

1.5A LDO REGULATOR FOR AUTOMOTIVE APPLICATIONS

NO. EC-125-140213

OUTLINE

The R1171x Series are CMOS-based positive voltage regulator ICs. The R1171x Series have features of low dropout voltage, high output voltage accuracy, low consumption current. Each of these ICs consists of a voltage reference unit, an error amplifier, resistor net for setting output voltage, a current limit circuit at short mode, a chip enable circuit, and thermal shutdown circuit. The output voltage of R1171x is fixed in the IC.

Low consumption current by the merit of CMOS process and built-in transistors with low ON-resistance make low dropout voltage and chip enable function prolongs the battery life. These regulators are remarkable improvement on the current regulators in terms of input transient response, and load transient response.

Thus, the R1171x Series are suitable for various power sources.

The R1171x Series are available in HSOP-6J package which supports high wattage.

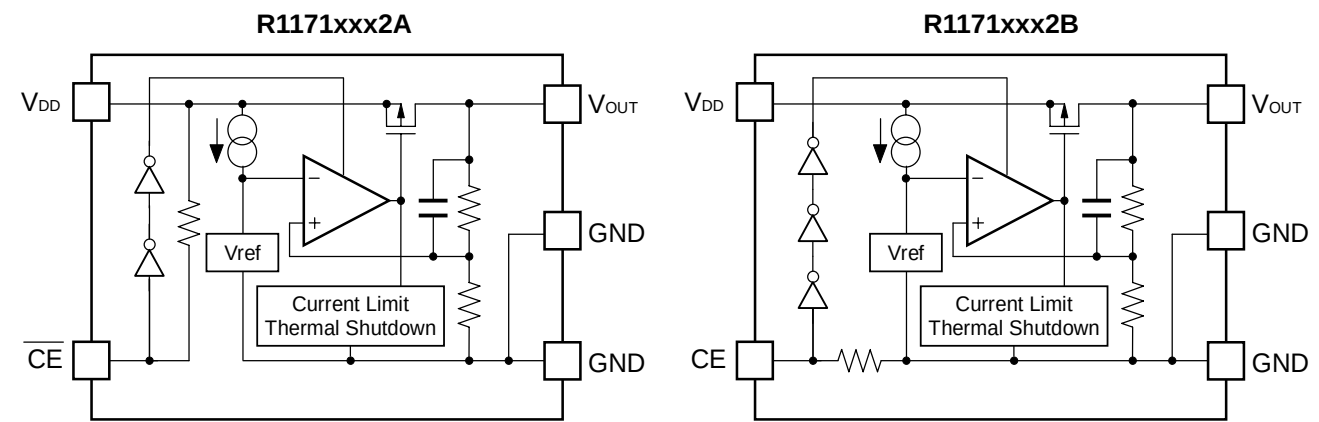
FEATURES

- Input Voltage (Maximum Rating)..... 2.1V to 6.0V (7.0V)
- Supply Current..... Typ. 130 μ A
- Standby Current..... Typ. 0.1 μ A
- Output Current..... Min. 1.5A ($V_{IN}=V_{OUT}+1.0V$)
- Output Voltage..... 1.5V to 5.0V (0.1V steps) , 1.85V, and 2.85V
- Ripple Rejection..... TYP. 50dB
- Output Voltage Accuracy..... $\pm 2.0\%$
- Dropout Voltage..... Typ. 0.09V ($V_{OUT}=3.0V$, $I_{OUT}=300mA$)
- Output Voltage Temperature Coefficient..... Typ. $\pm 100ppm/^{\circ}C$
- Line Regulation..... Typ. 0.05%/V
- Packages..... HSOP-6J
- Built-in Current Limit Circuit
- Built-in Thermal Shutdown Circuit
- Ceramic capacitor for phase compensation $C_{IN}=C_{OUT}$ =Ceramic 10 μ F ($V_{OUT}<1.8V$)
 $C_{IN}=C_{OUT}$ =Ceramic 4.7 μ F ($V_{OUT} \geq 1.8V$)

APPLICATIONS

- Power source for car accessories including car audio equipment, car navigation system, and ETC system.

BLOCK DIAGRAMS



SELECTION GUIDE

The output voltage, chip enable polarity, package for the ICs can be selected at the user’s request.

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R1171Sxx2*(y)-E2-#E	HSOP-6J	1,000 pcs	Yes	Yes

xx: The Set Output Voltage (V_{SET}) can be designated in the range from 1.5V(15) to 5.0V(50) in 0.1V steps.

y: If the output voltage includes the 3rd digit, indicate the digit of 0.01V. (1.85V, 2.85V)

Ex. If the output voltage is 1.85V, R1171S182*5-E2-AE.

 If the output voltage is 2.85V, R1171S282*5-E2-AE.

* : CE pin polarity is options as follows.

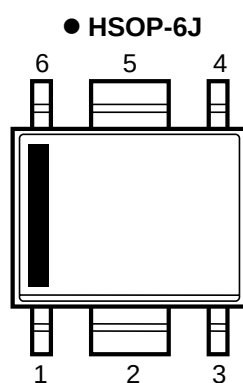
 (A) "L" active

 (B) "H" active

: Specify the automotive class code.

	Operating Temperature Range	Guaranteed Specs Temperature Range	Screening
A	-40°C to 85°C	25°C	High Temperature

PIN CONFIGURATIONS



PIN DESCRIPTIONS

HSOP-6J

Pin No	Symbol	Pin Description
1	V_{OUT}	Output Pin
2	GND^{*1}	Ground Pin
3	$\overline{CE}$ or CE	Chip Enable Pin
4	GND^{*1}	Ground Pin
5	GND^{*1}	Ground Pin
6	V_{DD}	Input Pin

^{*1} No.2, No.4 and No.5 pins must be connected to the ground plane on the board.

ABSOLUTE MAXIMUM RATINGS

Symbol	Item		Rating	Unit
V_{IN}	Input Voltage		7.0	V
V_{CE}	Input Voltage ($\overline{CE}$ or CE Input Pin)		-0.3 to $V_{IN}+0.3$	V
V_{OUT}	Output Voltage		-0.3 to $V_{IN}+0.3$	V
P_D	Power Dissipation (HSOP-6J)* ¹	Standard Land Pattern	1700	mW
		High Wattage Land Pattern	2000	
T_j	Junction Temperature		-40 to 125	°C
T_{stg}	Storage Temperature		-55 to 125	°C

*¹ 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 RATINGS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	2.1 to 6.0	V
T_a	Operating Temperature Range	-40 to 85	°C

RECOMMENDED OPERATING RATINGS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating ratings. The semiconductor devices cannot operate normally over the recommended operating ratings, even if when they are used over such ratings by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating ratings.

ELECTRICAL CHARACTERISTICS

$V_{IN} = V_{SET} + 1.0V$, $1.5V \leq V_{SET} < 1.8V$: $C_{IN} = C_{OUT} = 10\mu F$, $1.8V \leq V_{SET} \leq 5.0V$: $C_{IN} = C_{OUT} = 4.7\mu F$, unless otherwise noted.
The specifications surrounded by are guaranteed by design engineering at $-40^{\circ}C \leq T_a \leq 85^{\circ}C$.

• R1171xxx2A

$T_{opt} = 25^{\circ}C$

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	$I_{OUT} = 200mA$	×0.98		×1.02	V
I_{LIM}	Output Current Limit		1500			mA
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	$1mA \leq I_{OUT} \leq 300mA$		10	60	mV
V_{DIF}	Dropout Voltage	$I_{OUT} = 300mA$	Refer to the <i>Product-specific Electrical Characteristics</i>			
I_{SS}	Supply Current			130	320	μA
$I_{standby}$	Standby Current	$V_{CE} = V_{IN}$		0.1	2.0	μA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	$I_{OUT} = 200mA$ $2.1V \leq V_{IN} \leq 6.0V$ $(1.5V \leq V_{SET} < 1.6V)$ $V_{OUT} + 0.5V \leq V_{IN} \leq 6.0V$ $(1.6V \leq V_{SET} < 5.0V)$		0.05	0.30	%/V
I_{SC}	Short Current Limit	$V_{OUT} = 0V$		200		mA
R_{PU}	$\overline{CE}$ Pull-up Resistance		2.5	5.0	10.0	$M\Omega$
V_{CEH}	$\overline{CE}$ Input Voltage "H"	$I_{OUT} = 1mA$	1.2		V_{IN}	V
V_{CEL}	$\overline{CE}$ Input Voltage "L"		0		0.25	V
T_{TSD}	Thermal Shutdown Temperature	Junction Temperature		150		$^{\circ}C$
T_{TSR}	Thermal Shutdown Released Temperature	Junction Temperature		120		$^{\circ}C$

All test items listed under Electrical Characteristics are done under the pulse load condition ($T_j \approx T_a = 25^{\circ}C$).

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$V_{IN} = V_{SET} + 1.0V$, $1.5V \leq V_{SET} < 1.8V$: $C_{IN} = C_{OUT} = 10\mu F$, $1.8V \leq V_{SET} \leq 5.0V$: $C_{IN} = C_{OUT} = 4.7\mu F$, unless otherwise noted.
 The specifications surrounded by are guaranteed by design engineering at $-40^{\circ}C \leq T_a \leq 85^{\circ}C$.

- R1171Sxx2B**

Topt=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	$I_{OUT} = 200mA$	×0.98		×1.02	V
I_{LIM}	Output Current Limit		1500			mA
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	$1mA \leq I_{OUT} \leq 300mA$		10	60	mV
V_{DIF}	Dropout Voltage	$I_{OUT} = 300mA$	Refer to the <i>Product-specific Electrical Characteristics</i> .			
I_{SS}	Supply Current			130	320	μA
$I_{standby}$	Standby Current	$V_{CE} = 0V$		0.1	2.0	μA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	$I_{OUT} = 200mA$ $2.1V \leq V_{IN} \leq 6.0V$ $(1.5V \leq V_{SET} < 1.6V)$ $V_{OUT} + 0.5V \leq V_{IN} \leq 6.0V$ $(1.6V \leq V_{SET} < 5.0V)$		0.05	0.30	%/V
I_{SC}	Short Current Limit	$V_{OUT} = 0V$		200		mA
R_{PD}	CE Pull-down Resistance		2.5	5.0	10.0	MΩ
V_{CEH}	CE Input Voltage "H"	$I_{OUT} = 1mA$	1.2		V_{IN}	V
V_{CEL}	CE Input Voltage "L"		0		0.25	V
T_{TSD}	Thermal Shutdown Temperature	Junction Temperature		150		°C
T_{TSR}	Thermal Shutdown Released Temperature	Junction Temperature		120		°C

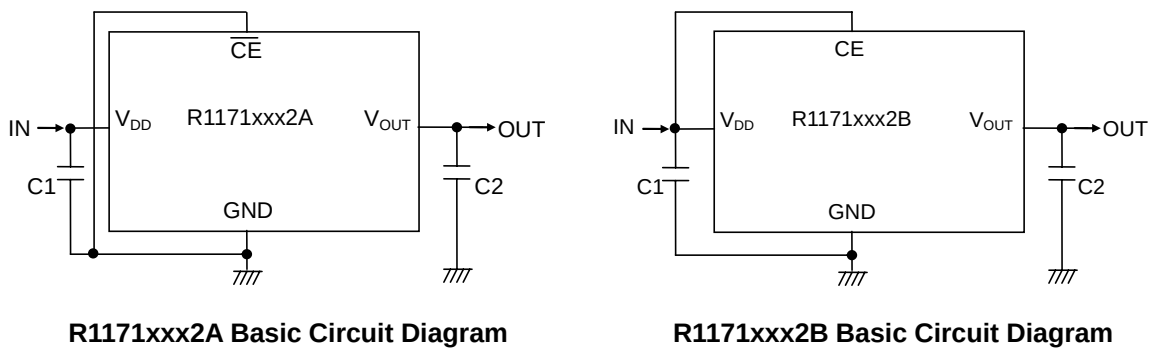
All test items listed under Electrical Characteristics are done under the pulse load condition ($T_j \approx T_a = 25^{\circ}C$).

● R1171Sxx2A/B Product-specific Electrical Characteristics

T_{opt}=25°C

Product Name	V _{OUT} [V]			V _{DIF} [V]	
	MIN.	TYP.	MAX.	TYP.	MAX.
R1171S152x	1.470	1.500	1.530	0.16	0.35
R1171S162x	1.568	1.600	1.632	0.14	0.32
R1171S172x	1.666	1.700	1.734	0.13	0.28
R1171S182x	1.764	1.800	1.836	0.12	0.24
R1171S182x5	1.813	1.850	1.887		
R1171S192x	1.862	1.900	1.938		
R1171S202x	1.960	2.000	2.040	0.10	0.21
R1171S212x	2.058	2.100	2.142		
R1171S222x	2.156	2.200	2.244		
R1171S232x	2.254	2.300	2.346		
R1171S242x	2.352	2.400	2.448	0.09	0.18
R1171S252x	2.450	2.500	2.550		
R1171S262x	2.548	2.600	2.652		
R1171S272x	2.646	2.700	2.754		
R1171S282x	2.744	2.800	2.856		
R1171S282x5	2.793	2.850	2.907		
R1171S292x	2.842	2.900	2.958		
R1171S302x	2.940	3.000	3.060		
R1171S312x	3.038	3.100	3.162		
R1171S322x	3.136	3.200	3.264		
R1171S332x	3.234	3.300	3.366		
R1171S342x	3.332	3.400	3.468		
R1171S352x	3.430	3.500	3.570		
R1171S362x	3.528	3.600	3.672		
R1171S372x	3.626	3.700	3.774		
R1171S382x	3.724	3.800	3.876		
R1171S392x	3.822	3.900	3.978		
R1171S402x	3.920	4.000	4.080		
R1171S412x	4.018	4.100	4.182		
R1171S422x	4.116	4.200	4.284		
R1171S432x	4.214	4.300	4.386		
R1171S442x	4.312	4.400	4.488		
R1171S452x	4.410	4.500	4.590		
R1171S462x	4.508	4.600	4.692		
R1171S472x	4.606	4.700	4.794		
R1171S482x	4.704	4.800	4.896		
R1171S492x	4.802	4.900	4.998		
R1171S502x	4.900	5.000	5.100		

TYPICAL APPLICATION CIRCUITS



External Parts Example:

1.5V ≤ V _{SET} < 1.8V	
C1	10μF (Ceramic)
C2	10μF (Ceramic)
1.8V ≤ V _{SET} ≤ 5.0V	
C1	4.7μF (Ceramic)
C2	4.7μF (Ceramic)

TECHNICAL NOTES

Phase Compensation

In the R1171x Series, phase compensation is provided to secure stable operation even when the load current is varied. For this purpose, use a 4.7μF to 10μF capacitor C2.

If you use a tantalum type capacitor and the ESR (Equivalent Series Resistance) value of the capacitor is large, the output might become unstable. Evaluate your circuit including consideration of frequency characteristics.

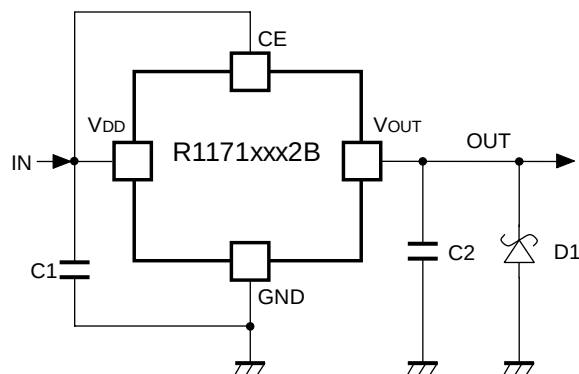
PCB Layout

Ensure the V_{DD} and GND lines are sufficiently robust. If their impedance is too high, noise pickup or unstable operation may result. Connect an around 4.7μF to 10μF capacitor between the V_{DD} and GND pins, and as close as possible to the pins. Please refer to the Basic Circuit Diagram as above.

Short Current Protection Function

The R1171x Series contain a short current protection function and a thermal shutdown function. The thermal shutdown circuit detects overheating of the regulator due to short circuit. If the junction temperature of the ICs becomes higher than 150°C(Typ.), the thermal shutdown function stops the regulator operation to protect it from damage.

TYPICAL APPLICATION FOR IC CHIP BREAKDOWN PROVENTION



Ex. R1171xxx2B Circuit Diagram

When a sudden surge of electrical current travels along the V_{OUT} pin and GND due to a short-circuit, electrical resonance of a circuit involving an output capacitor (C_{OUT}) and a short circuit inductor generates a negative voltage and may damage the device or the load devices. Connecting a schottky diode (D1) between the V_{OUT} pin and GND has the effect of preventing damage to them.

PACKAGE INFORMATION

POWER DISSIPATION (HSOP-6J)

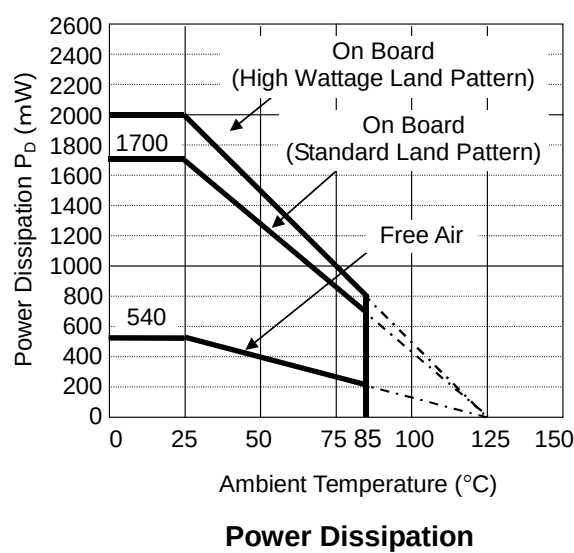
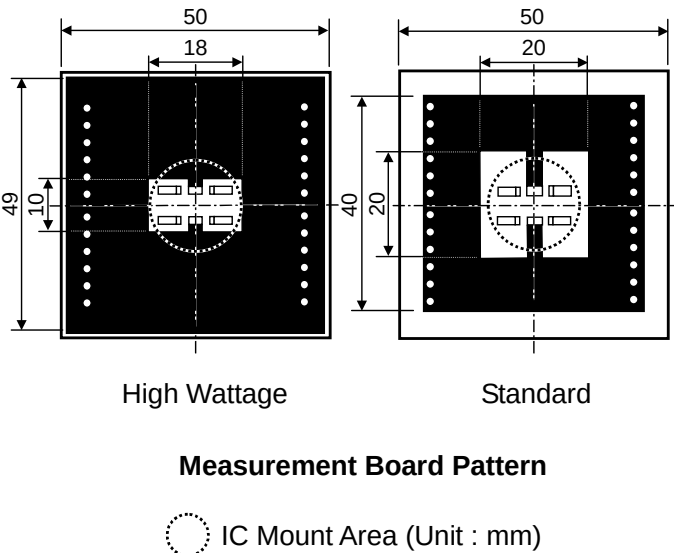
Power Dissipation (P_D) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

Measurement Conditions

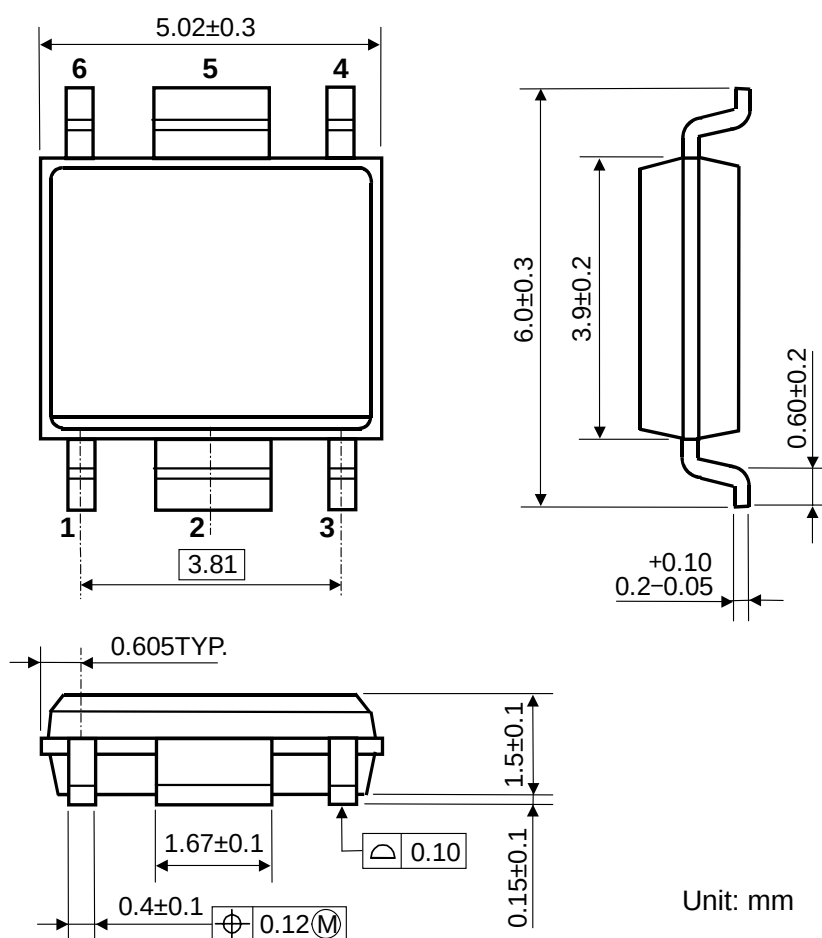
	High Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind Velocity=0m/s)	Mounting on Board (Wind Velocity=0m/s)
Board Material	Glass Cloth Epoxy Plastic (Double-sided)	Glass Cloth Epoxy Plastic (Double-sided)
Board Dimensions	50mm x 50mm x 1.6mm	50mm x 50mm x 1.6mm
Copper Ratio	90%	50%
Through-hole	φ0.5mm x 24pcs	φ0.5mm x 24pcs

Measurement Result (Ta=25°C, Tjmax=125°C)

	High Wattage Land Pattern	Standard Land Pattern	Free Air
Power Dissipation	2000mW	1700mW	540mW
Thermal Resistance	50°C/W	59°C/W	185°C/W



PACKAGE DIMENSIONS (HSOP-6J)

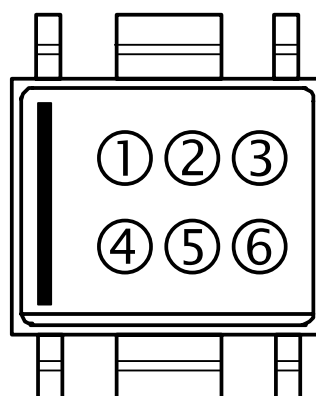


HSOP-6J Package Dimensions

MARK SPECIFICATION (HSOP-6J)

①②③④: Product Code ... Refer to *R1171S MARK SPECIFICATION TABLE*

⑤⑥: Lot Number ... Alphanumeric Serial Number



R1171S

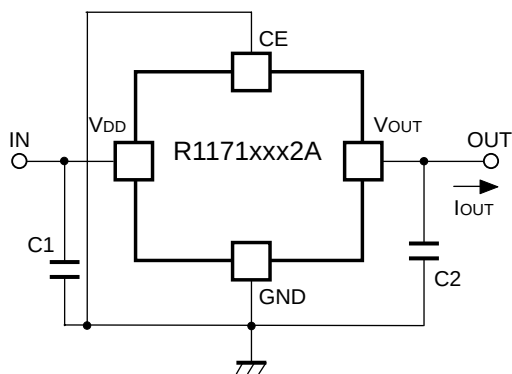
NO. EC-125-140213

R1171S MARK SPECIFICATION TABLE (HSOP-6J)

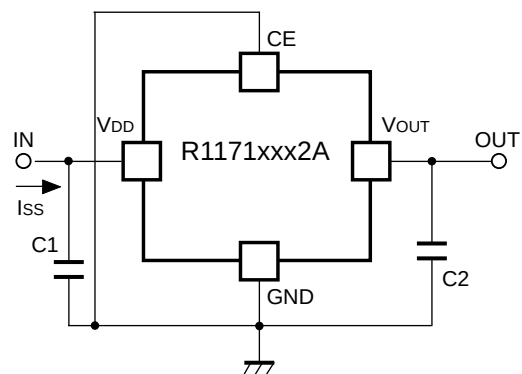
Product Name	①②③④	V _{SET}	Product Name	①②③④	V _{SET}
R1171S152A	D 1 5 C	1.5 V	R1171S152B	D 1 5 D	1.5 V
R1171S162A	D 1 6 C	1.6 V	R1171S162B	D 1 6 D	1.6 V
R1171S172A	D 1 7 C	1.7 V	R1171S172B	D 1 7 D	1.7 V
R1171S182A	D 1 8 C	1.8 V	R1171S182B	D 1 8 D	1.8 V
R1171S192A	D 1 9 C	1.9 V	R1171S192B	D 1 9 D	1.9 V
R1171S202A	D 2 0 C	2.0 V	R1171S202B	D 2 0 D	2.0 V
R1171S212A	D 2 1 C	2.1 V	R1171S212B	D 2 1 D	2.1 V
R1171S222A	D 2 2 C	2.2 V	R1171S222B	D 2 2 D	2.2 V
R1171S232A	D 2 3 C	2.3 V	R1171S232B	D 2 3 D	2.3 V
R1171S242A	D 2 4 C	2.4 V	R1171S242B	D 2 4 D	2.4 V
R1171S252A	D 2 5 C	2.5 V	R1171S252B	D 2 5 D	2.5 V
R1171S262A	D 2 6 C	2.6 V	R1171S262B	D 2 6 D	2.6 V
R1171S272A	D 2 7 C	2.7 V	R1171S272B	D 2 7 D	2.7 V
R1171S282A	D 2 8 C	2.8 V	R1171S282B	D 2 8 D	2.8 V
R1171S292A	D 2 9 C	2.9 V	R1171S292B	D 2 9 D	2.9 V
R1171S302A	D 3 0 C	3.0 V	R1171S302B	D 3 0 D	3.0 V
R1171S312A	D 3 1 C	3.1 V	R1171S312B	D 3 1 D	3.1 V
R1171S322A	D 3 2 C	3.2 V	R1171S322B	D 3 2 D	3.2 V
R1171S332A	D 3 3 C	3.3 V	R1171S332B	D 3 3 D	3.3 V
R1171S342A	D 3 4 C	3.4 V	R1171S342B	D 3 4 D	3.4 V
R1171S352A	D 3 5 C	3.5 V	R1171S352B	D 3 5 D	3.5 V
R1171S362A	D 3 6 C	3.6 V	R1171S362B	D 3 6 D	3.6 V
R1171S372A	D 3 7 C	3.7 V	R1171S372B	D 3 7 D	3.7 V
R1171S382A	D 3 8 C	3.8 V	R1171S382B	D 3 8 D	3.8 V
R1171S392A	D 3 9 C	3.9 V	R1171S392B	D 3 9 D	3.9 V
R1171S402A	D 4 0 C	4.0 V	R1171S402B	D 4 0 D	4.0 V
R1171S412A	D 4 1 C	4.1 V	R1171S412B	D 4 1 D	4.1 V
R1171S422A	D 4 2 C	4.2 V	R1171S422B	D 4 2 D	4.2 V
R1171S432A	D 4 3 C	4.3 V	R1171S432B	D 4 3 D	4.3 V
R1171S442A	D 4 4 C	4.4 V	R1171S442B	D 4 4 D	4.4 V
R1171S452A	D 4 5 C	4.5 V	R1171S452B	D 4 5 D	4.5 V
R1171S462A	D 4 6 C	4.6 V	R1171S462B	D 4 6 D	4.6 V
R1171S472A	D 4 7 C	4.7 V	R1171S472B	D 4 7 D	4.7 V
R1171S482A	D 4 8 C	4.8 V	R1171S482B	D 4 8 D	4.8 V
R1171S492A	D 4 9 C	4.9 V	R1171S492B	D 4 9 D	4.9 V
R1171S502A	D 5 0 C	5.0 V	R1171S502B	D 5 0 D	5.0 V
R1171S182A5	D 0 1 C	1.85 V	R1171S182B5	D 0 1 D	1.85 V
R1171S282A5	D 0 2 C	2.85 V	R1171S282B5	D 0 2 D	2.85 V

TEST CIRCUITS

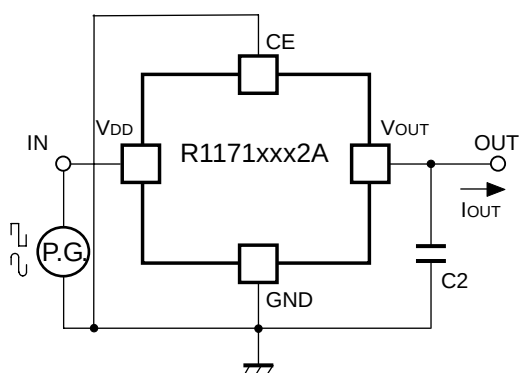
R1171xxx2A Test Circuits



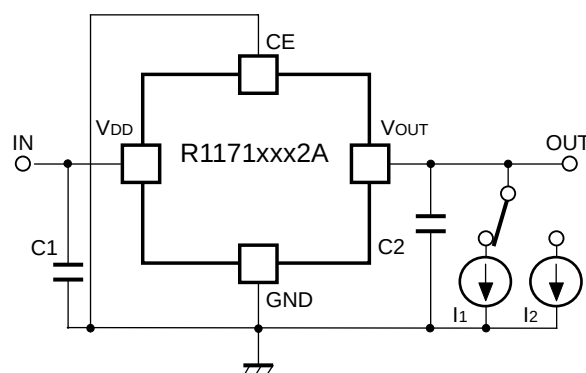
Basic Test Circuit



Test Circuit for Supply Current

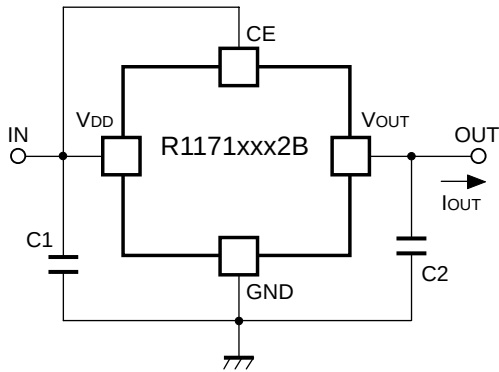
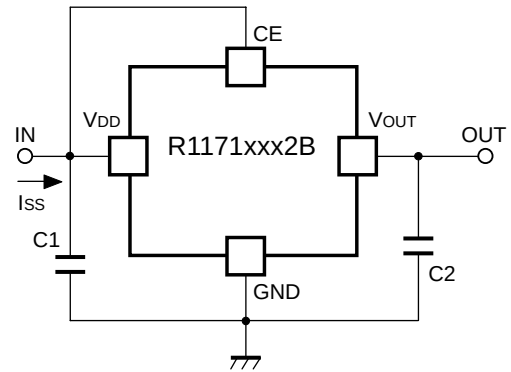
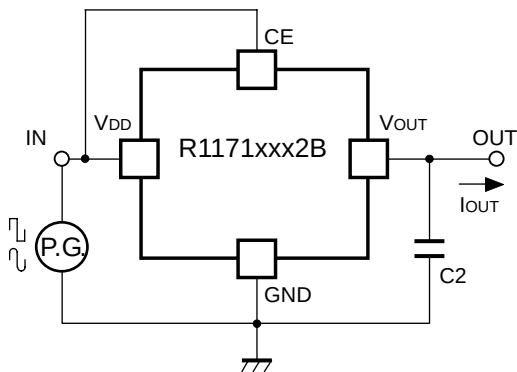
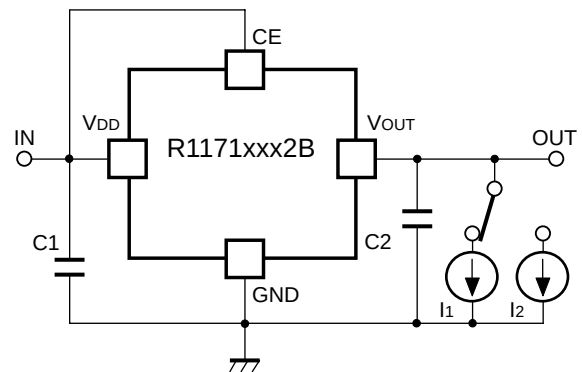


**Test Circuit for Ripple Rejection and
Line Transient Response**



Test Circuit for Load Transient Response

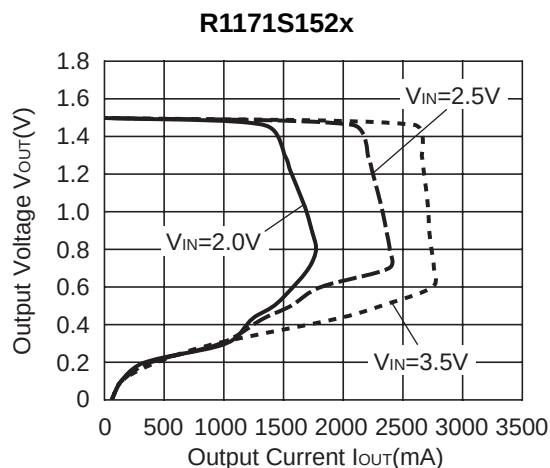
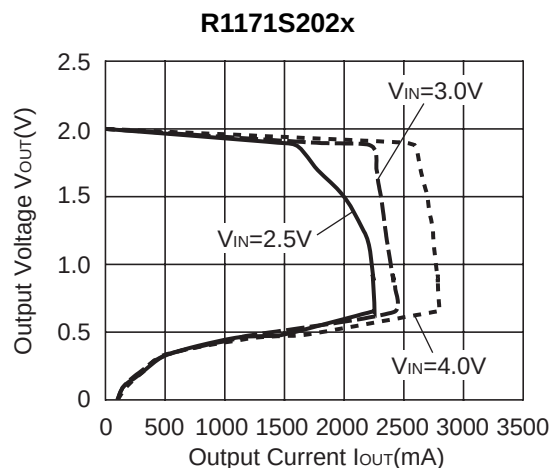
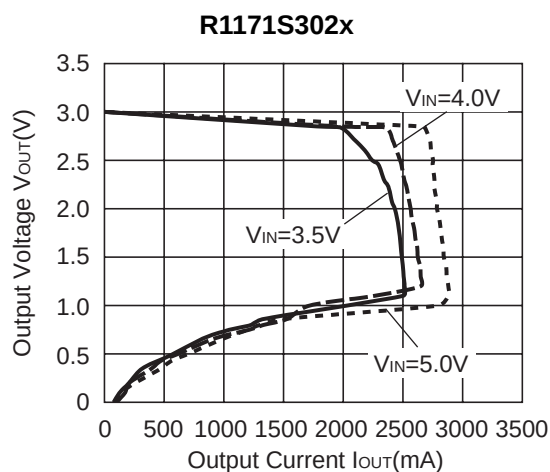
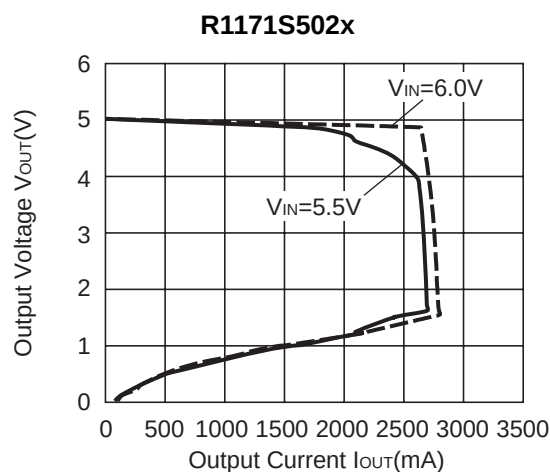
R1171SNO. EC-125-140213

R1171xxx2B 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**

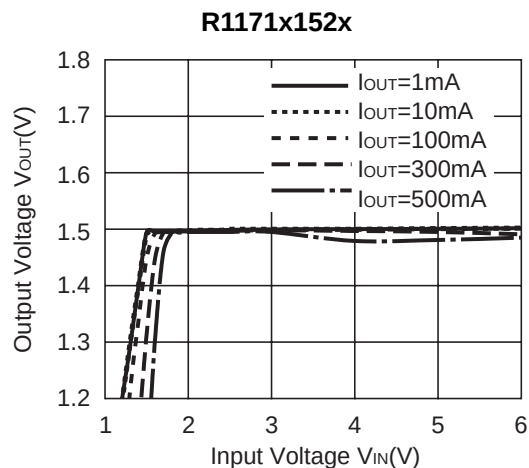
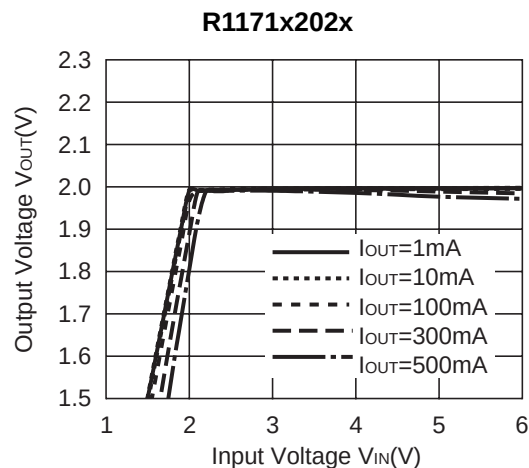
TYPICAL CHARACTERISTICS

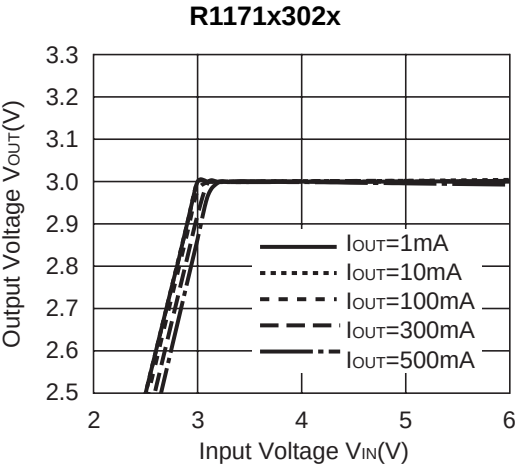
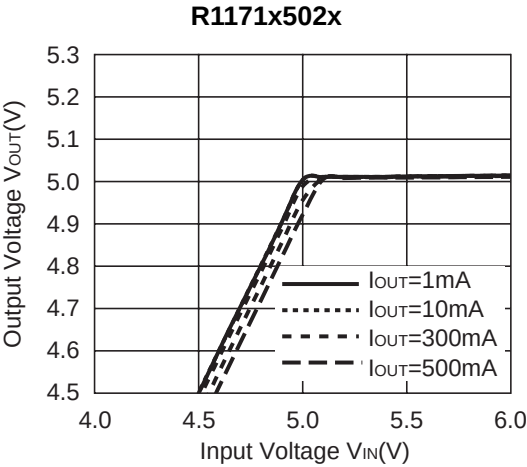
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

1) Output Voltage vs. Output Current (T_{opt}=25°C)

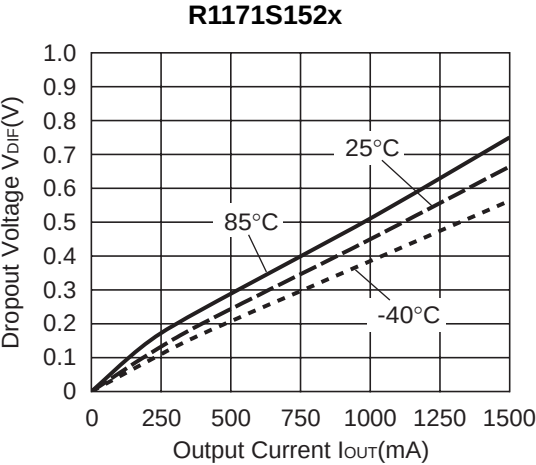
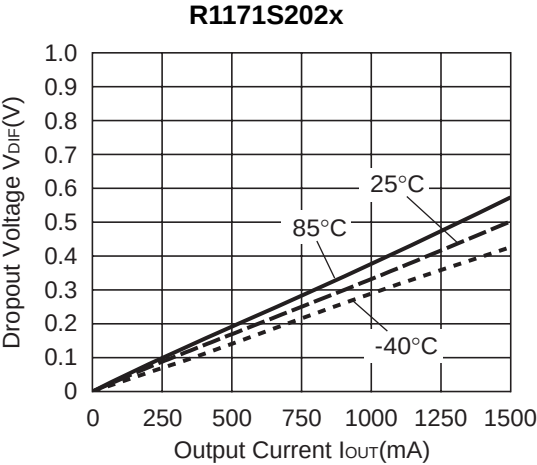
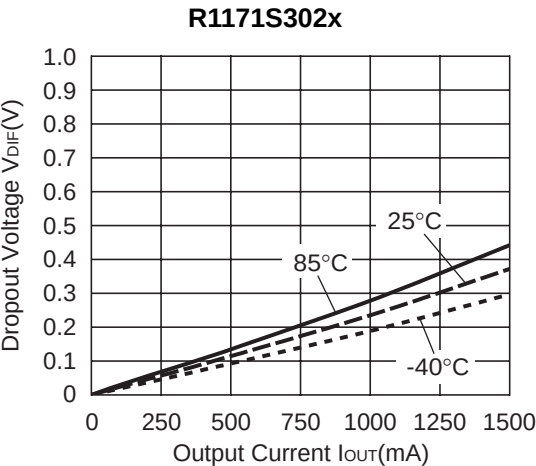
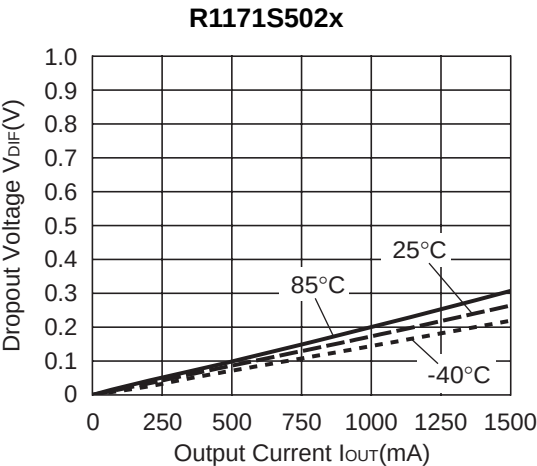


2) Output Voltage vs. Input Voltage (T_{opt}=25°C)



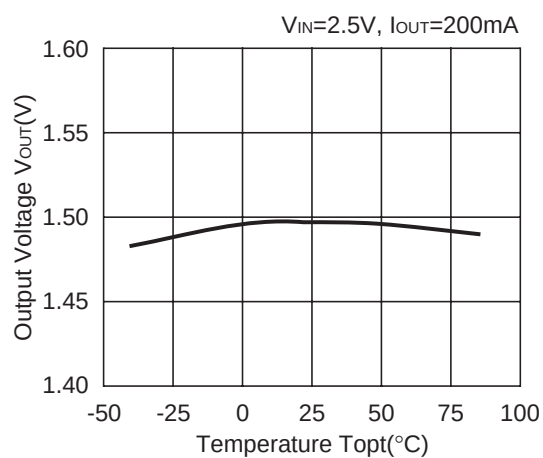


3) Dropout Voltage vs. Output Current

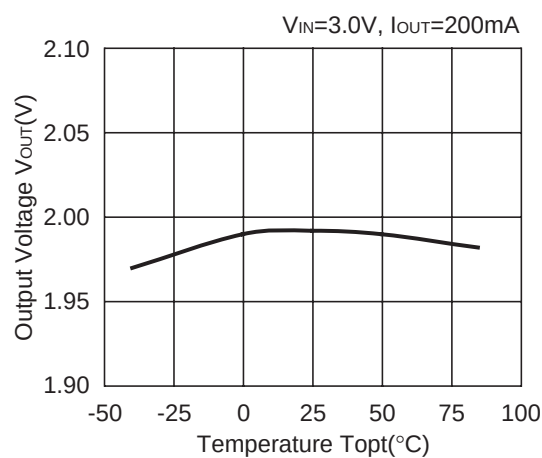


4) Output Voltage vs. Temperature

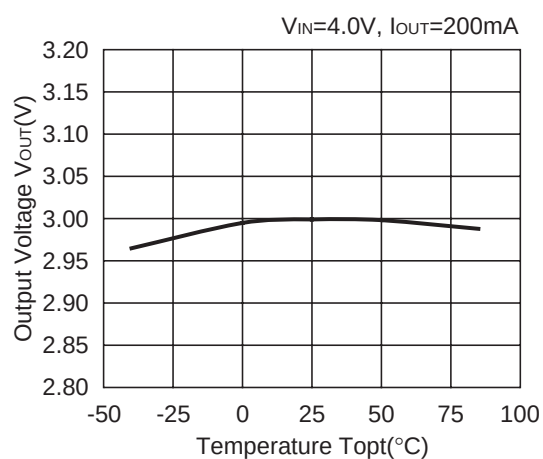
R1171x152x



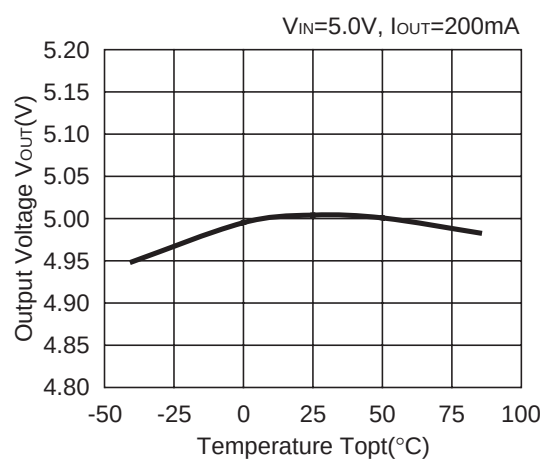
R1171x202x



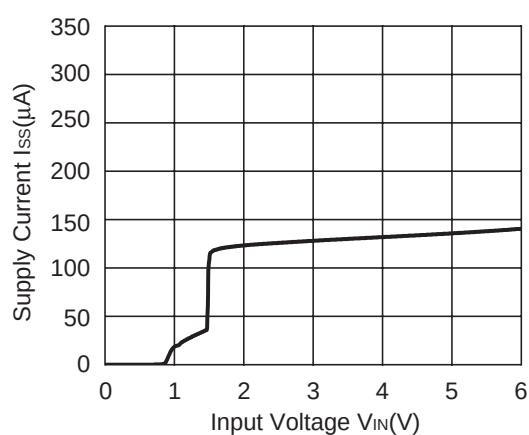
R1171x302x



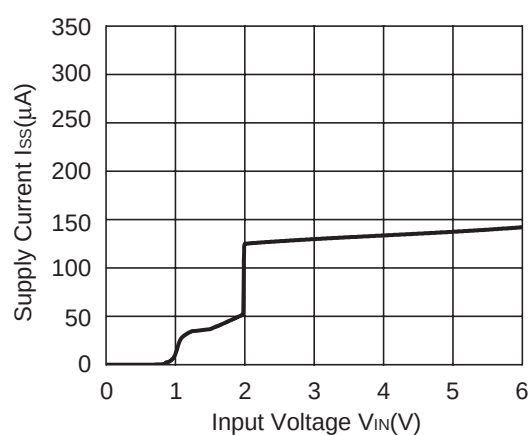
R1171x502x

5) Supply Current vs. Input Voltage ($T_{opt}=25^{\circ}C$)

R1171x152x

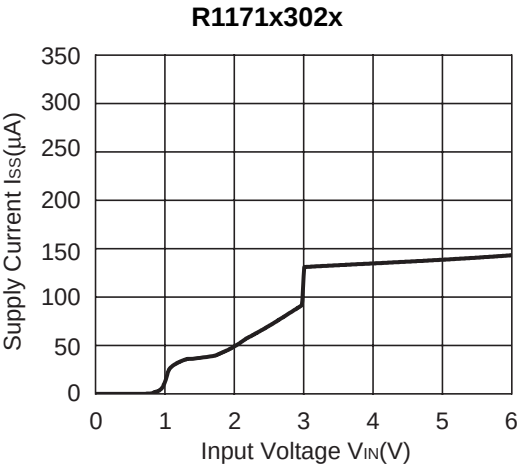
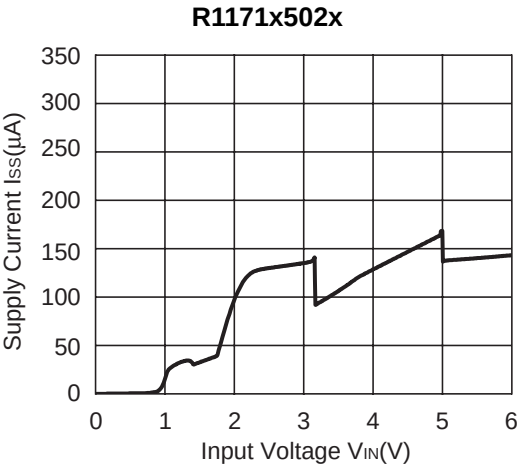


R1171x202x

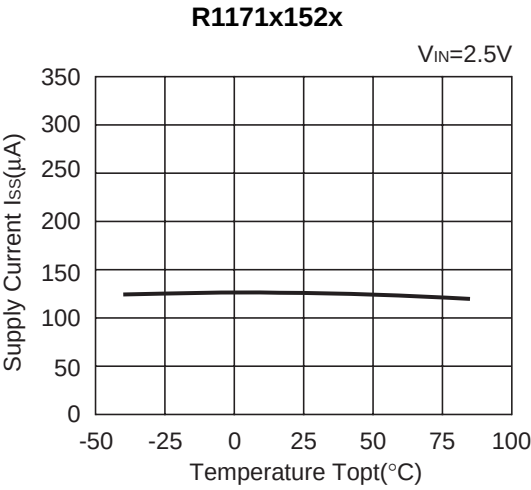
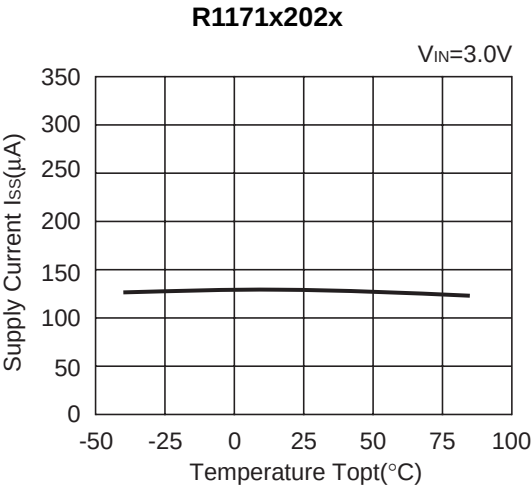
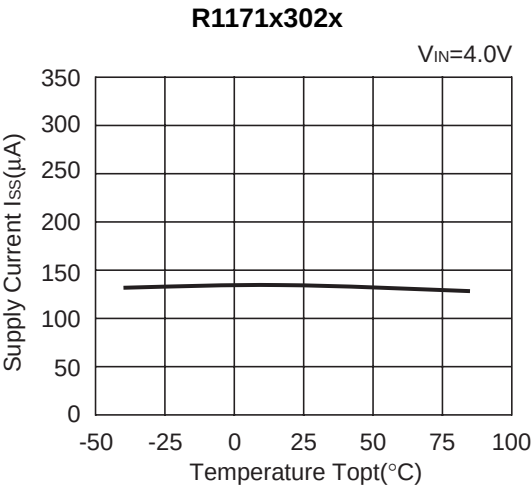
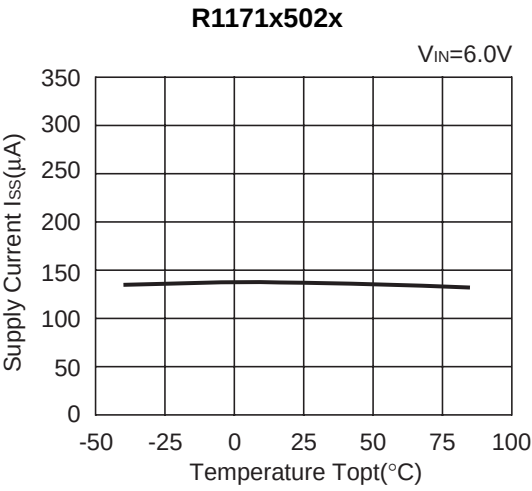


R1171S

NO. EC-125-140213

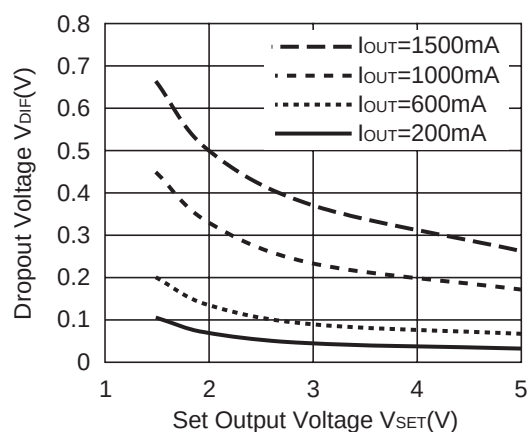


6) Supply Current vs. Temperature



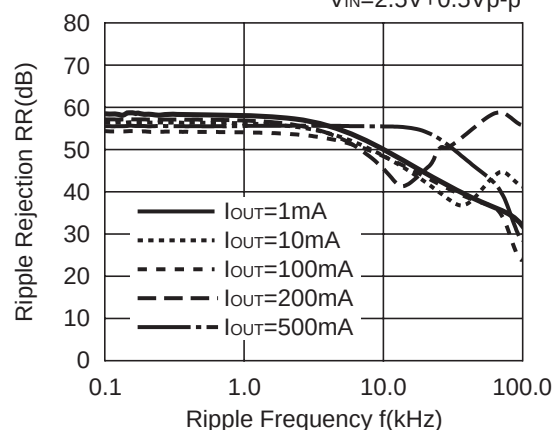
7) Dropout Voltage vs. Set Output Voltage ($T_{opt}=25^{\circ}\text{C}$)

R1171Sxx2x

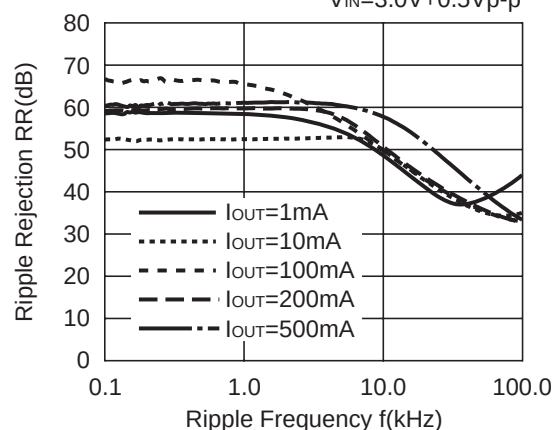


8) Ripple Rejection vs. Frequency

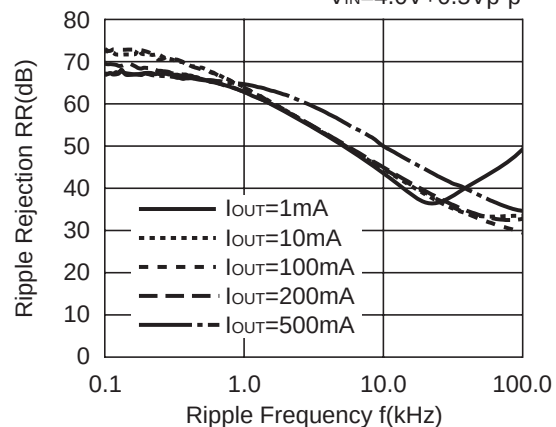
R1171x152x

 $V_{IN}=2.5\text{V}+0.5\text{Vp-p}$ 

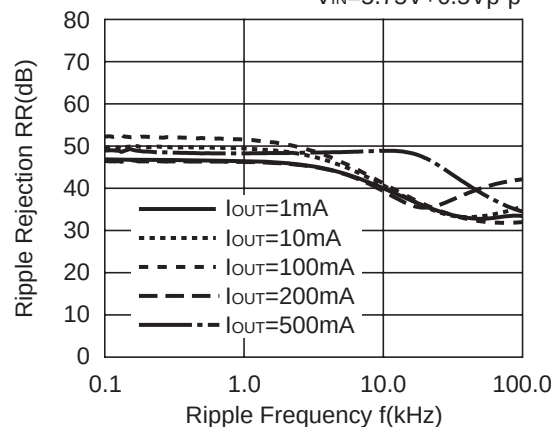
R1171x202x

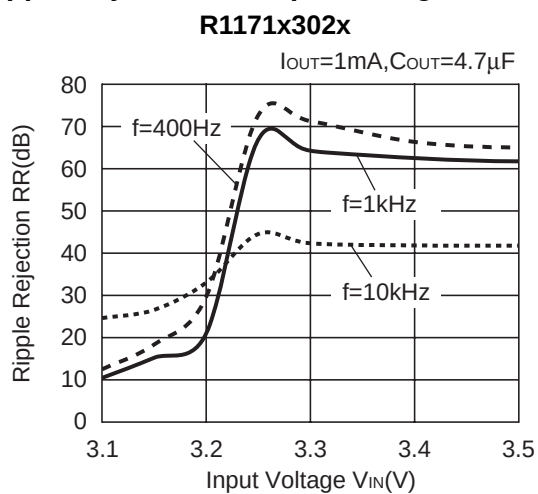
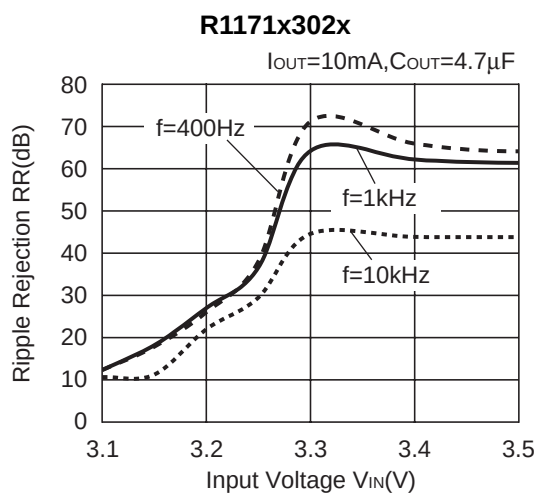
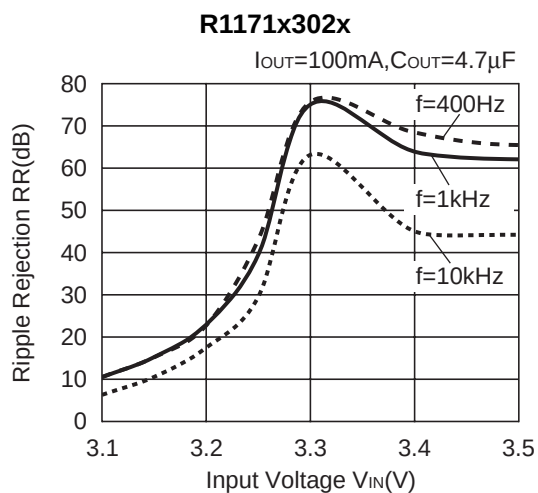
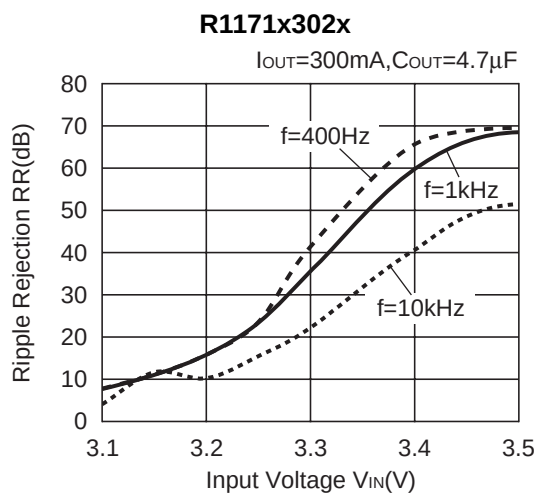
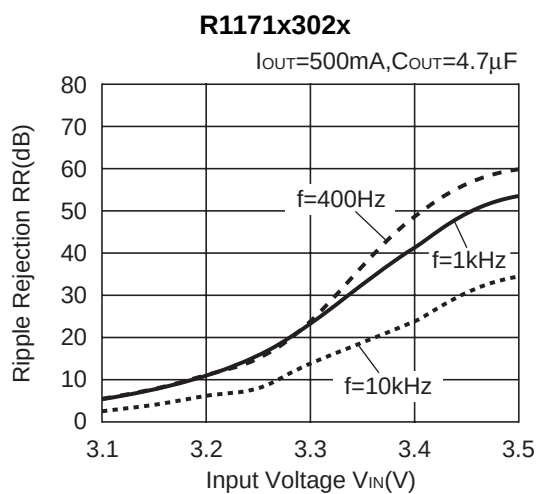
 $V_{IN}=3.0\text{V}+0.5\text{Vp-p}$ 

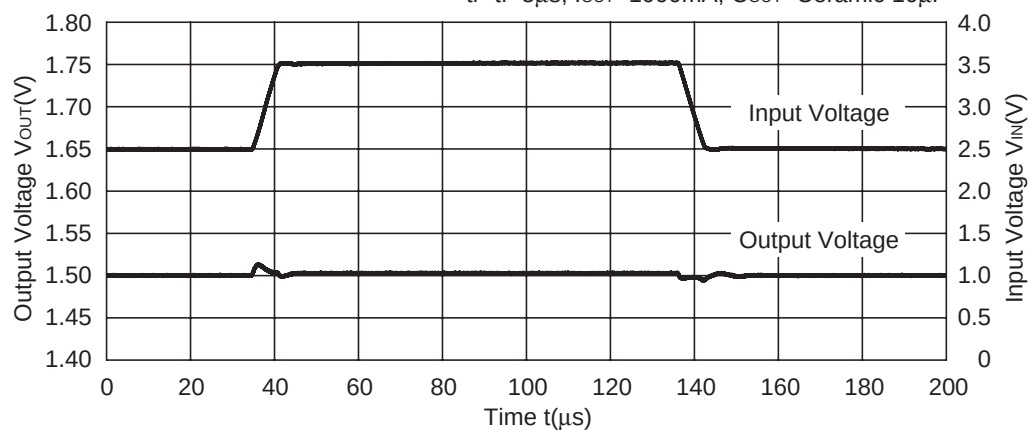
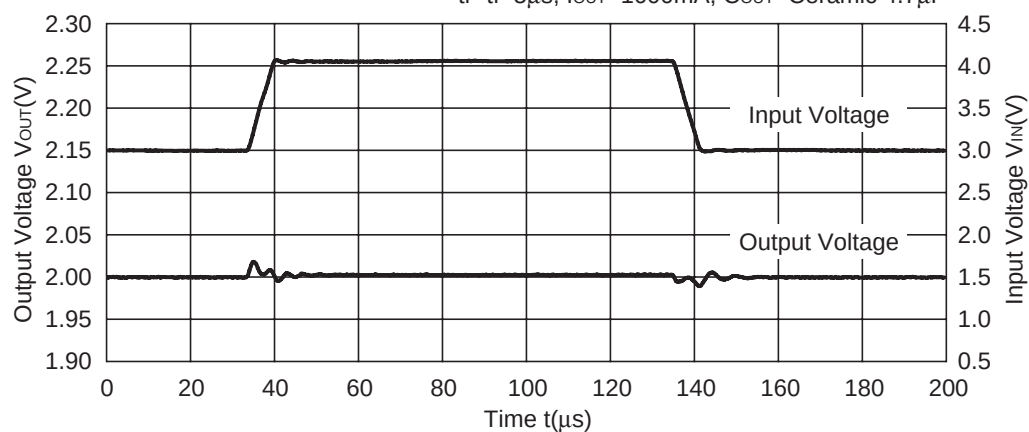
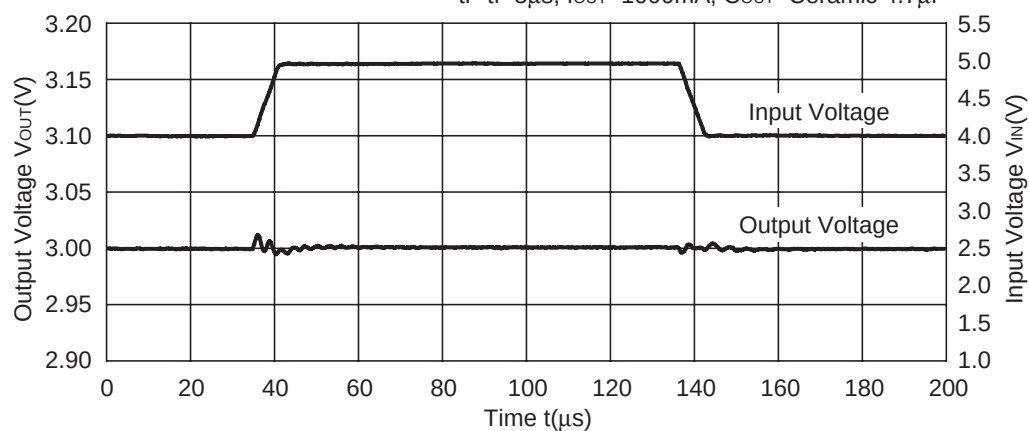
R1171x302x

 $V_{IN}=4.0\text{V}+0.5\text{Vp-p}$ 

R1171x502x

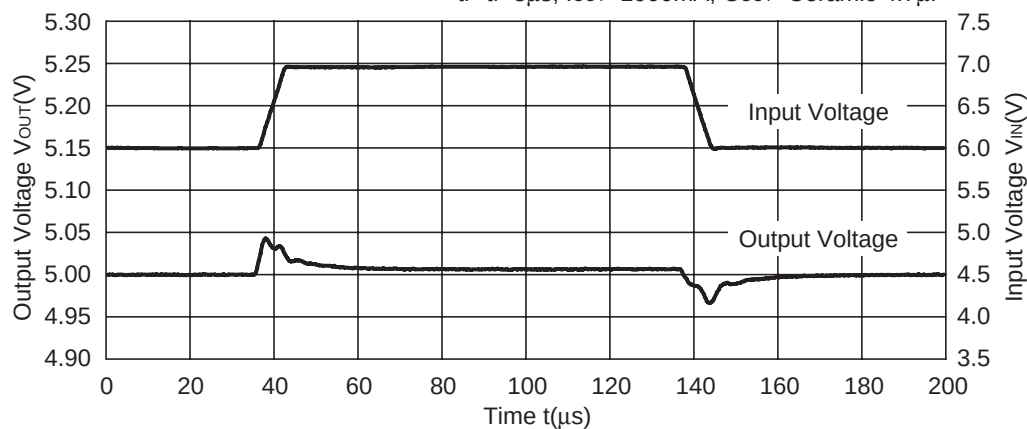
 $V_{IN}=5.75\text{V}+0.5\text{Vp-p}$ 

9) Ripple Rejection vs. Input Voltage

10) Input Transient Response ($T_{opt}=25^{\circ}\text{C}$)**R1171x152x** $t_r=t_f=5\mu\text{s}$, $I_{OUT}=1000\text{mA}$, $C_{OUT}=\text{Ceramic } 10\mu\text{F}$ **R1171x202x** $t_r=t_f=5\mu\text{s}$, $I_{OUT}=1000\text{mA}$, $C_{OUT}=\text{Ceramic } 4.7\mu\text{F}$ **R1171x302x** $t_r=t_f=5\mu\text{s}$, $I_{OUT}=1000\text{mA}$, $C_{OUT}=\text{Ceramic } 4.7\mu\text{F}$ 

R1171x502x

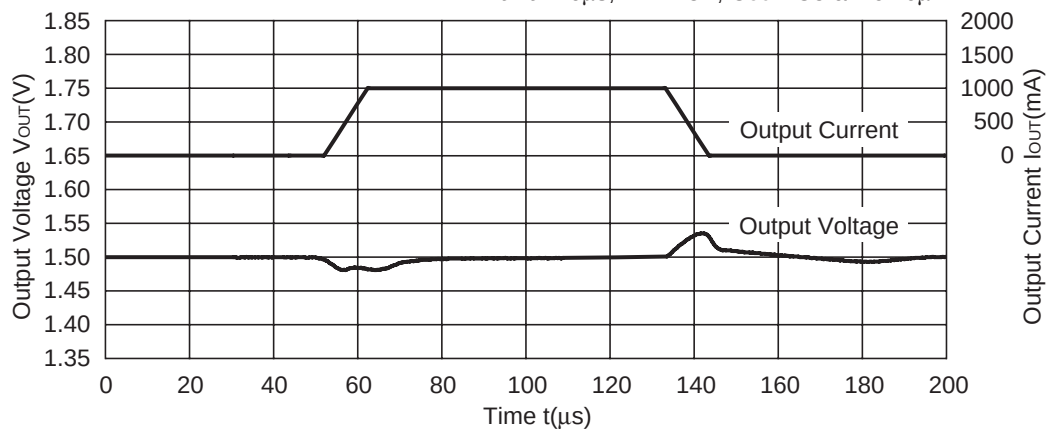
$t_r=t_f=5\mu s$, $I_{OUT}=1000mA$, C_{OUT} =Ceramic $4.7\mu F$



11) Load Transient Response ($T_{opt}=25^{\circ}C$)

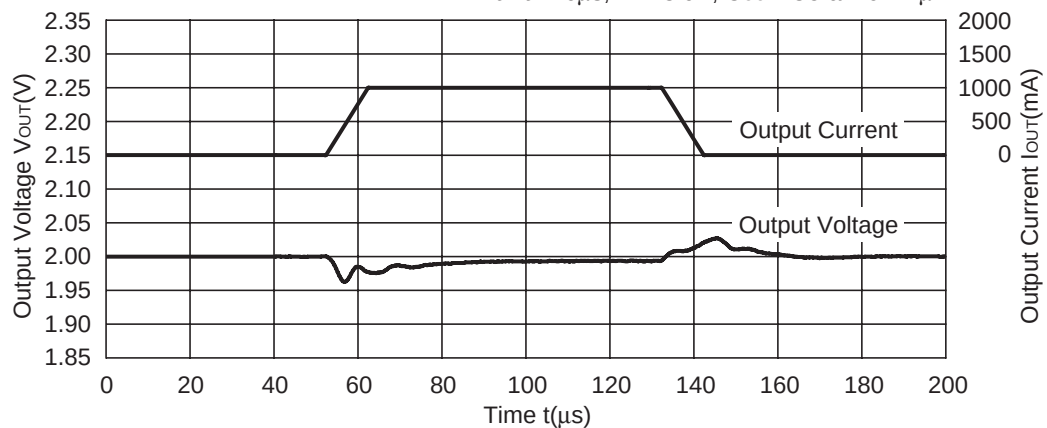
R1171x152x

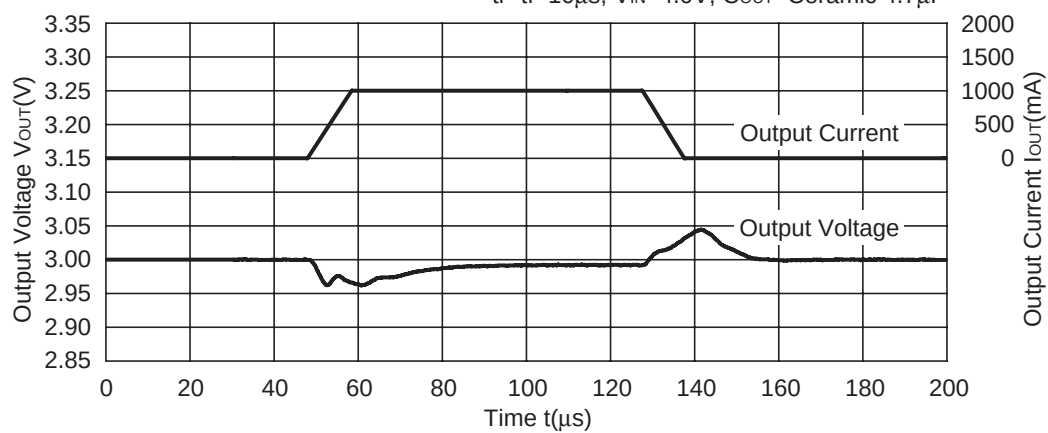
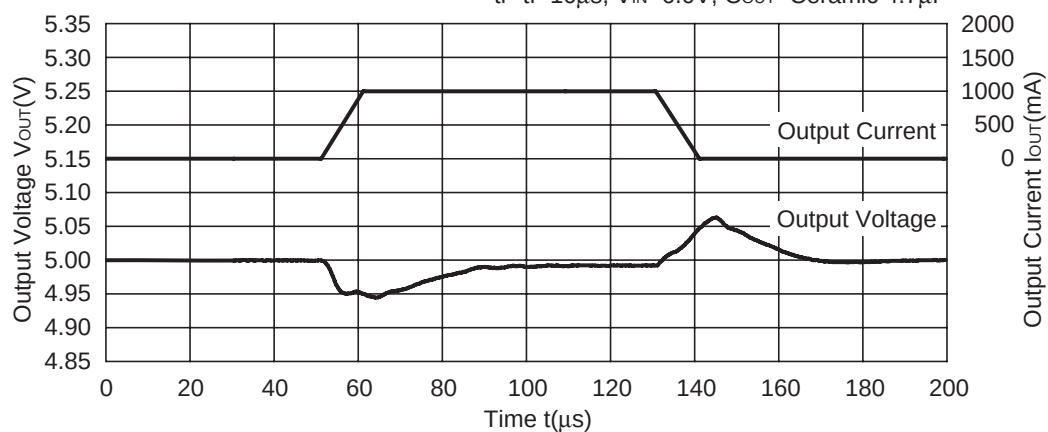
$t_r=t_f=10\mu s$, $V_{IN}=2.5V$, C_{OUT} =Ceramic $10\mu F$

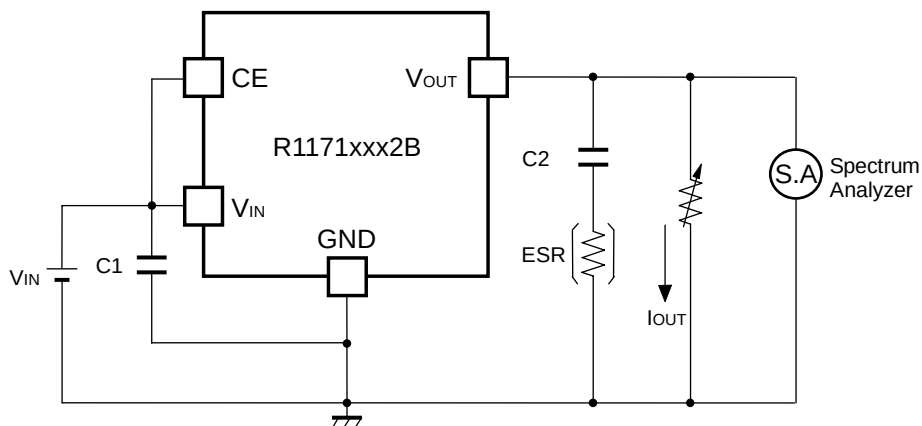


R1171x202x

$t_r=t_f=10\mu s$, $V_{IN}=3.0V$, C_{OUT} =Ceramic $4.7\mu F$

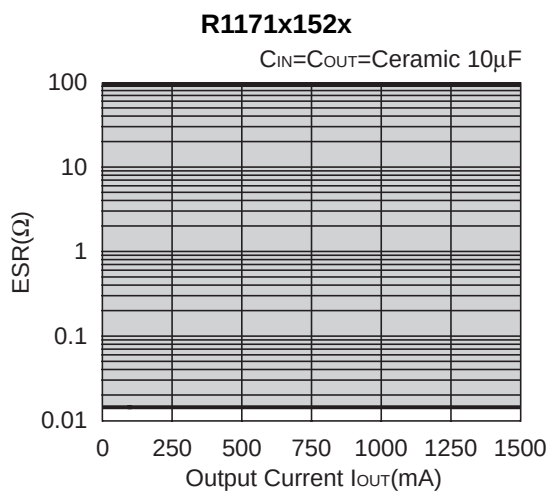
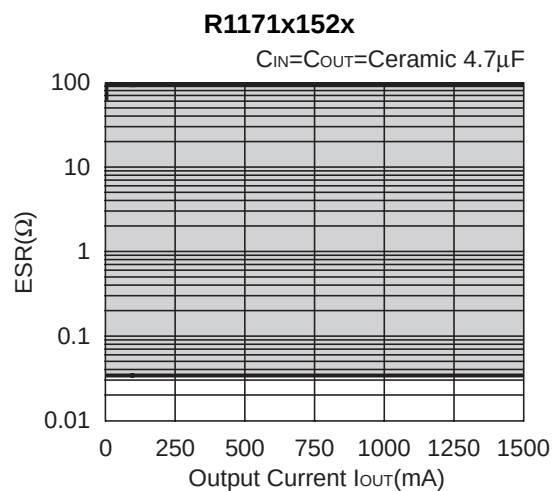


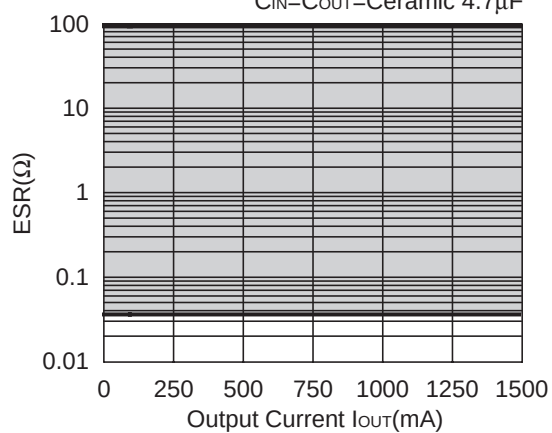
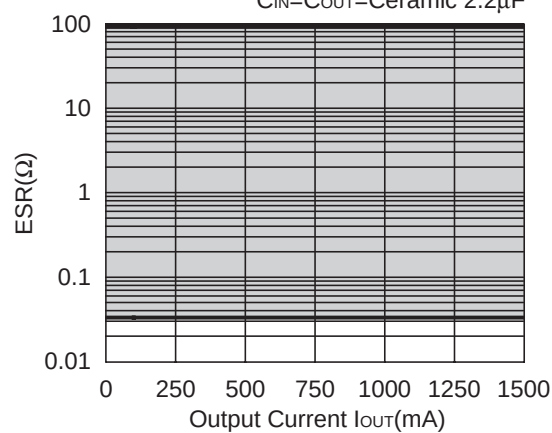
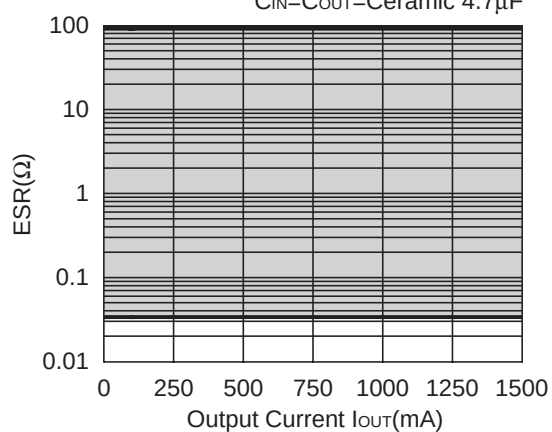
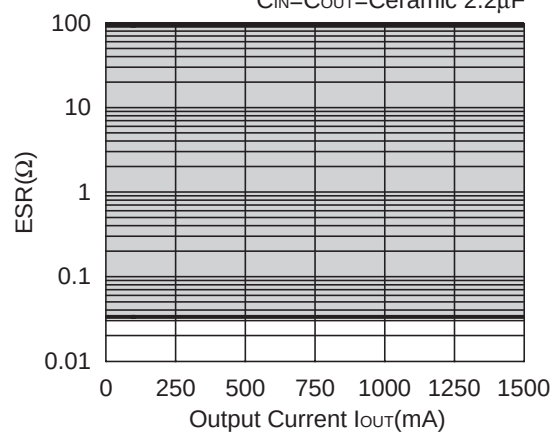
R1171x302x $t_r=t_f=10\mu s$, $V_{IN}=4.0V$, $C_{OUT}=\text{Ceramic } 4.7\mu F$ **R1171x502x** $t_r=t_f=10\mu s$, $V_{IN}=6.0V$, $C_{OUT}=\text{Ceramic } 4.7\mu F$ 

ESR vs. Output Current ($T_{opt}=25^{\circ}\text{C}$, $V_{IN}=V_{SET}+1\text{V}$, $C1=\text{Ceramic } 10\mu\text{F}$)

Ex. R1171xxx2B Circuit Diagram

As an output capacitor for this IC, Ceramic capacitor is recommendable. However, other low ESR type capacitor can be used with this IC.

For your reference, noise level is tested with the circuit as shown above, and if the noise level is $40\mu\text{V}$ or less than $40\mu\text{V}$, the ESR values are plotted as stable area. Upper limit is described in the next four graphs, or ESR vs. Output Current. (Hatched area is the stable area.)



R1171S302x $C_{IN}=C_{OUT}$ =Ceramic 4.7 μ F**R1171S302x** $C_{IN}=C_{OUT}$ =Ceramic 2.2 μ F**R1171S502x** $C_{IN}=C_{OUT}$ =Ceramic 4.7 μ F**R1171S502x** $C_{IN}=C_{OUT}$ =Ceramic 2.2 μ F



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