the detected output voltage is com-pared with a reference voltage by the error amplifier so that the base current of an external PNP Transistor can be adjusted and the output voltage V_{OUT} is able to be regulated.

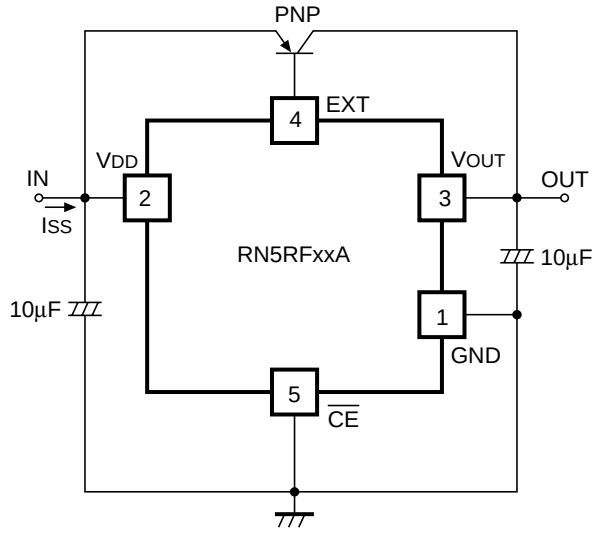
The base current of an external Tr. is monitored and controlled by an internal base current limit circuit to keep current within a proper range. Furthermore, the other current limit circuit prevents a problem which is that a base current increases sharply when an input voltage, V_{IN} becomes lower than set output voltage.

Notes on selecting external components
(1) On external PNP transistor Be careful of output current, input voltage and power dissipation of an external PNP Transistor. External PNP Transistor with a low V_{CE} (sat) and an h_{FE} between 100 and 300 is suitable.
(2) On phase compensation in these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, be sure to use a capacitor C_L (tantalum type) with a capacitance of 10μF of more. There may be the case the loop oscillation takes place when a tantalum capacitor C_L with a large ESR is used, so select the C_L carefully with considering the frequency characteristics also.

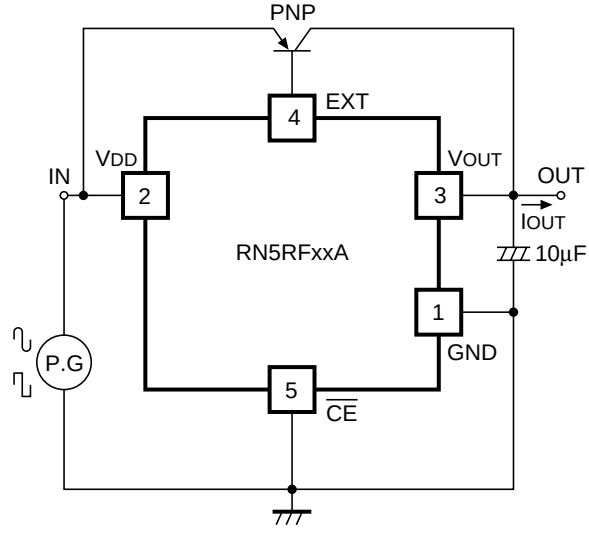
TEST CIRCUITS



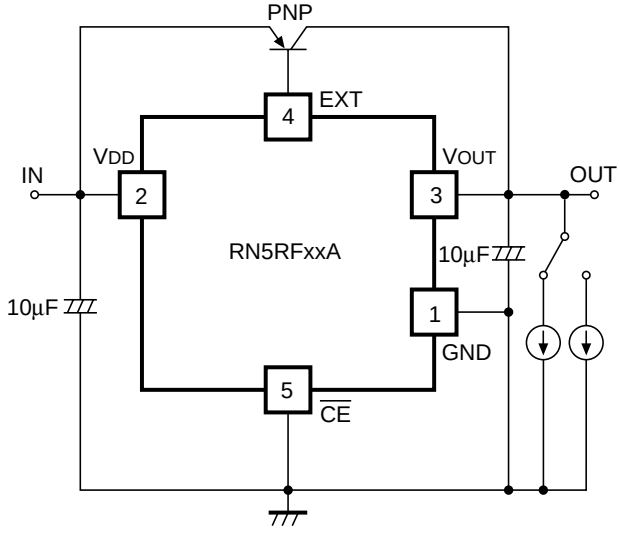
Basic Test Circuit



Test Circuit for Supply Current



Test Circuit for Ripple Rejection and Line Transient Response

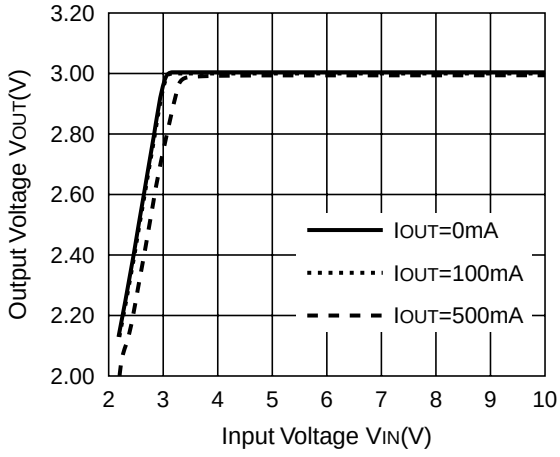


Test Circuit for Load Transient Response

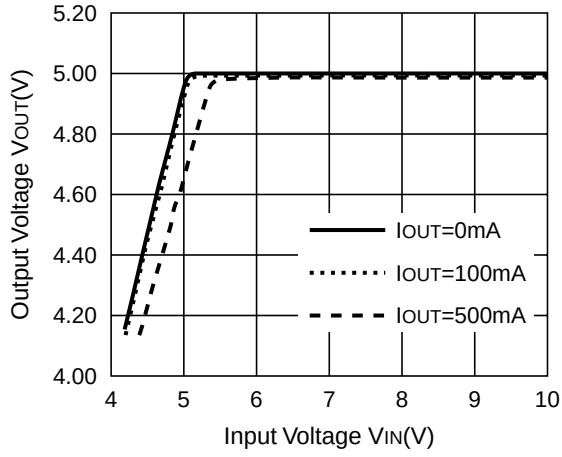
TYPICAL CHARACTERISTICS

1) Output Voltage vs. Input Voltage (Topt=25°C)

RN5RF30A

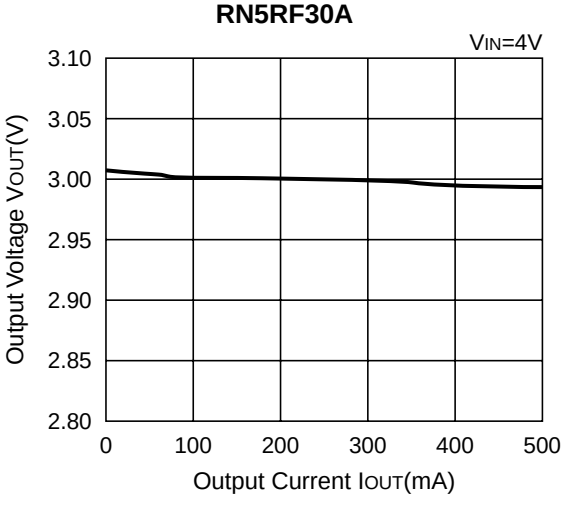


RN5RF50A

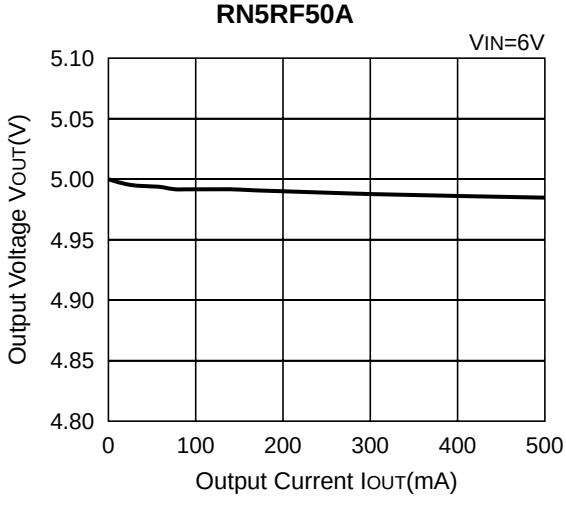


2) Output Voltage vs. Output Current (Topt=25°C)

RN5RF30A

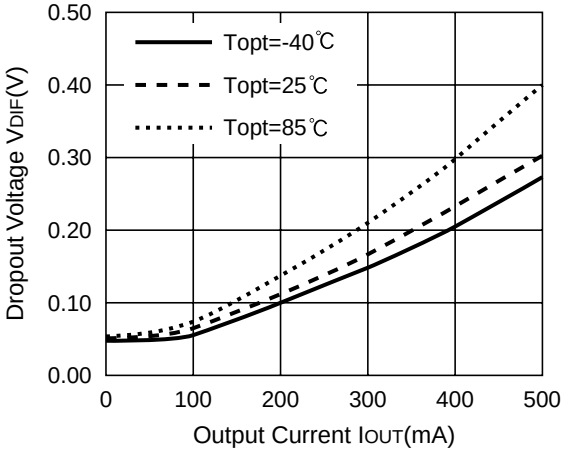


RN5RF50A

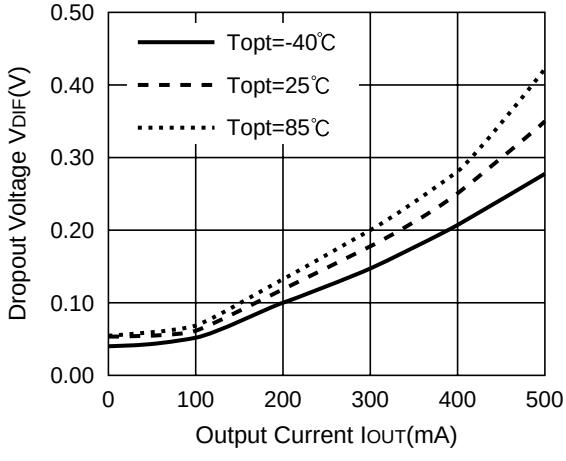


3) Dropout Voltage vs. Output Current

RN5RF30A

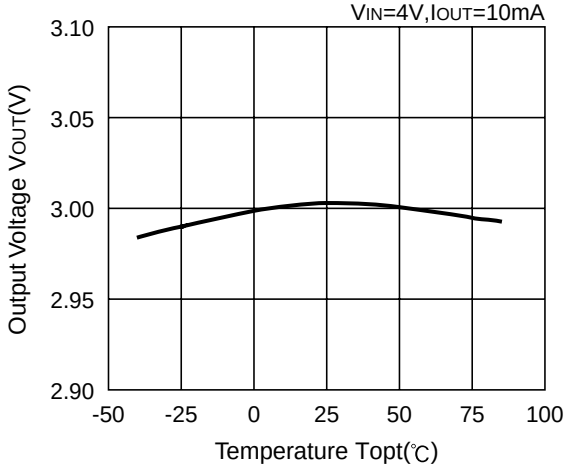


RN5RF50A

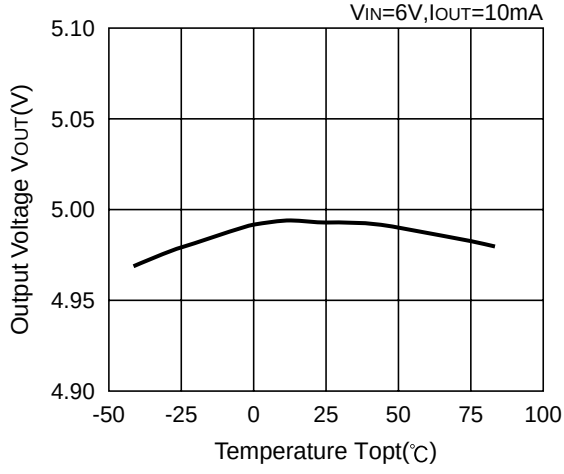


4) Output Voltage vs. Temperature

RN5RF30A

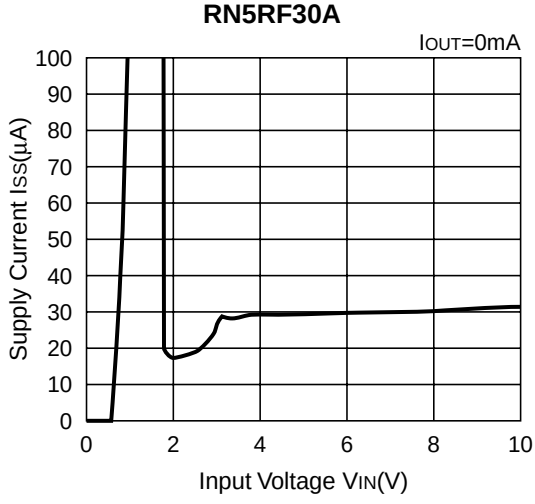


RN5RF50A

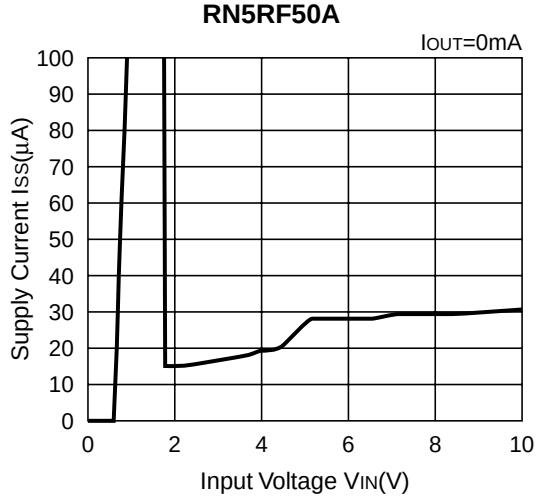


5) Supply Current vs. Input Voltage (Topt=25°C)

RN5RF30A

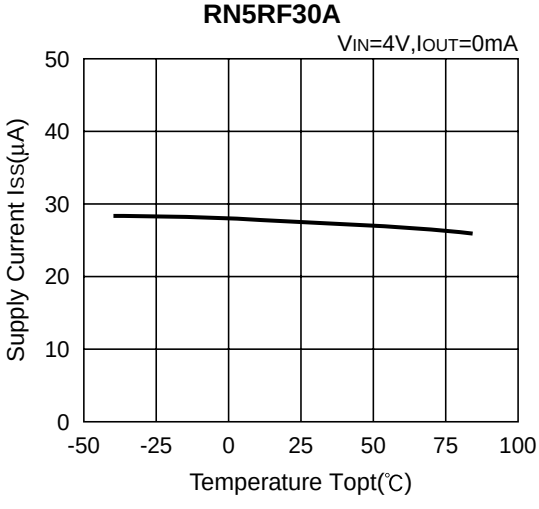


RN5RF50A

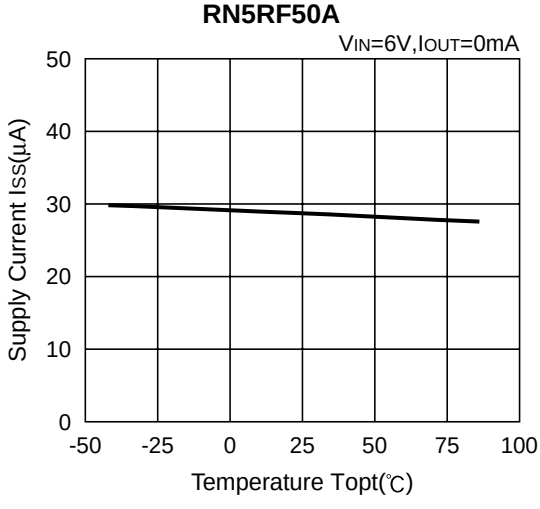


6) Supply Current vs. Temperature

RN5RF30A

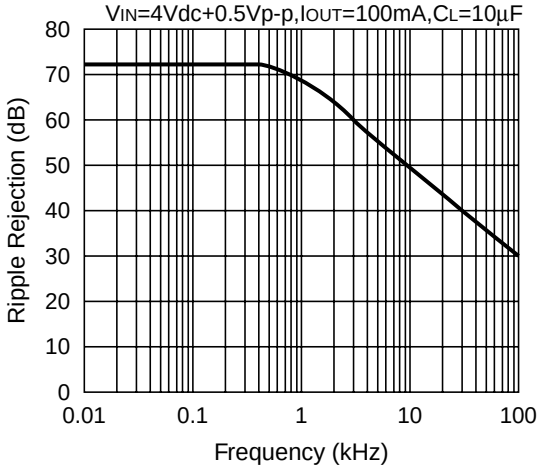


RN5RF50A

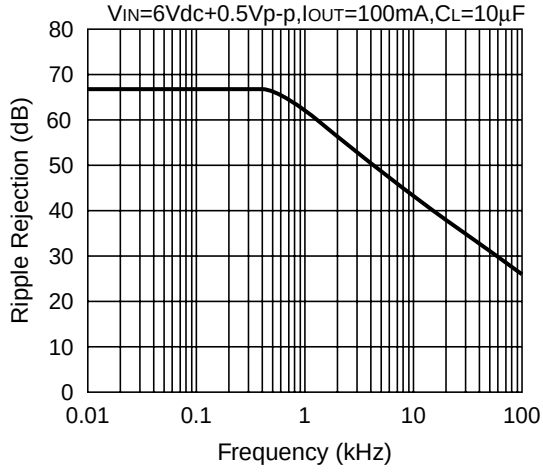


7) Ripple Rejection vs. Frequency (Topt=25°C)

RN5RF30A

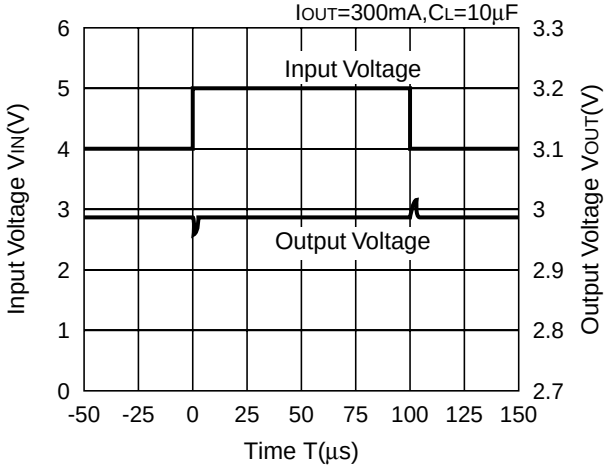


RN5RF50A

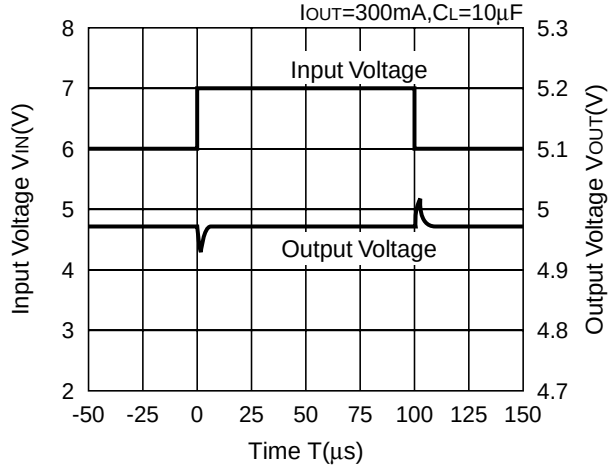


8) Line Transient Response (Topt=25°C)

RN5RF30A

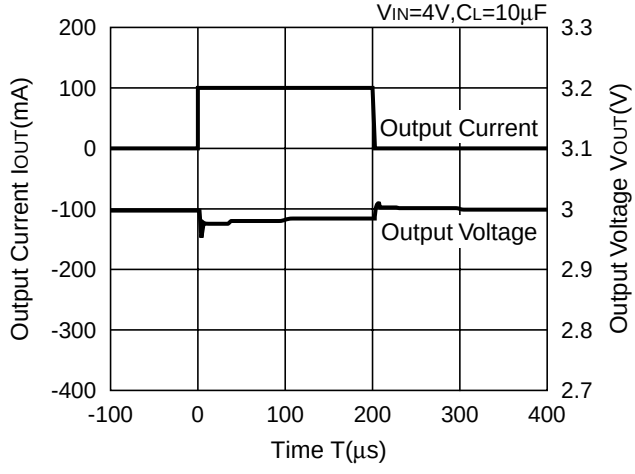


RN5RF50A

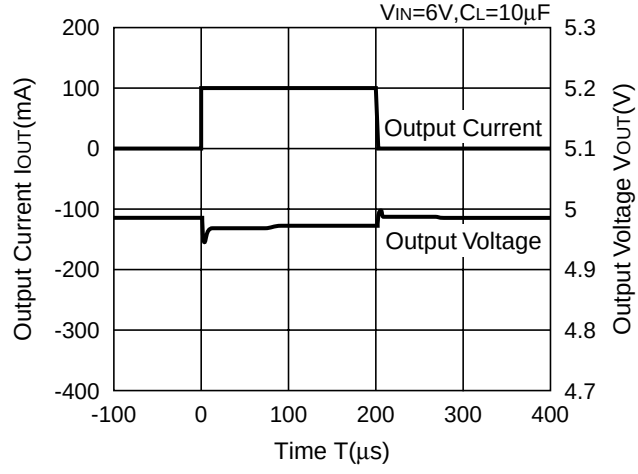


9) Load Transient Response (Topt=25°C)

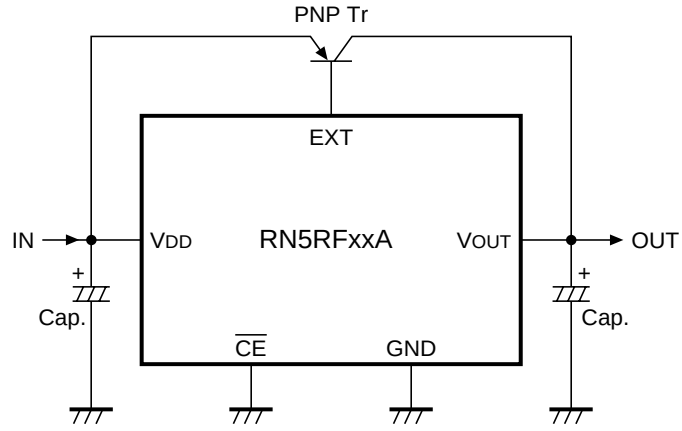
RN5RF30A



RN5RF50A



TYPICAL APPLICATION



Components

Transistor: 2SB766A

Capacitor: 10µF (Tantalum type)

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 our 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 our company.
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 our company'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 our sales or our distributor before attempting to use AOI.
11. Please contact our sales representatives should you have any questions or comments concerning the products or the technical information.

NISSHINBO

Nisshinbo Micro Devices Inc.

Official website
https://www.nisshinbo-microdevices.co.jp/en/
Purchase information
https://www.nisshinbo-microdevices.co.jp/en/buy/

ENTEGRECİ

Bu belge www.entegreci.com üzerinden sunulmaktadır.

Elektronik komponent tedarikinde Entegreci

Entegreci, Eskişehir merkezli, Türkiye geneline satış yapan bir elektronik komponent mağazasıdır. Entegreler (IC), mikrodenetleyiciler, transistörler, diyotlar, pasif elemanlar, konnektörler, modüller ve geliştirme kartları tek adetten seri üretim adetlerine kadar satılır. Ürün sayfalarında güncel stok durumunu, fiyatı ve datasheet bağlantısını bulabilirsiniz.

Parça koduyla arama

Üretici parça numarasını yazın; stok ve fiyatı hemen görün.

www.entegreci.com

Ürün kategorileri

Entegreden kapasitöre tüm elektronik komponent kategorileri.

Kategorilere göz atın

Üreticiler

Aradığınız üreticinin ürünlerini tek sayfada inceleyin.

Üreticileri görün

Toplu alım ve teklif

Listede olmayan ya da yüksek adetli parçalar için teklif isteyin.

Teklif isteyin

www.entegreci.com | **destek@entegreci.com** | **0850 305 90 34**

Entegreci is an online electronic components store based in Türkiye. Search by manufacturer part number to see stock, prices and datasheets for integrated circuits, microcontrollers, transistors, passive components and connectors, or request a quote for parts that are not listed.

Bu sayfa Entegreci tarafından eklenmiştir. Belgenin önceki sayfaları asıl yayıncısına aittir ve içeriği değiştirilmemiştir; en güncel sürüm için belgenin yayıncısına başvurun.