R2A20101BM/NP

Monolithic Synchronous Step-Down DC/DC Converter

REJ03D0790-0300
Rev.3.00
May 14, 2008

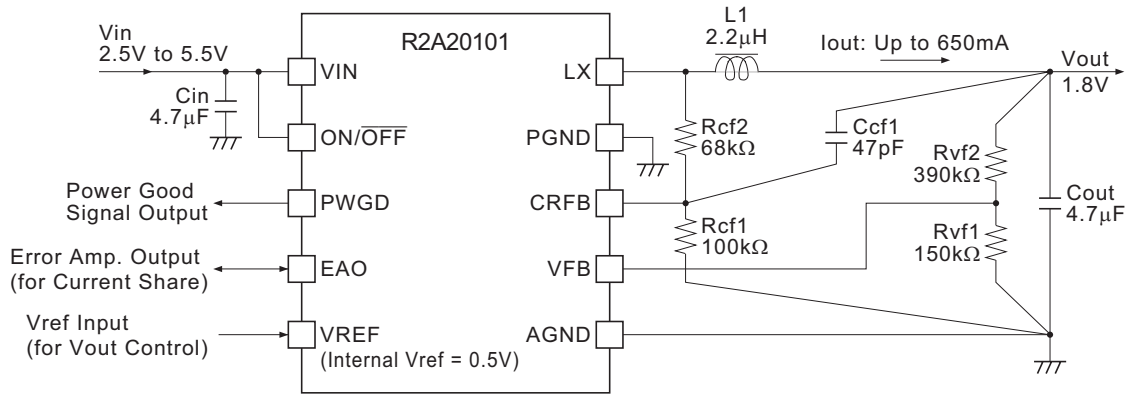
Features

- Built-in low Ron power MOS FETs
  Pch Ron = 0.30 Ω (Typ), Nch Ron = 0.14 Ω (Typ)
- High switching frequency: 2 MHz (Max)
- Output current: 650 mA (Max)
- Output ON/OFF control
- Vout control
- Power good monitor
- Current share for redundant power supply operation
- Vout = 0.5 V to (VIN – 0.5) V

Application

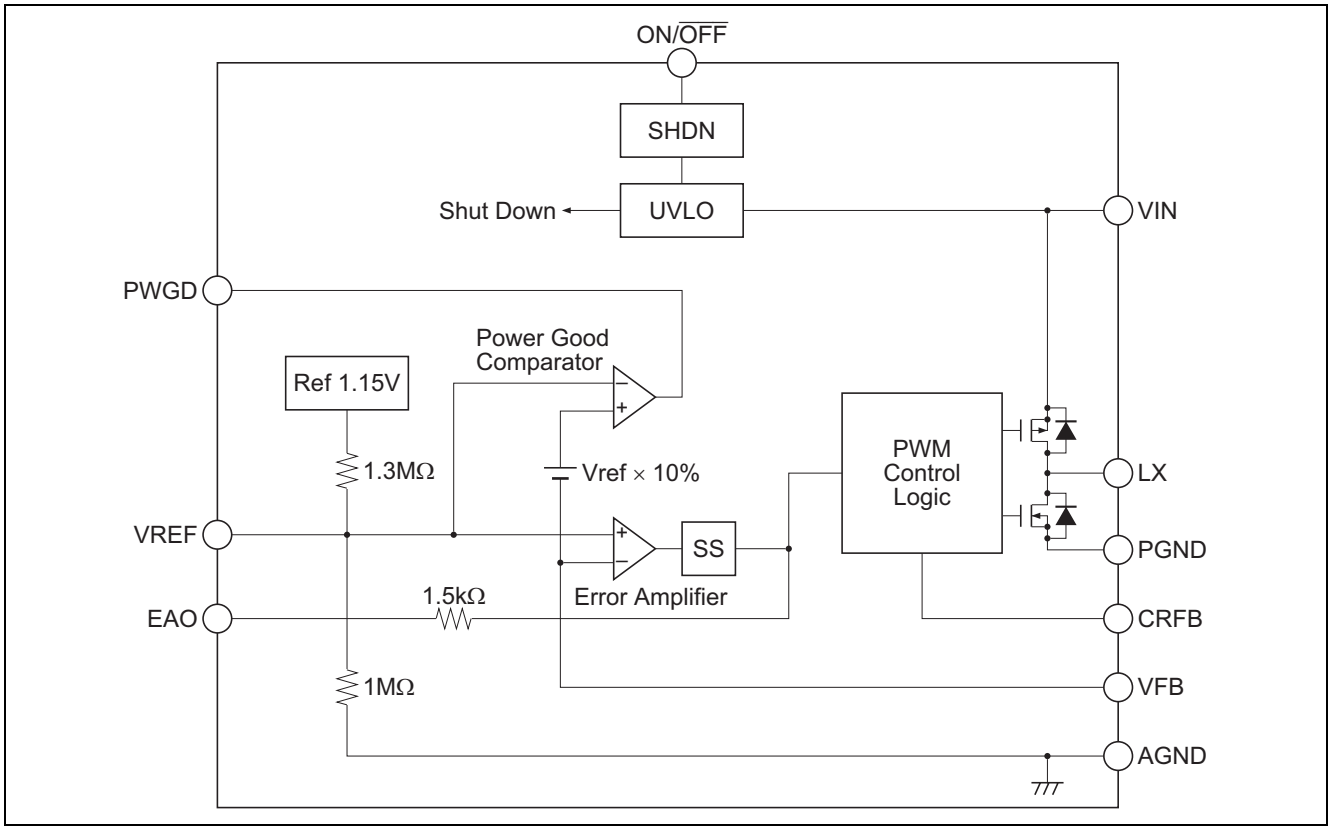
- POL (Point of Load) power supplies
- Power supply for microcomputer systems
  MCU-Core, I/O, Memory (DDR, SRAM, FLASH, HDD, etc.), FPGA, DSP, Graphic Processor
- Battery powered equipment systems
  Cellular phone (CDMA power amplifier, MCU, DSP, ASIC), PDA, Digital camera, Portable game, Handy terminal

Operating Circuit Example



Notes: 1. All ceramic capacitor
2. Rcf1 : Rcf2(recommend) = 3 : 2
3. fsw is adjustable by Ccf1, Rcf1, and Rcf2.

Block Diagram



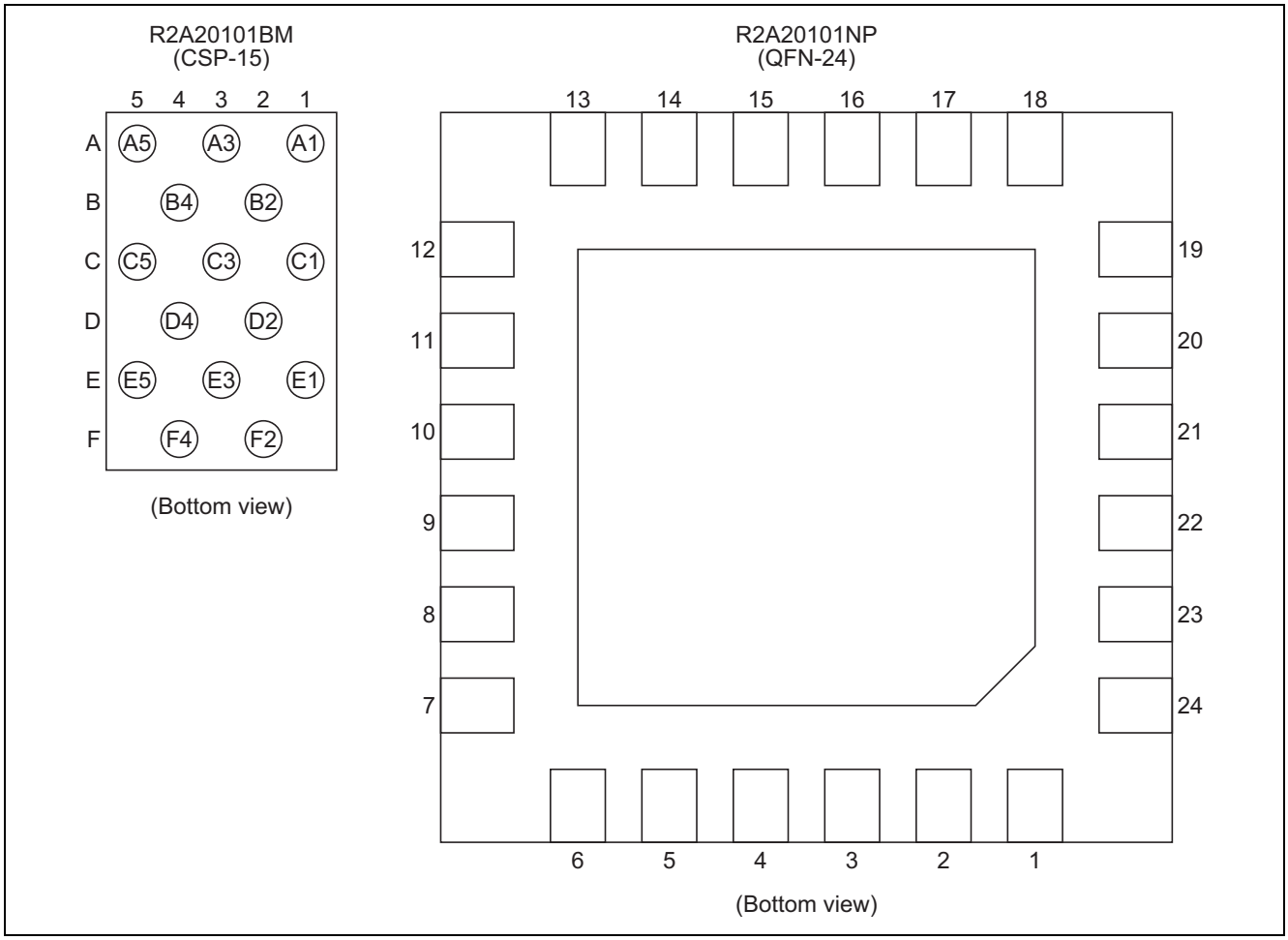
Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit	Note
Power supply voltage	V_{IN}	6	V	1
ON/$\overline{OFF}$, PWGD, EAO, VREF, LX, CRFB, VFB terminal voltage	V_{MAX}	–0.3 to (V_{IN} + 0.3)	V	1
PGND terminal voltage	V_{PGND}	–0.3 to +0.3	V	1
Operating ambient temperature	Topr(Ta)	–40 to +85	°C	
Junction temperature 1	Tjmax1	+125	°C	
Junction temperature 2	Tjmax2	+150	°C	2
Storage temperature	Tstg	–55 to +150	°C	

Notes: 1. Rated voltages are with reference to the AGND pin.
2. Operation by Tjmax2 is made within 24 hours through life.

Pin Arrangement



Pin Description

Pin No.		Pin Name	Pin Function
R2A20101BM (CSP-15)	R2A20101NP (QFN-24)		
A1, A3, A5	15, 16, 17	PGND	Power ground
B2, B4	11, 20	LX	Inductor connection node
C1, C3, C5	10, 21	VIN	Power supply voltage input
D4	22	ON/$\overline{\text{OFF}}$	Output on/off control input
D2	9	CRFB	CR feedback input
E5	23	PWGD	Power good monitor output
E1	8	VFB	Feedback voltage input
F4	2	EAO	Error amplifier output (for current share)
E3	5	VREF	Vout control voltage input
F2	4	AGND	Analog ground (IC chip ground voltage)

Note: Please apply solder to pins 1, 3, 6, 7, 12, 13, 14, 18, 19, and 24 even though they are NC pins. Solder on the underside pads improves heat-radiation characteristics.

Electrical Characteristics

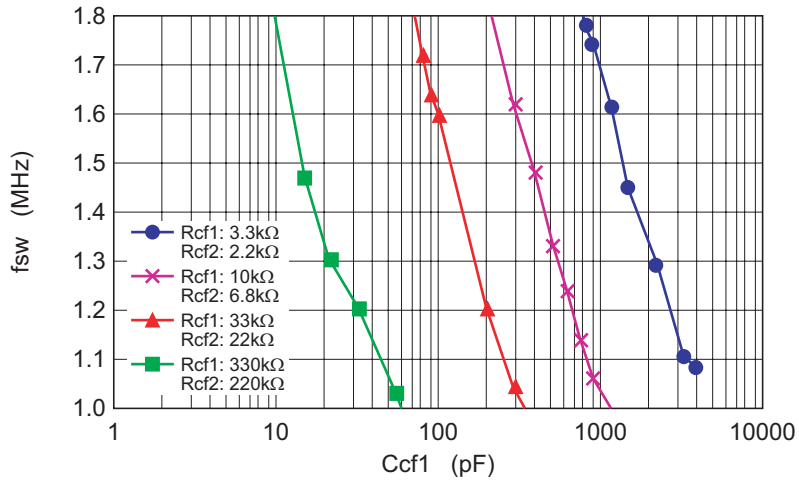
(Ta = 25°C, Vin = 3.6 V, ON/$\overline{\text{OFF}}$ = Vin, unless otherwise specified.)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input voltage range	Vin	2.5	—	5.5	V	
UVL threshold high	Vuvl-Hi	2.0	2.3	2.5	V	VFB = CRFB = GND, Vin = rising
UVL hysteresis	Vuvl-Hys	0.15	0.22	0.29	V	
Quiescent supply current	Iss	20	45	80	μA	
Shutdown supply current	Ishdn	—	0.0	1.0	μA	ON/$\overline{\text{OFF}}$ = 0V
Reference voltage	Vref	0.485	0.500	0.515	V	
Vref line regulation	dVref/dVin	(–0.4)	0.1	(0)	%/V	Vin = 2.5 to 5.5V
Vref temperature stability	dVref/dTa	—	(±100)	—	ppm/°C	Ta = –40 to +85°C
VREF sink current	Ivref-sink	1.3	3.7	8.0	μA	Vref = 2.5V
VREF source current	Ivref-source	0.3	0.9	2.0	μA	Vref = 0V
VFB leakage current	Ileak-VFB	–1	0	+1	μA	VFB = 1/2 × Vin
Pch FET on resistance	Ron-Pch	—	0.30	0.50	Ω	VFB = CRFB = 0V, ILX = –100mA
Nch FET on resistance	Ron-Nch	—	0.14	0.25	Ω	VFB = CRFB = Vin, ILX = 100mA
Pch FET leakage current	Ileak-Pch	—	—	1.0	μA	ON/$\overline{\text{OFF}}$ = 0V, LX = 0V
Nch FET leakage current	Ileak-Nch	—	—	1.0	μA	ON/$\overline{\text{OFF}}$ = 0V, LX = Vin
Peak current limit	Ipeak-Limit	0.7	—	—	A	
ON/$\overline{\text{OFF}}$ threshold high	Von/off-Hi	1.0	1.45	1.85	V	ON/$\overline{\text{OFF}}$ = rising
ON/$\overline{\text{OFF}}$ threshold low	Von/off-Lo	0.75	1.24	1.65	V	ON/$\overline{\text{OFF}}$ = falling
ON/$\overline{\text{OFF}}$ leakage current	Ileak-on/off	–1	0	+1	μA	ON/$\overline{\text{OFF}}$ = Vin
ON/$\overline{\text{OFF}}$ input current	Iinput-on/off	—	1.4	5	μA	ON/$\overline{\text{OFF}}$ = 0.9V
Switching frequency	fsw	Adjustable by external Ccf1, Rcf1, Rcf2			Hz	
Soft start time	tss	56 × Rcf1/(Rcf1 + Rcf2) × Vout			μs	
Power good threshold	Vth-PGood	(–15)	–10	(–5)	%	Vref = 0.5V
Power good VOL	Ipg-VOL	20	—	—	μA	PWGD = 0.2V, VFB = 0V
Power good VOH	Ipg-VOH	–10	—	—	μA	PWGD = 3.4V, VFB = 0.5V
Output voltage load regulation	dVout/dIout	—	±0.7	—	%/A	L = 2.2μH, Vout = 1.8V, Iout = 0 to 650mA

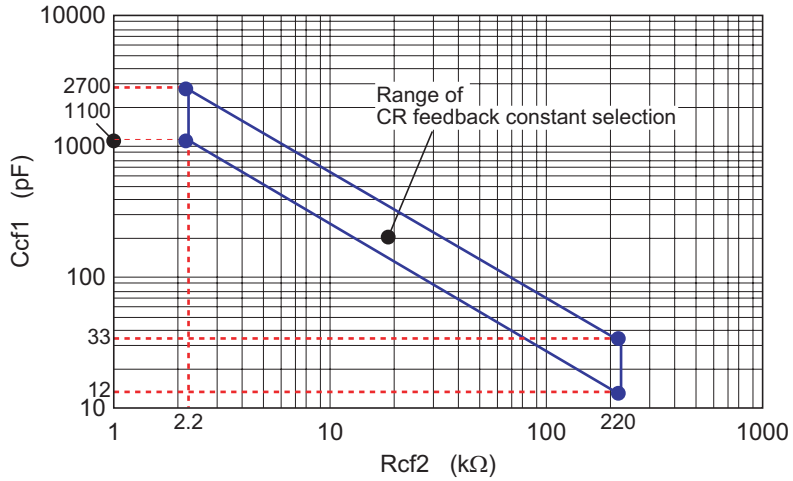
Note: ( ) is design spec.

Main Characteristics

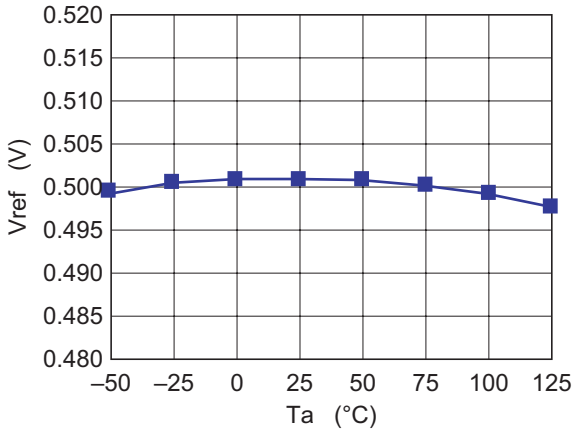
CR Feedback Constant vs. Switching Frequency



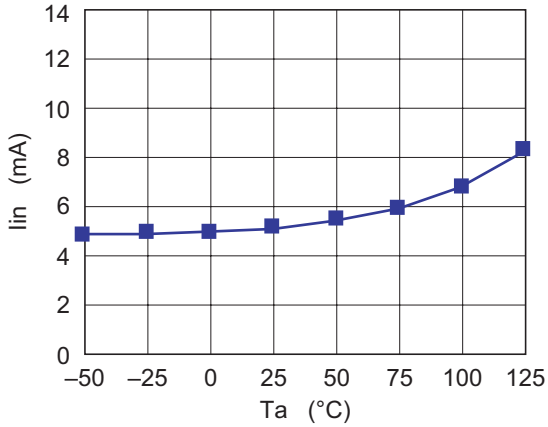
Range of CR Feedback Constant Selection



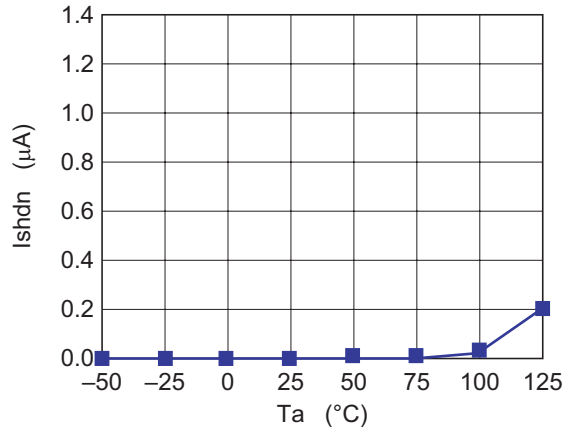
Reference Voltage vs. Ambient Temperature



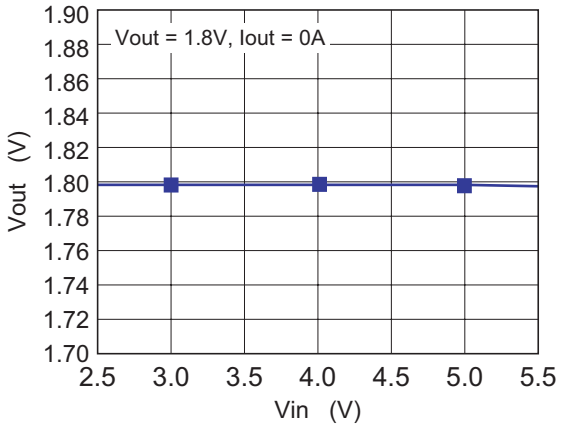
Switching Operating Current vs. Ambient Temperature



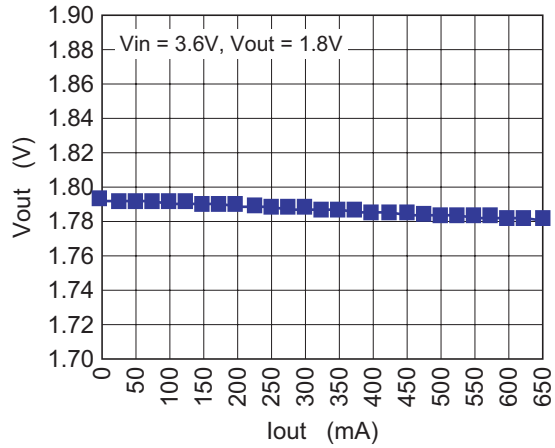
Shutdown Current vs. Ambient Temperature



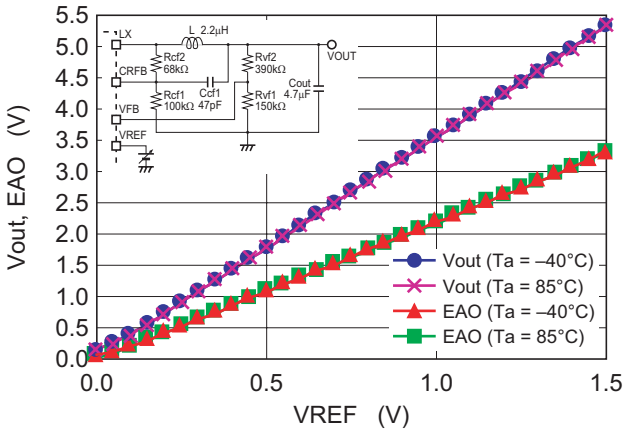
Vout Line Regulation



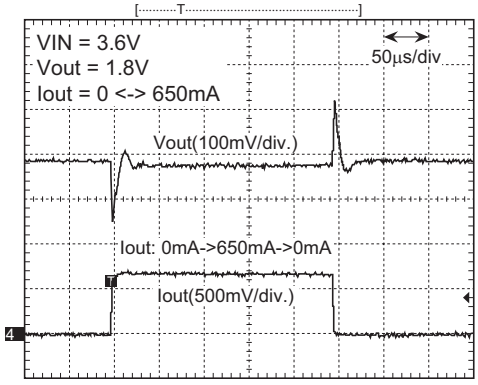
Vout Load Regulation



VREF Impressed Voltage vs. Vout

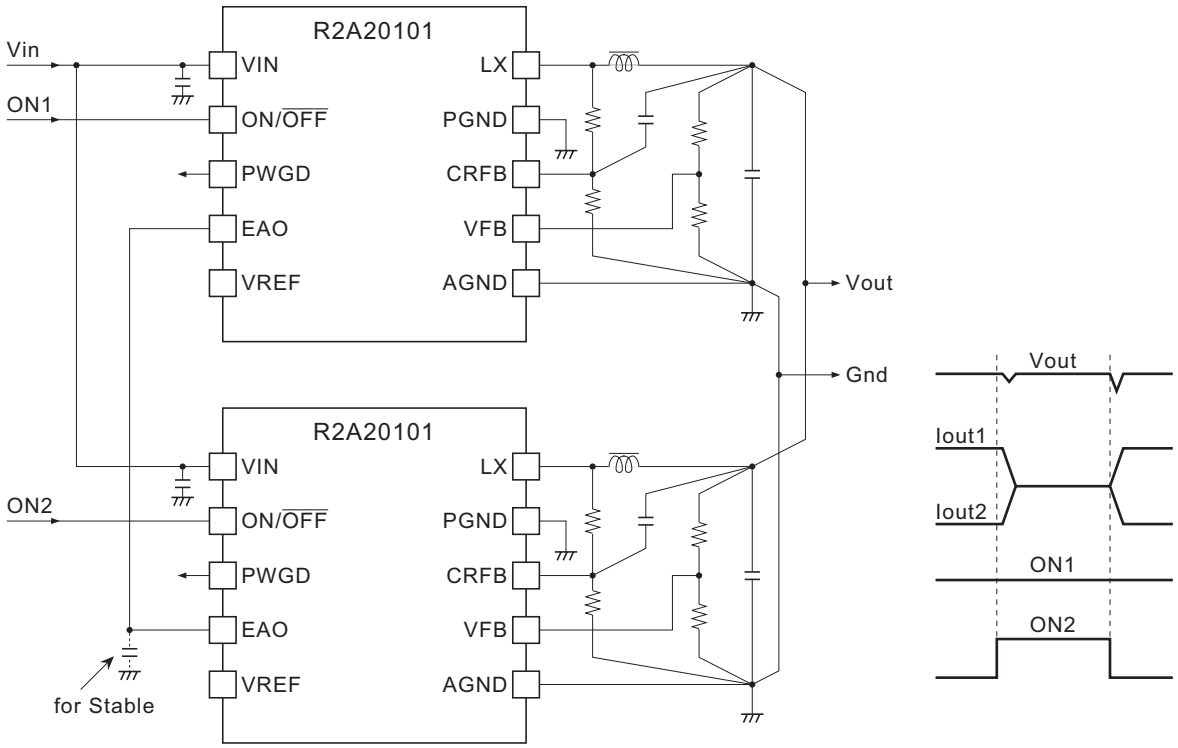


Transient Response Characteristics



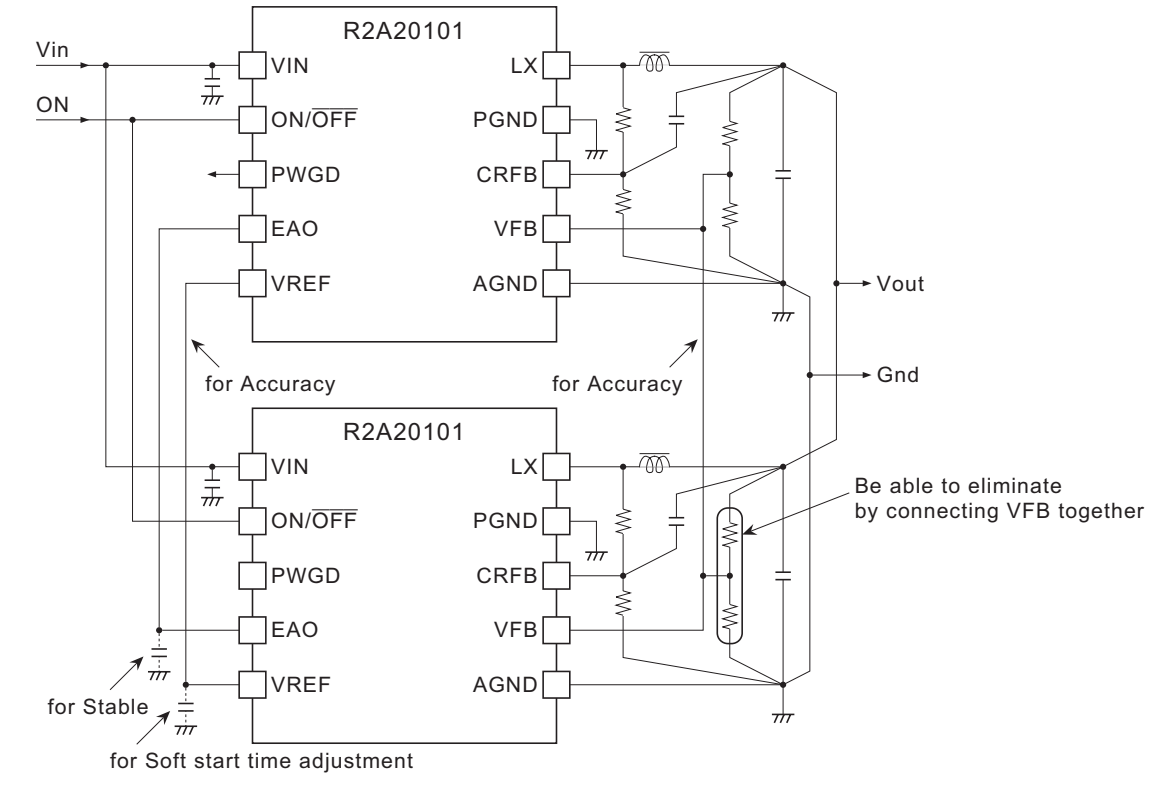
Application Circuit Example

1. Current Share 1 (Redundant, Hot Swap type)



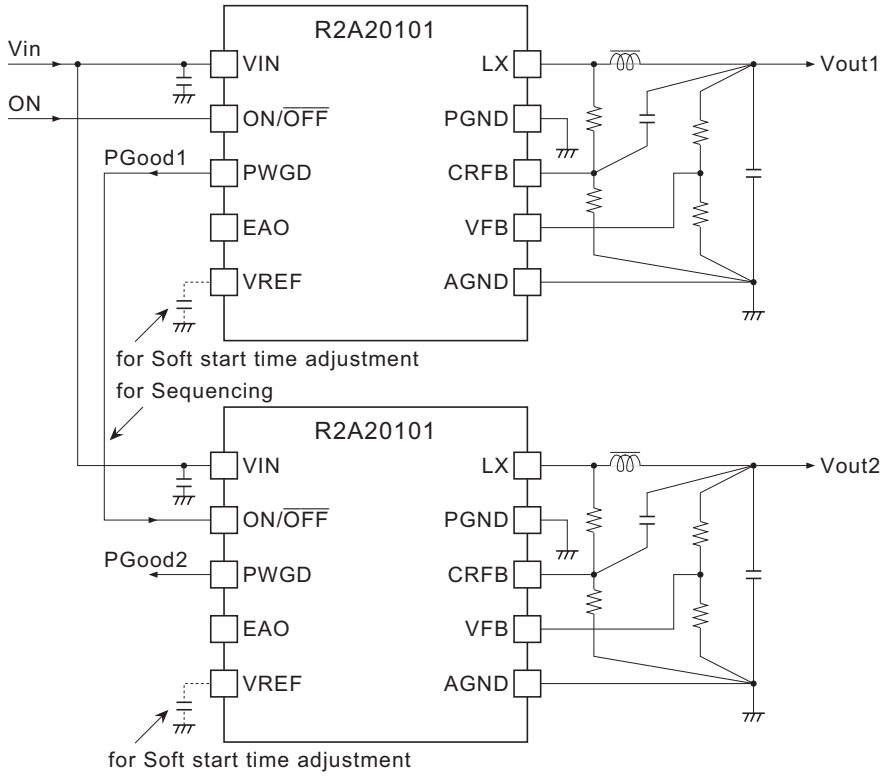
Note: Dotted line is not always necessary.

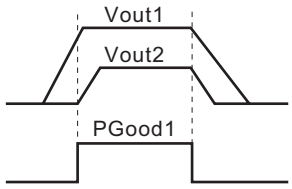
2. Current Share 2 (Accuracy type)



Note: Dotted line is not always necessary.

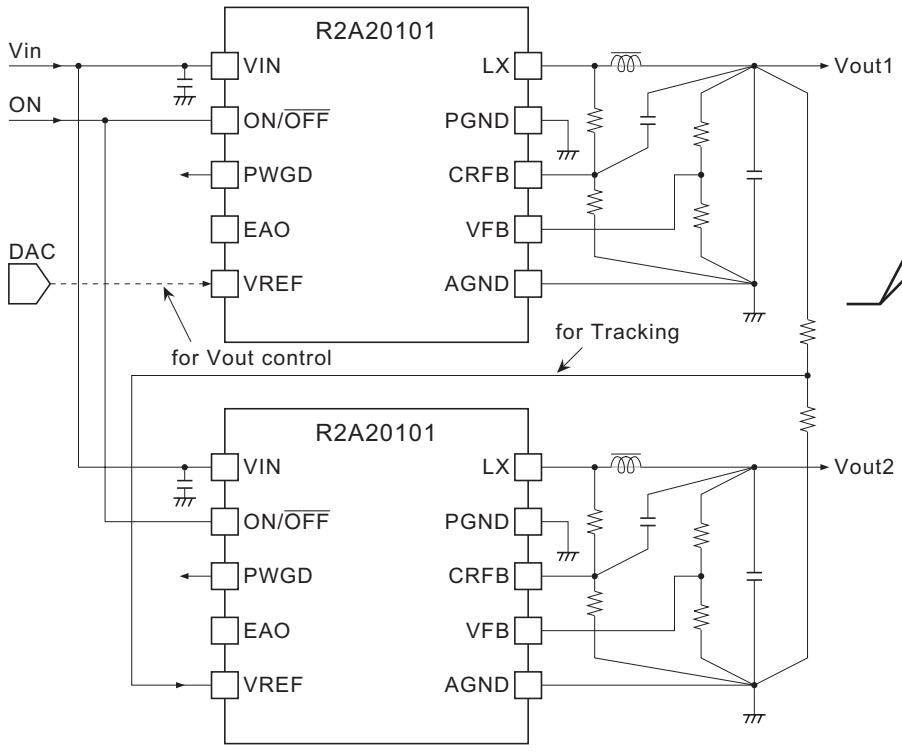
3. Sequential Start-up

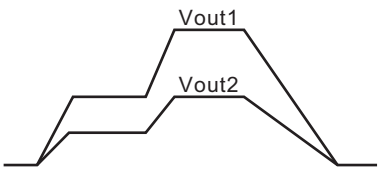




Note: Dotted line is not always necessary.

4. Tracking



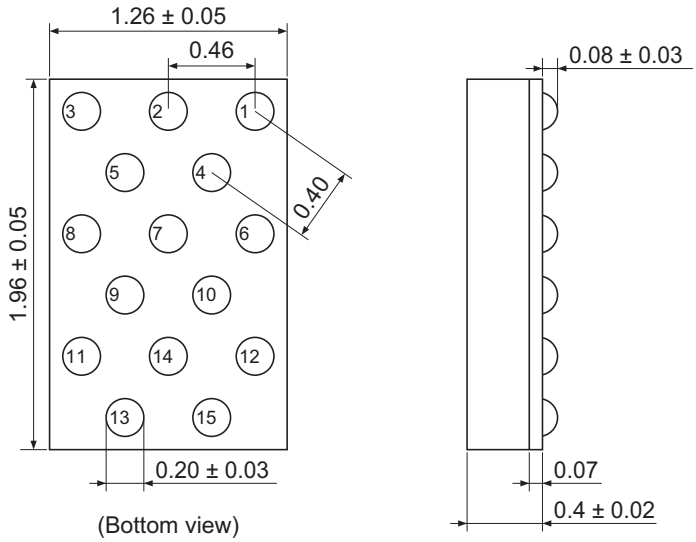


Note: Dotted line is not always necessary.

Package Dimensions

Preliminary

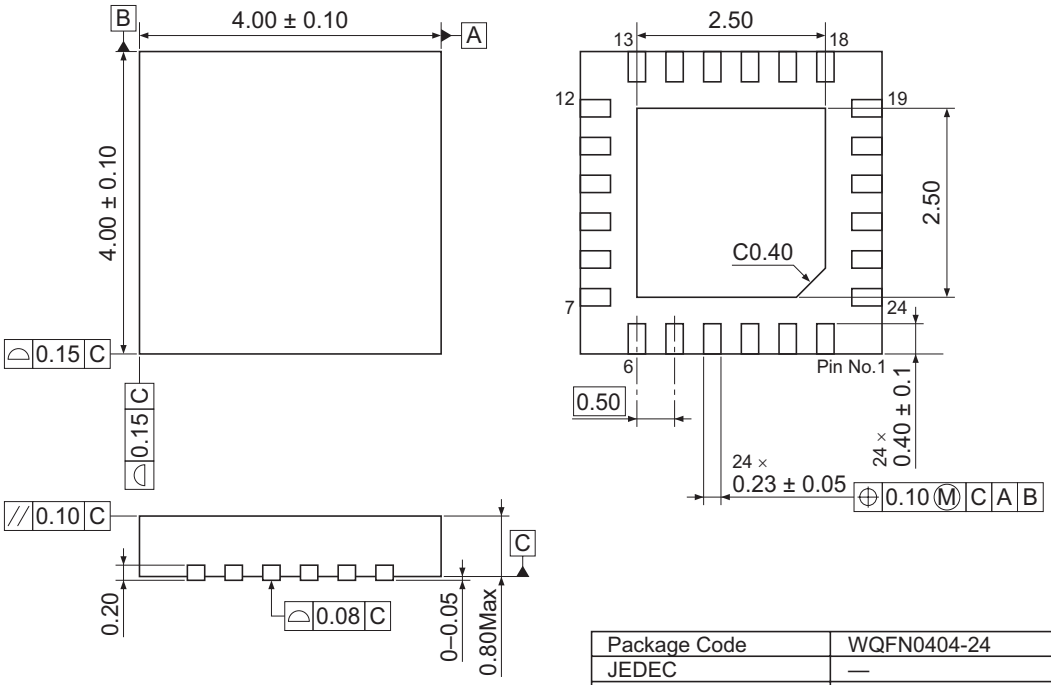
Unit: mm



Package Code	CSP-15
JEDEC	—
JEITA	—
Mass (reference value)	—

Preliminary

Unit: mm



Package Code	WQFN0404-24
JEDEC	—
JEITA	—
Mass (reference value)	—

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