



## LR1102

CMOS IC

### LOW NOISE 150mA LDO REGULATOR

#### DESCRIPTION

The UTC **LR1102** families are CMOS-based voltage regulator ICs with extremely low supply current, high output voltage accuracy, high Ripple Rejection and chip enable circuit.

These ICs performance are excellent and with SOT-25 package, thus these ICs are very suitable for hand-held communication equipment.

#### FEATURES

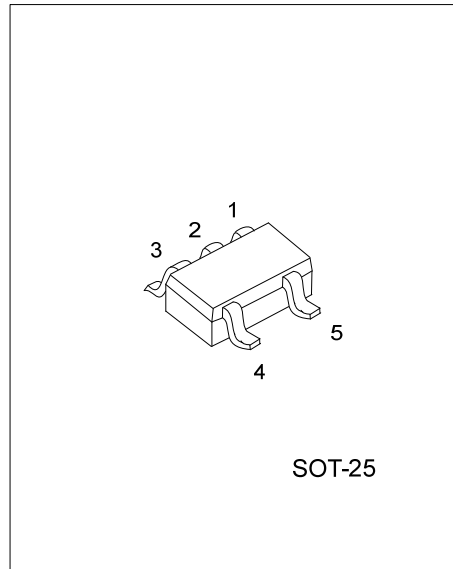
- \* Ultra-low supply current : Typ. 35 $\mu$ A
- \* Standby mode: typ. 0.1 $\mu$ A
- \* Low dropout voltage: Typ. 0.2V ( $I_{OUT} = 100mA$ )
- \* Excellent line regulation: Typ. 0.05%/V
- \* High ripple rejection: Typ. 70dB (f = 1kHz)

#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment					Packing
Normal	Lead Free Plating		1	2	3	4	5	
LR1102x-xx-AF5-R	LR1102xL-xx-AF5-R	SOT-25	I	G	C	N	O	Tape Reel

Note: Pin Assignment: I:V<sub>DD</sub> O:V<sub>OUT</sub> G:GND C: CE/ $\overline{CE}$  N: No Connection

<p>LR1102xL-xx-AF5-R</p> <ul style="list-style-type: none"> <li>(1)Packing Type</li> <li>(2)Package Type</li> <li>(3)Output Voltage Code</li> <li>(4)Lead Plating</li> <li>(5)Active</li> </ul>	<ul style="list-style-type: none"> <li>(1) R: Tape Reel</li> <li>(2) AF5: SOT-25</li> <li>(3) xx: refer to Marking Information</li> <li>(4) L: Lead Free Plating, Blank: Pb/Sn</li> <li>(5) A: Low B: High</li> </ul>
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SOT-25

\*Pb-free plating product number:  
LR1102AL/LR1102BL

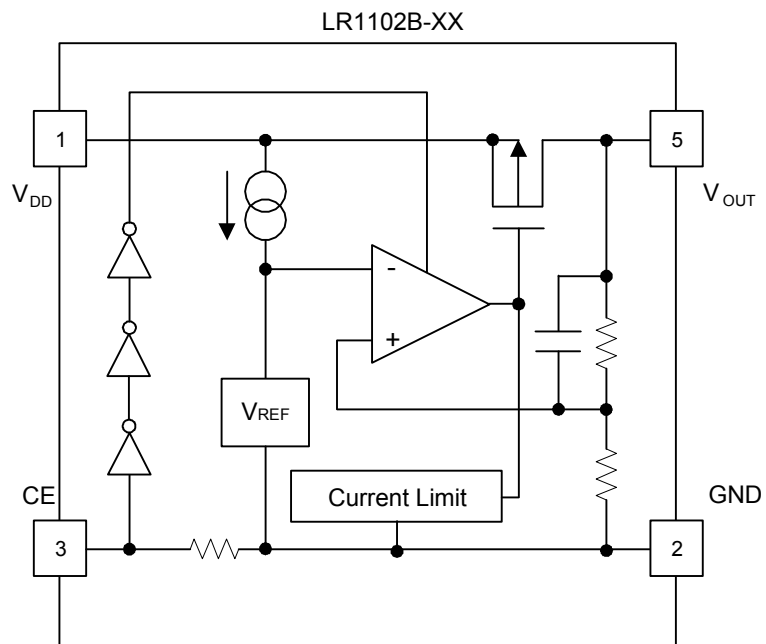
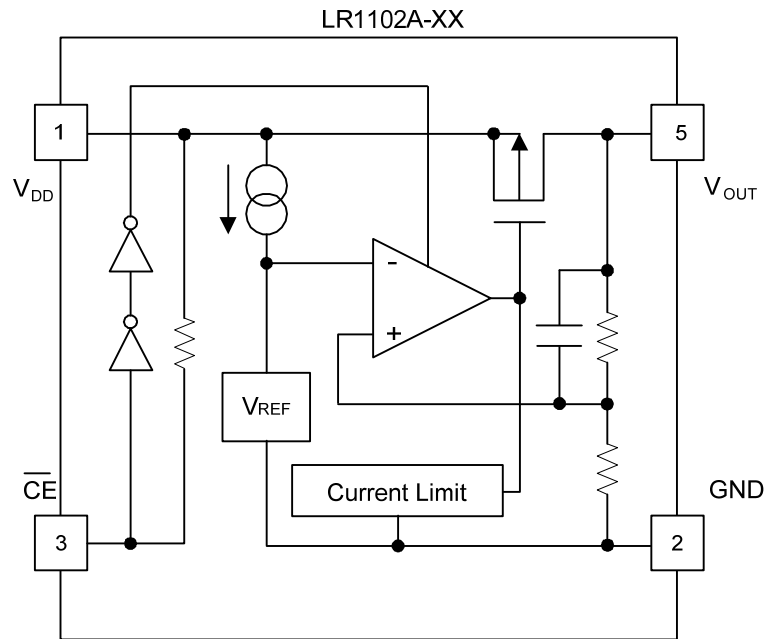
MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING	
SOT-25	15:1.5V	<p>For LR1102A-XX</p>	<p>For LR1102B-XX</p>
	18:1.8V		
	20:2.0V		
	25:2.5V		
	27:2.7V		
	28:2.8V		
	2J:2.85V		
	30:3.0V		
	33:3.3V		
	35:3.5V		
	50:5.0V		

PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	V <sub>DD</sub>	Input Pin
2	GND	Ground Pin
3	CE/ $\overline{\text{CE}}$	Chip Enable Pin
4	NC	No Connection
5	V <sub>OUT</sub>	Output Pin

■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	$V_{IN}$	9	V
Input Voltage	$V_{CE}$	-0.3 ~ $V_{IN}+0.3$	V
Output Voltage	$V_{OUT}$	-0.3 ~ $V_{IN}+0.3$	V
Output Current	$I_{OUT}$	200	mA
Power Dissipation	$P_D$	250	mW
Junction Temperature	$T_J$	+125	°C
Operating Temperature	$T_{OPR}$	-40 ~ +85	°C
Storage Temperature	$T_{STG}$	-55 ~ +125	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

## ■ ELECTRICAL CHARACTERISTICS

### LR1102A-XX ( $T_{OPR}=25^{\circ}\text{C}$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$V_{IN}=\text{Set } V_{OUT} + 1\text{V}, 1\text{mA}\leq I_{OUT}\leq 30\text{mA}$	$V_{OUT}\times 0.98$		$V_{OUT}\times 1.02$	V
		$V_{IN}=\text{Set } V_{OUT} + 1\text{V}, 0\text{mA}\leq I_{OUT}\leq 150\text{mA}$	$V_{OUT}\times 0.97$		$V_{OUT}\times 1.03$	V
		$V_{IN}=9\text{V}, 0\text{mA}\leq I_{OUT}\leq 150\text{mA}$	$V_{OUT}\times 0.97$		$V_{OUT}\times 1.03$	V
Output Current	$I_{OUT}$	Refer to the Electrical Characteristics by Output Voltage				
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	$V_{IN}=\text{Set } V_{OUT} + 1\text{V}, 1\text{mA}\leq I_{OUT}\leq 80\text{mA}$		12	40	mV
Dropout Voltage	$V_{DIF}$	Refer to the Electrical Characteristics by Output Voltage				
Supply Current	$I_{SS}$	$V_{IN}=\text{Set } V_{OUT} + 1\text{V}$		10	20	$\mu\text{A}$
Supply Current (Standby)	$I_{ST-BY}$	$V_{IN}=V_{CE}=\text{Set } V_{OUT} + 1\text{V}$		0.1	1.0	$\mu\text{A}$
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	$\text{Set } V_{OUT} + 0.5\text{V}\leq V_{IN}\leq 8\text{V}, I_{OUT}=30\text{mA}$		0.05	0.20	%/V
Ripple Rejection	RR	$f=1\text{kHz}$ , Ripple 0.5Vp-p $V_{IN}=\text{Set } V_{OUT} + 1\text{V}$		70		dB
Input Voltage	$V_{IN}$		2		8	V
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT} = 30\text{mA}, -20^{\circ}\text{C}\leq T_{OPR}\leq 85^{\circ}\text{C}$		$\pm 100$		ppm/°C
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0\text{V}$		200		mA
$\overline{\text{CE}}$ Pull-up Resistance	$R_{PU}$		2.5	5.0	10.0	M $\Omega$
$\overline{\text{CE}}$ Input Voltage "H"	$V_{CEH}$		1.5		$V_{IN}$	V
$\overline{\text{CE}}$ Input Voltage "L"	$V_{CEL}$		0.00		0.25	V
Output Noise	eN	$B_W = 10\text{Hz} \sim 100\text{kHz}$		30		$\mu\text{Vrms}$

### LR1102B-XX ( $T_{OPR}=25^{\circ}\text{C}$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$V_{IN}=\text{Set } V_{OUT} + 1\text{V}, 1\text{mA}\leq I_{OUT}\leq 30\text{mA}$	$V_{OUT}\times 0.98$		$V_{OUT}\times 1.02$	V
Output Voltage	$V_{OUT}$	$V_{IN}=\text{Set } V_{OUT} + 1\text{V}, 0\text{mA}\leq I_{OUT}\leq 150\text{mA}$	$V_{OUT}\times 0.97$		$V_{OUT}\times 1.03$	V
Output Voltage	$V_{OUT}$	$V_{IN}=9\text{V}, 0\text{mA}\leq I_{OUT}\leq 150\text{mA}$	$V_{OUT}\times 0.97$		$V_{OUT}\times 1.03$	V
Output Current	$I_{OUT}$	Refer to the Electrical Characteristics by Output Voltage				
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	$V_{IN}=\text{Set } V_{OUT} + 1\text{V}, 1\text{mA}\leq I_{OUT}\leq 80\text{mA}$		12	40	mV
Dropout Voltage	$V_{DIF}$	Refer to the Electrical Characteristics by Output Voltage				
Supply Current	$I_{SS}$	$V_{IN}=\text{Set } V_{OUT} + 1\text{V}$		10	20	$\mu\text{A}$
Supply Current (Standby)	$I_{ST-BY}$	$V_{IN}=\text{Set } V_{OUT} + 1\text{V}, V_{CE}=\text{GND}$		0.1	1.0	$\mu\text{A}$
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	$\text{Set } V_{OUT} + 0.5\text{V}\leq V_{IN}\leq 8\text{V}, I_{OUT}=30\text{mA}$		0.05	0.20	%/V
Ripple Rejection	RR	$f=1\text{kHz}$ , Ripple 0.5Vp-p $V_{IN}=\text{Set } V_{OUT} + 1\text{V}$		70		dB

## ■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage	$V_{IN}$		2		8	V
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT} = 30mA, -20^{\circ}C \leq T_{OPR} \leq 85^{\circ}C$		$\pm 100$		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		200		mA
CE Pull-down Resistance	$R_{PD}$		2.5	5.0	10.0	M $\Omega$
CE Input Voltage "H"	$V_{CEH}$		1.5		$V_{IN}$	V
CE Input Voltage "L"	$V_{CEL}$		0.00		0.25	V
Output Noise	eN	$B_W = 10Hz \sim 100kHz$		30		$\mu V_{rms}$

## ■ ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE

( $T_{OPR}=25^{\circ}C$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Current	$I_{OUT}$	$V_{IN} - V_{OUT} = 1.0V$	$1.5 \leq V_{OUT} \leq 1.7$	100		mA
			$1.8 \leq V_{OUT} \leq 5.0$	150		mA
Dropout Voltage	$V_D$	$I_{OUT} = 100mA$	$V_{OUT}=1.5V$		0.8	V
			$V_{OUT}=1.6V$		0.7	V
			$V_{OUT}=1.7V$		0.5	V
			$1.8 \leq V_{OUT} \leq 1.9$	0.20	0.40	V
			$2.0 \leq V_{OUT} \leq 2.4$	0.20	0.35	V
			$2.5 \leq V_{OUT} \leq 2.7$	0.18	0.30	V
			$2.8 \leq V_{OUT} \leq 3.3$	0.18	0.25	V
		$3.4 \leq V_{OUT} \leq 5.0$	0.15	0.22	V	

■ TEST CIRCUITS

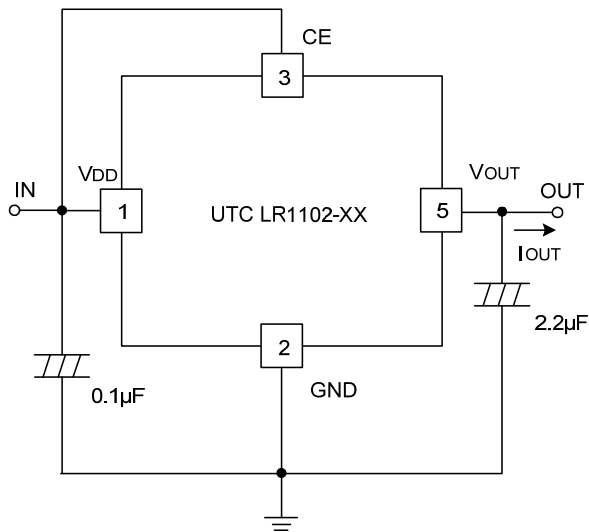


Fig.1 Standard Test Circuit

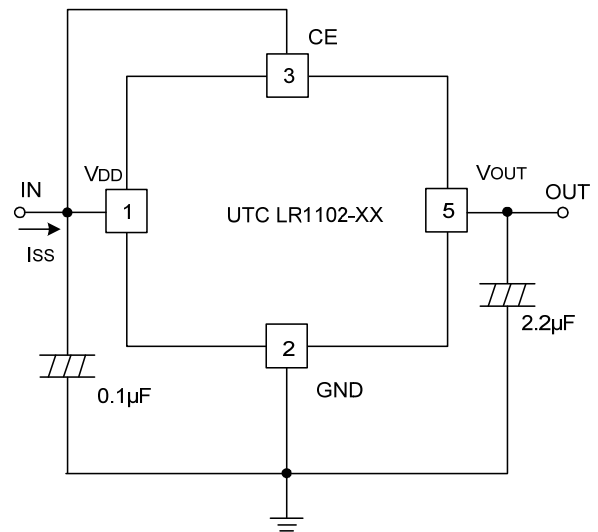


Fig.2 Supply Current Test Circuit

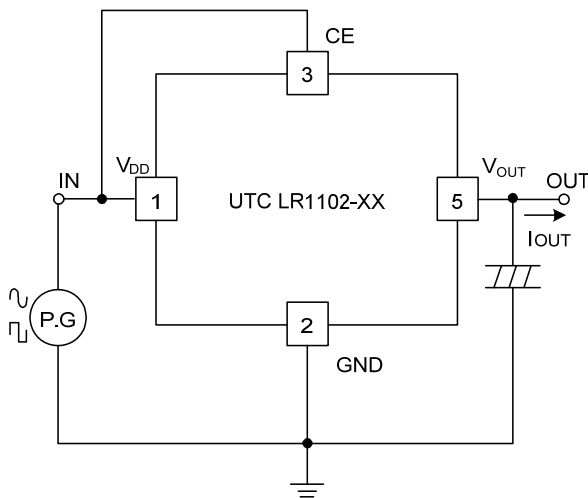


Fig.3 Ripple Rejection, Line Transient Response Test Circuit

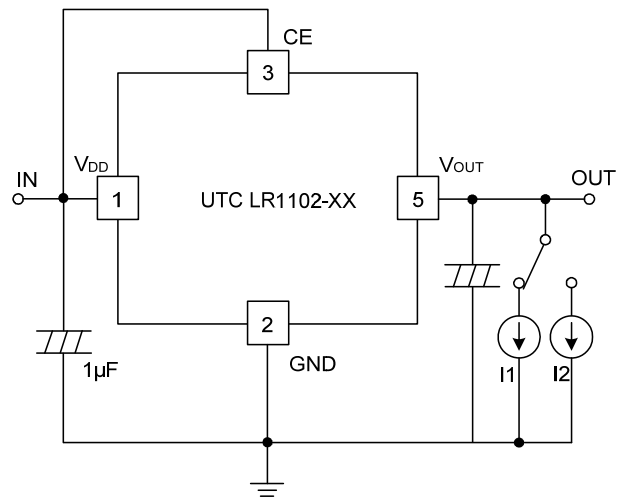
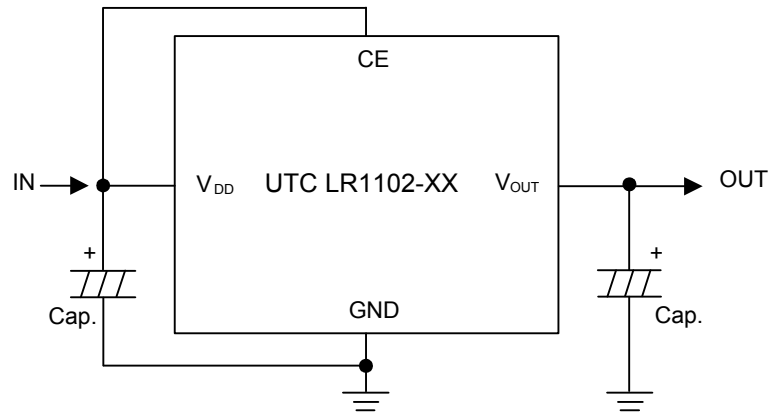


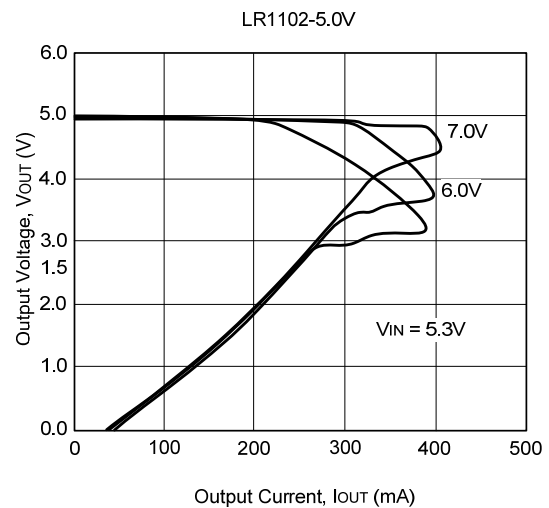
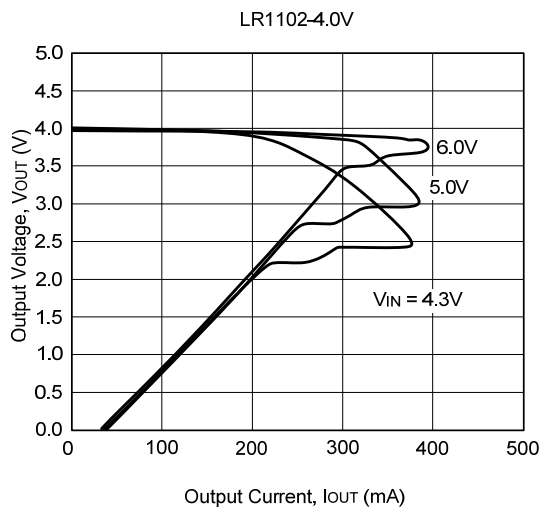
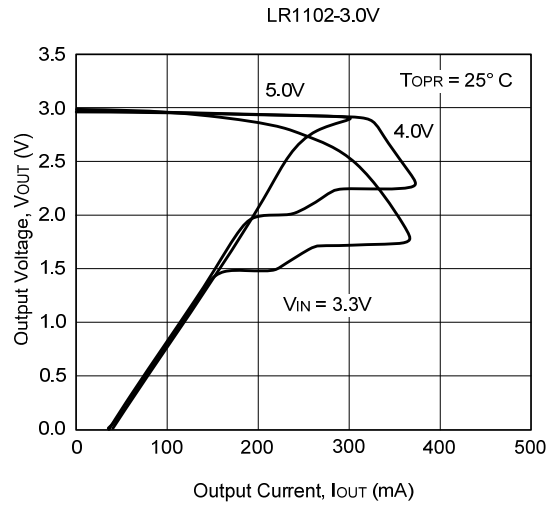
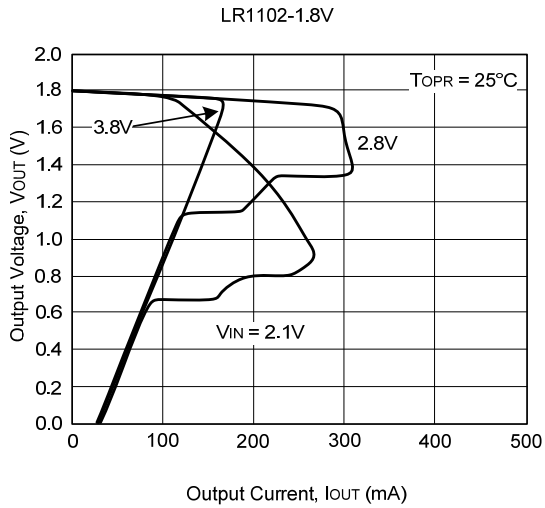
Fig.4 Load Transient Response Test Circuit

■ TYPICAL APPLICATION

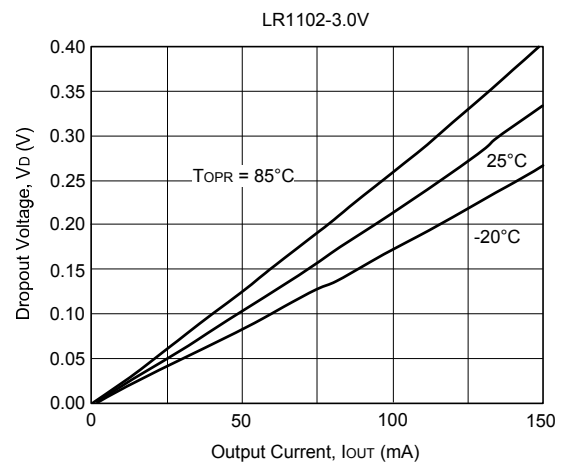
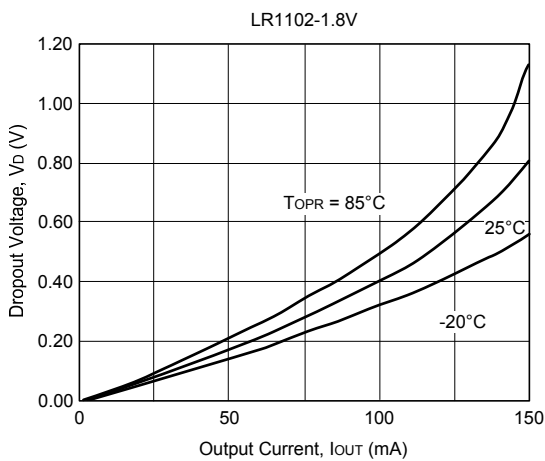


## ■ TYPICAL CHARACTERISTICS

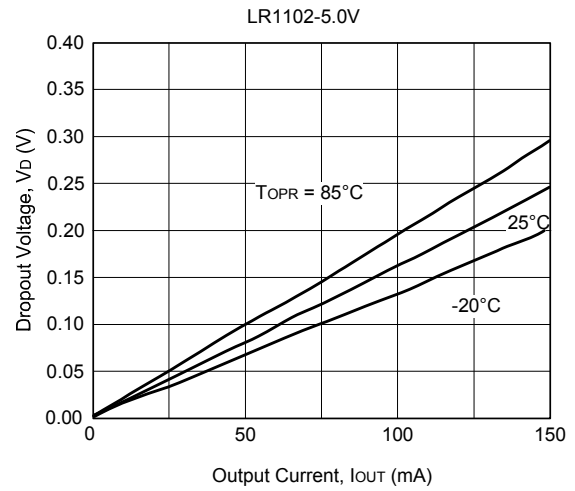
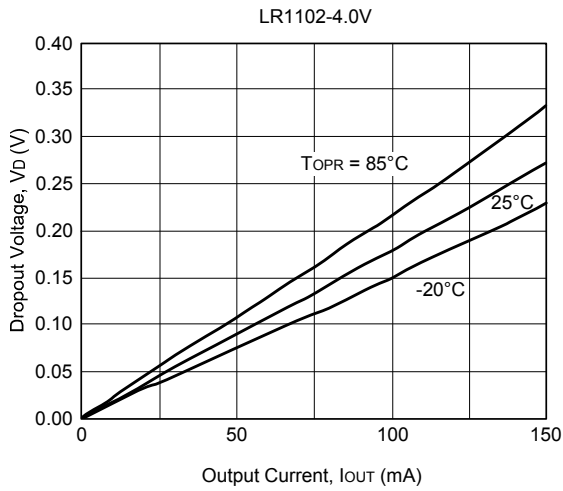
### 1. Output Voltage vs. Output Current



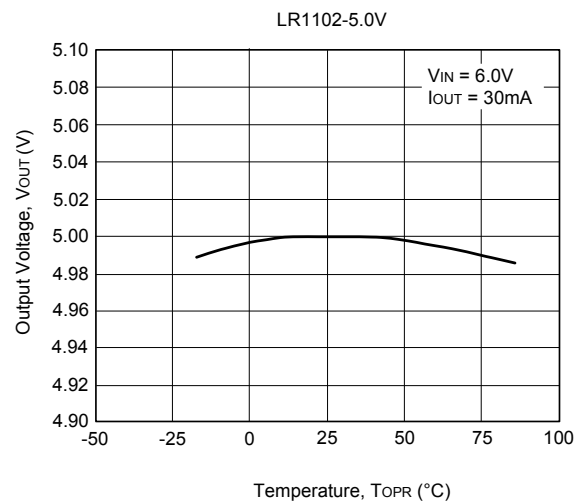
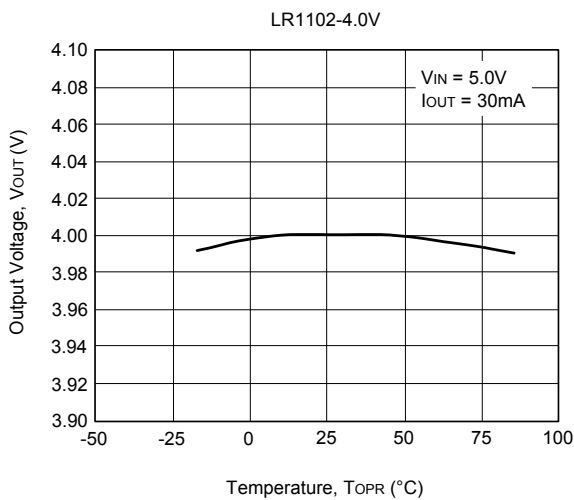
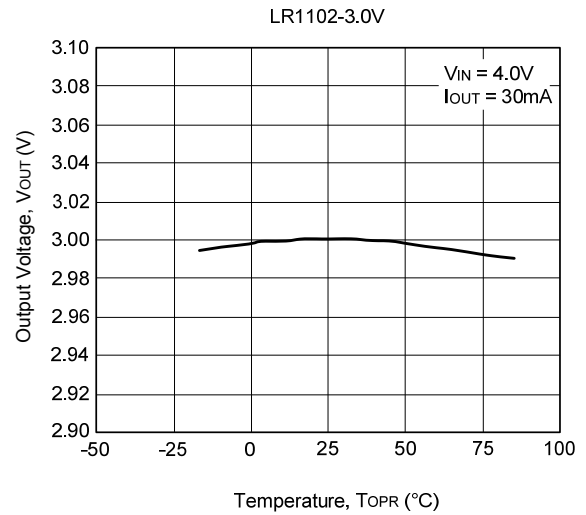
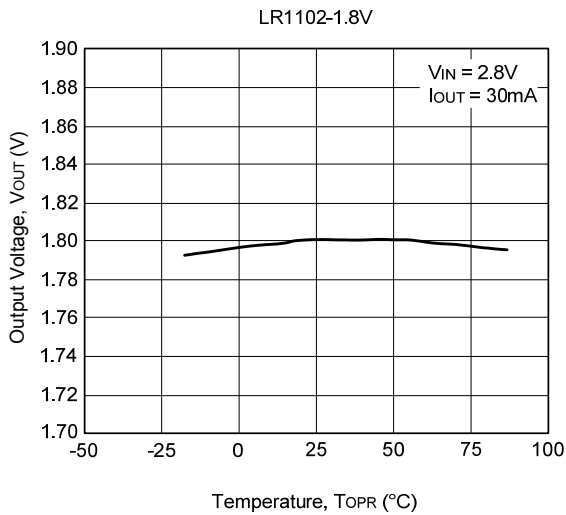
### 2. Dropout Voltage vs. Output Current



## ■ TYPICAL CHARACTERISTICS(Cont.)

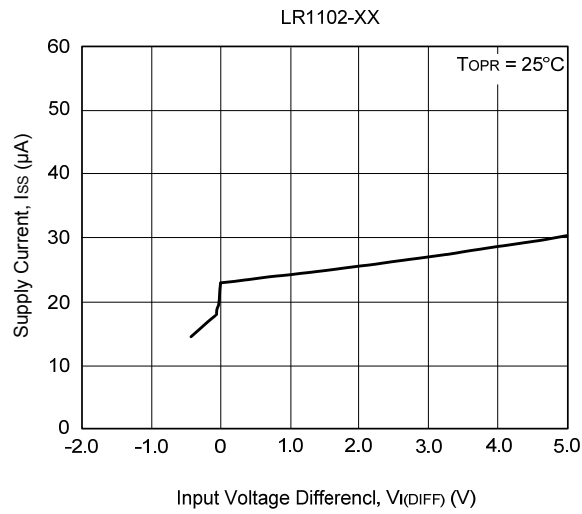


## 3. Output Voltage vs. Temperature

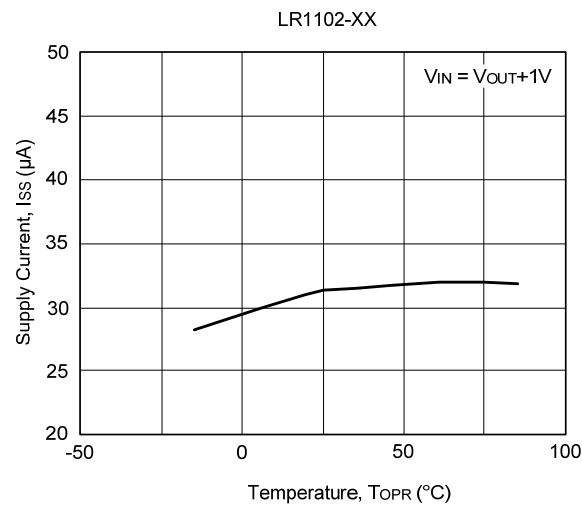


## ■ TYPICAL CHARACTERISTICS(Cont.)

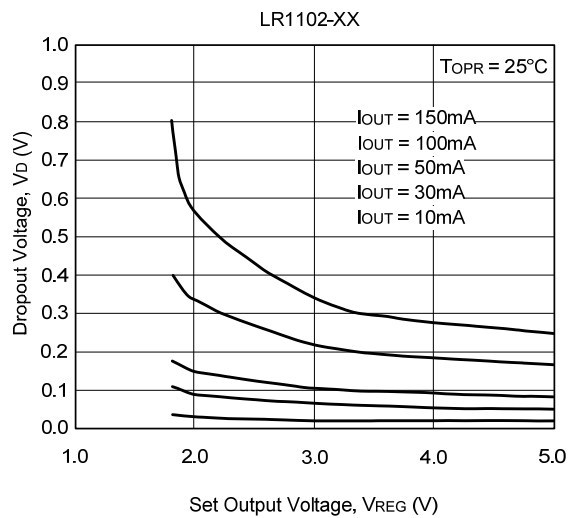
### 4. Supply Current vs. Input Voltage



### 5. Supply Current vs. Temperature

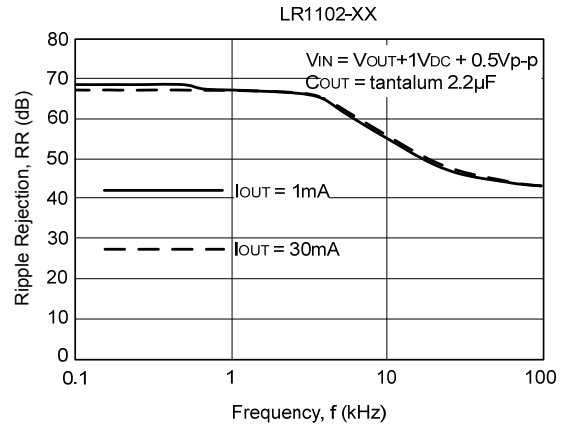
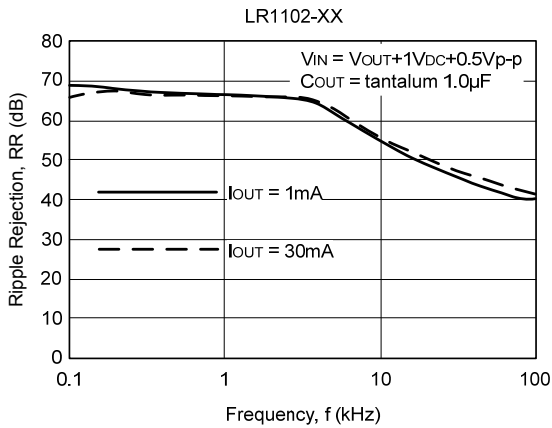


### 6. Dropout Voltage vs. Set Output Voltage

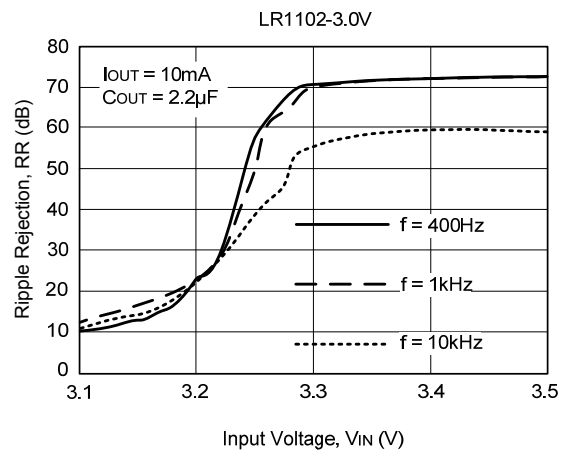
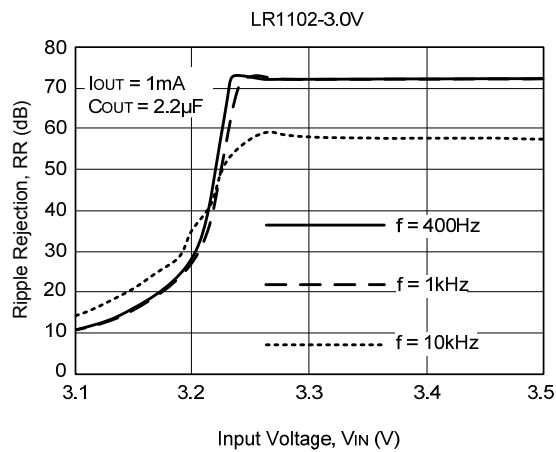


## ■ TYPICAL CHARACTERISTICS(Cont.)

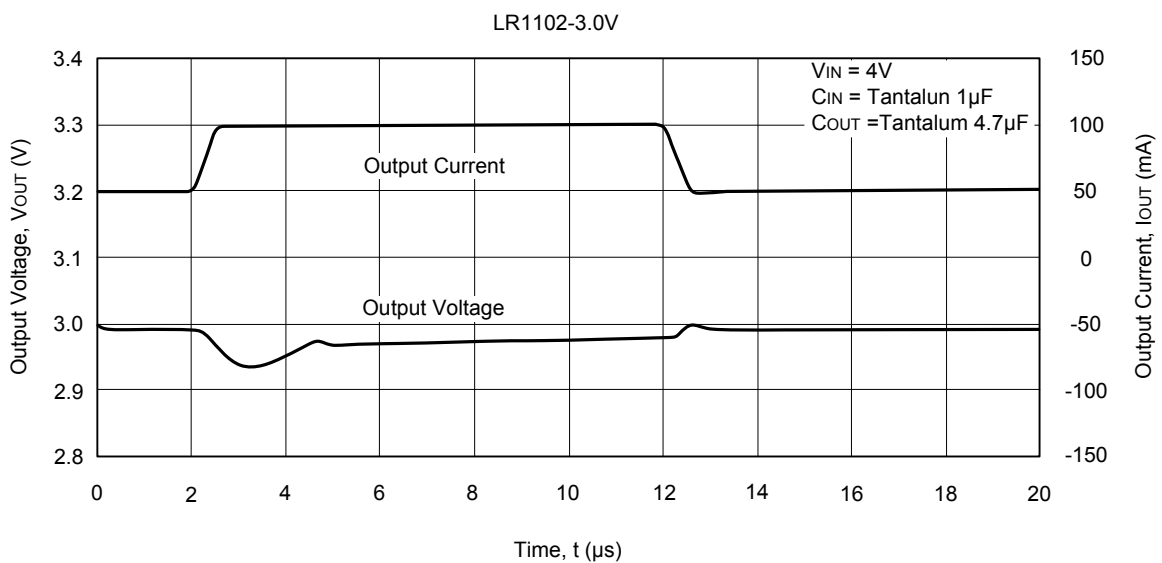
### 7. Ripple Rejection vs. Frequency



### 8. Ripple Rejection vs. Input Voltage (DC bias)



### 9. Load Transient Response



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