



LR1106

CMOS IC

LARGE CURRENT POSITIVE VOLTAGE REGULATORS

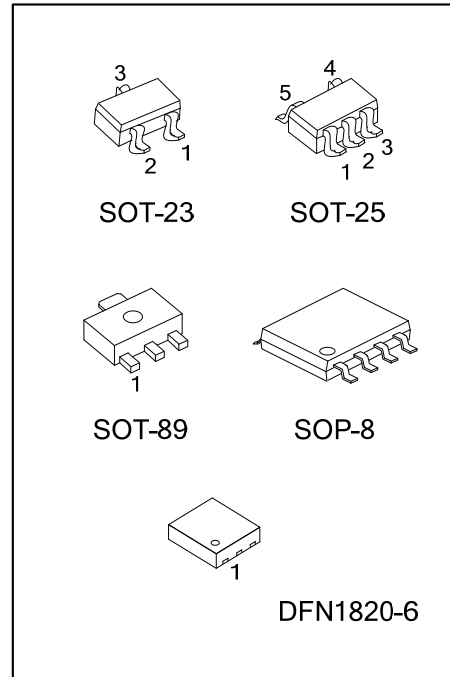
DESCRIPTION

The UTC **LR1106** series are positive voltage regulators that developed in CMOS technology with highly precise, low power consumption. It is capable of large currents with a significantly small dropout voltage.

The device consists of a driver transistor, a precision reference voltage and an error amplifier. Basically, output voltage is selectable in 0.1V step form 1.5V to 6.0V, 2.85V also is available.

FEATURES

- * Maximum Output Current : 400mA
- * Maximum Operating Voltage: 8V
- * Highly Accurate : ± 2%
- * Output Voltage Temperature Characteristics : TYP ±100ppm/°C



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
LR1106L-xx-AB3-B-R	LR1106G-xx-AB3-B-R	SOT-89	O	G	I	-	-	-	-	-	Tape Reel
LR1106L-xx-AB3-C-R	LR1106G-xx-AB3-C-R	SOT-89	G	I	O	-	-	-	-	-	Tape Reel
LR1106L-xx-AE3-3-R	LR1106G-xx-AE3-3-R	SOT-23	O	G	I	-	-	-	-	-	Tape Reel
LR1106L-xx-AF5-R	LR1106G-xx-AF5-R	SOT-25	I	G	E	N	O	-	-	-	Tape Reel
LR1106L-xx-S08-R	LR1106G-xx-S08-R	SOP-8	O	N	G	N	E	N	N	I	Tape Reel
LR1106L-xx-K06-1820-R	LR1106G-xx-K06-1820-R	DFN1820-6	I	N	O	N	G	E	-	-	Tape Reel

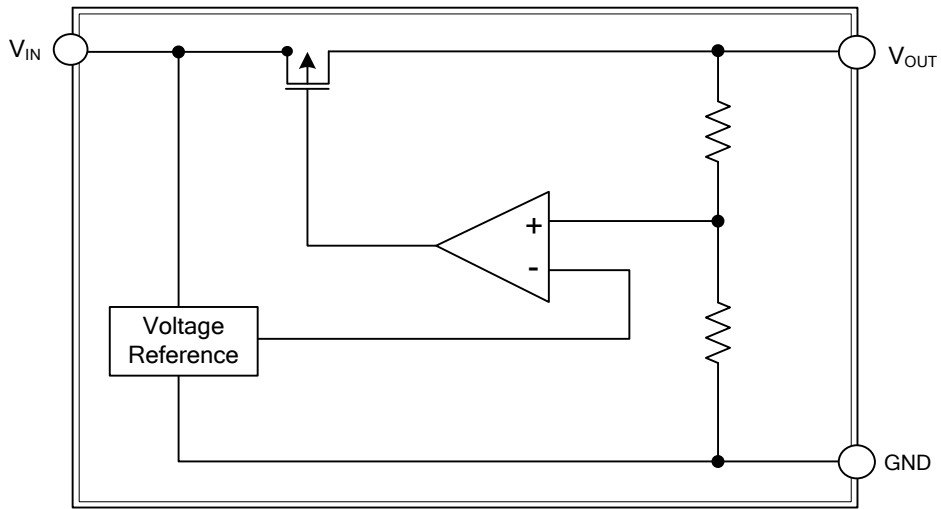
Note: Pin Assignment: I: V_{IN} O: V_{OUT} G: GND N: No Connection E: Enable
 xx: Output Voltage, refer to Marking Information.

<p>LR1106G-xx-AB3-B-R</p>	<p>(1) R: Tape Reel (2) Refer to Pin Assignment (3) AB3: SOT-89, AE3: SOT-23, AF5: SOT-25, S08: SOP-8 K06-1820: DFN1820-6 (4) xx: Refer to Marking Information (5) G: Halogen Free and Lead Free</p>
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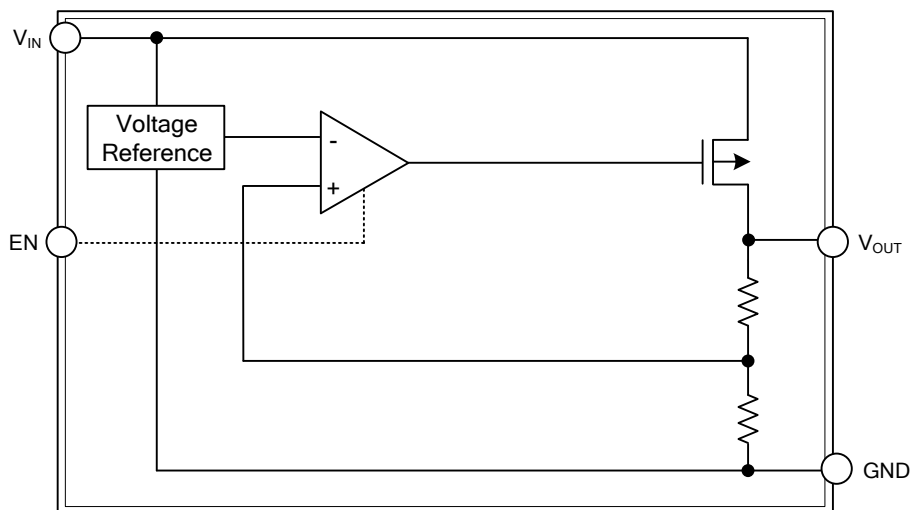
MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-23	15:1.5V 18:1.8V 22:2.2V 25:2.5V 27:2.7V 28:2.8V 2J:2.85V 30:3.0V 31:3.1V 33:3.3V 50:5.0V	
SOT-25		
SOT-89		
SOP-8		
DFN1820-6		

■ BLOCK DIAGRAM



For SOT-89 / SOT-23 Package



For SOP-8 / DFN1820-6 / SOT-25 Package

■ ABSOLUTE MAXIMUM RATINGS (T_A=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V _{IN}	8	V
Output Voltage		V _{OUT}	V _{SS} -0.3 ~ V _{IN} +0.3	V
Output Current		I _{OUT}	400	mA
Power Dissipation	SOT-25/SOT-23	P _D	300	mW
	SOT-89/SOP-8		500	mW
	DFN1820-6		1000	mW
Operating Ambient Temperature		T _{OPR}	-40 ~ +85	°C
Storage Temperature		T _{STG}	-40 ~ +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 (T_A=25°C, unless otherwise specified.)

For LR1106-15

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V _{OUT}	V _{IN} =2.5V, I _{OUT} =40mA	1.470	1.500	1.530	V
Input Voltage	V _{IN}				8	V
Load Regulation	ΔV _{OUT}	V _{IN} =2.5V, 1mA ≤ I _{OUT} ≤ 200mA		40	100	mV
Dropout Voltage	V _{D1}	I _{OUT} =100mA		200	300	mV
	V _{D2}	I _{OUT} =200mA		400	600	
Maximum Output Current	I _{OUT(MAX)}	V _{IN} =2.5V, V _{OUT} ≥ V _{OUT} × 0.90	400			mA
Supply Current	I _{SS}	V _{IN} =2.5V, V _{EN} =V _{IN}		30.0	50.0	μA
EN Input Bias Current	I _{EH}	V _{EN} =V _{IN}			0.1	μA
	I _{EL}	V _{EN} =0, V _{IN} =2.5V to 8V		1.0	3.0	
EN Input Threshold	V _{EH}	V _{IN} =2.5V to 8V	V _{IN} /2+0.8		V _{IN}	V
	V _{EL}	V _{IN} =2.5V to 8V	0		0.4	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	I _{OUT} =40mA, 2.5V ≤ V _{IN} ≤ 8.0V		0.2	0.5	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{OPR} \times V_{OUT}}$	I _{OUT} =40mA		±100		ppm/°C

For LR1106-18

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V _{OUT}	V _{IN} =2.8V, I _{OUT} =40mA	1.764	1.800	1.836	V
Input Voltage	V _{IN}				8	V
Load Regulation	ΔV _{OUT}	V _{IN} =2.8V, 1mA ≤ I _{OUT} ≤ 200mA		40	100	mV
Dropout Voltage	V _{D1}	I _{OUT} =100mA		200	300	mV
	V _{D2}	I _{OUT} =200mA		400	600	
Maximum Output Current	I _{OUT(MAX)}	V _{IN} =2.8V, V _{OUT} ≥ V _{OUT} × 0.90	400			mA
Supply Current	I _{SS}	V _{IN} =2.8V, V _{EN} =V _{IN}		30.0	50.0	μA
EN Input Bias Current	I _{EH}	V _{EN} =V _{IN}			0.1	μA
	I _{EL}	V _{EN} =0, V _{IN} =2.8V to 8V		1.0	3.0	
EN Input Threshold	V _{EH}	V _{IN} =2.8V to 8V	V _{IN} /2+0.8		V _{IN}	V
	V _{EL}	V _{IN} =2.8V to 8V	0		0.4	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	I _{OUT} =40mA, 2.8V ≤ V _{IN} ≤ 8.0V		0.2	0.5	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{OPR} \times V_{OUT}}$	I _{OUT} =40mA		±100		ppm/°C

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LR1106-22

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$V_{IN}=3.2V, I_{OUT}=40mA$	2.156	2.200	2.244	V
Input Voltage	V_{IN}				8	V
Load Regulation	ΔV_{OUT}	$V_{IN}=3.2V, 1mA \leq I_{OUT} \leq 200mA$		40	100	mV
Dropout Voltage	V_{D1}	$I_{OUT}=100mA$		200	300	mV
	V_{D2}	$I_{OUT}=200mA$		400	600	
Maximum Output Current	$I_{OUT(MAX)}$	$V_{IN}=3.2V, V_{OUT} \geq V_{OUT} \times 0.90$	400			mA
Supply Current	I_{SS}	$V_{IN}=3.2V, V_{EN}=V_{IN}$		30.0	50.0	μA
EN Input Bias Current	I_{EH}	$V_{EN}=V_{IN}$			0.1	μA
	I_{EL}	$V_{EN}=0, V_{IN}=3.2V \text{ to } 8V$		1.0	3.0	μA
EN Input Threshold	V_{EH}	$V_{IN}=3.2V \text{ to } 8V$	$V_{IN}/2+0.8$		V_{IN}	V
	V_{EL}	$V_{IN}=3.2V \text{ to } 8V$	0		0.4	V
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$I_{OUT}=40mA, 3.2V \leq V_{IN} \leq 8.0V$		0.2	0.5	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{OPR} \times V_{OUT}}$	$I_{OUT}=40mA$		± 100		ppm/ $^{\circ}C$

For LR1106-25

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$V_{IN}=3.5V, I_{OUT}=40mA$	2.450	2.500	2.550	V
Input Voltage	V_{IN}				8	V
Load Regulation	ΔV_{OUT}	$V_{IN}=3.5V, 1mA \leq I_{OUT} \leq 200mA$		40	100	mV
Dropout Voltage	V_{D1}	$I_{OUT}=100mA$		170	250	mV
	V_{D2}	$I_{OUT}=200mA$		320	500	
Maximum Output Current	$I_{OUT(MAX)}$	$V_{IN}=3.5V, V_{OUT} \geq V_{OUT} \times 0.93$	400			mA
Supply Current	I_{SS}	$V_{IN}=3.5V, V_{EN}=V_{IN}$		30.0	50.0	μA
EN Input Bias Current	I_{EH}	$V_{EN}=V_{IN}$			0.1	μA
	I_{EL}	$V_{EN}=0, V_{IN}=3.5V \text{ to } 8V$		1.0	3.0	μA
EN Input Threshold	V_{EH}	$V_{IN}=3.5V \text{ to } 8V$	$V_{IN}/2+0.8$		V_{IN}	V
	V_{EL}	$V_{IN}=3.5V \text{ to } 8V$	0		0.4	V
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$I_{OUT}=40mA, 3.5V \leq V_{IN} \leq 8.0V$		0.2	0.5	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{OPR} \times V_{OUT}}$	$I_{OUT}=40mA$		± 100		ppm/ $^{\circ}C$

For LR1106-27

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$V_{IN}=3.7V, I_{OUT}=40mA$	2.646	2.700	2.754	V
Input Voltage	V_{IN}				8	V
Load Regulation	ΔV_{OUT}	$V_{IN}=3.7V, 1mA \leq I_{OUT} \leq 200mA$		40	100	mV
Dropout Voltage	V_{D1}	$I_{OUT}=100mA$		170	250	mV
	V_{D2}	$I_{OUT}=200mA$		320	500	
Maximum Output Current	$I_{OUT(MAX)}$	$V_{IN}=3.7V, V_{OUT} \geq V_{OUT} \times 0.93$	400			mA
Supply Current	I_{SS}	$V_{IN}=3.7V, V_{EN}=V_{IN}$		30.0	50.0	μA
EN Input Bias Current	I_{EH}	$V_{EN}=V_{IN}$			0.1	μA
	I_{EL}	$V_{EN}=0, V_{IN}=3.7V \text{ to } 8V$		1.0	3.0	μA
EN Input Threshold	V_{EH}	$V_{IN}=3.7V \text{ to } 8V$	$V_{IN}/2+0.8$		V_{IN}	V
	V_{EL}	$V_{IN}=3.7V \text{ to } 8V$	0		0.4	V
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$I_{OUT}=40mA, 3.7V \leq V_{IN} \leq 8.0V$		0.2	0.5	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{OPR} \times V_{OUT}}$	$I_{OUT}=40mA$		± 100		ppm/ $^{\circ}C$

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LR1106-28

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$V_{IN}=3.8V, I_{OUT}=40mA$	2.744	2.800	2.856	V
Input Voltage	V_{IN}				8	V
Load Regulation	ΔV_{OUT}	$V_{IN}=3.8V, 1mA \leq I_{OUT} \leq 200mA$		40	100	mV
Dropout Voltage	V_{D1}	$I_{OUT}=100mA$		170	250	mV
	V_{D2}	$I_{OUT}=200mA$		320	500	
Maximum Output Current	$I_{OUT(MAX)}$	$V_{IN}=3.8V, V_{OUT} \geq V_{OUT} \times 0.93$	400			mA
Supply Current	I_{SS}	$V_{IN}=3.8V, V_{EN}=V_{IN}$		30.0	50.0	μA
EN Input Bias Current	I_{EH}	$V_{EN}=V_{IN}$			0.1	μA
	I_{EL}	$V_{EN}=0, V_{IN}=3.8V \text{ to } 8V$		1.0	3.0	μA
EN Input Threshold	V_{EH}	$V_{IN}=3.8V \text{ to } 8V$	$V_{IN}/2+0.8$		V_{IN}	V
	V_{EL}	$V_{IN}=3.8V \text{ to } 8V$	0		0.4	V
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$I_{OUT}=40mA, 3.8V \leq V_{IN} \leq 8.0V$		0.2	0.5	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{OPR} \times V_{OUT}}$	$I_{OUT}=40mA$		± 100		ppm/ $^{\circ}C$

For LR1106-2J(2.85V)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$V_{IN}=3.85V, I_{OUT}=40mA$	2.793	2.850	2.907	V
Input Voltage	V_{IN}				8	V
Load Regulation	ΔV_{OUT}	$V_{IN}=3.85V, 1mA \leq I_{OUT} \leq 200mA$		40	100	mV
Dropout Voltage	V_{D1}	$I_{OUT}=100mA$		170	250	mV
	V_{D2}	$I_{OUT}=200mA$		250	500	
Maximum Output Current	$I_{OUT(MAX)}$	$V_{IN}=3.85V, V_{OUT} \geq V_{OUT} \times 0.93$	400			mA
Supply Current	I_{SS}	$V_{IN}=3.85V, V_{EN}=V_{IN}$		30.0	50.0	μA
EN Input Bias Current	I_{EH}	$V_{EN}=V_{IN}$			0.1	μA
	I_{EL}	$V_{EN}=0, V_{IN}=3.85 \text{ to } 8V$		1.0	3.0	μA
EN Input Threshold	V_{EH}	$V_{IN}=3.85V \text{ to } 8V$	$V_{IN}/2+0.8$		V_{IN}	V
	V_{EL}	$V_{IN}=3.85V \text{ to } 8V$	0		0.4	V
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$I_{OUT}=40mA, 3.85V \leq V_{IN} \leq 8.0V$		0.2	0.5	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{OPR} \times V_{OUT}}$	$I_{OUT}=40mA$		± 100		ppm/ $^{\circ}C$

For LR1106-30

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$V_{IN}=4.0V, I_{OUT}=40mA$	2.940	3.000	3.060	V
Input Voltage	V_{IN}				8	V
Load Regulation	ΔV_{OUT}	$V_{IN}=4.0V, 1mA \leq I_{OUT} \leq 200mA$		40	100	mV
Dropout Voltage	V_{D1}	$I_{OUT}=100mA$		150	220	mV
	V_{D2}	$I_{OUT}=200mA$		300	420	
Maximum Output Current	$I_{OUT(MAX)}$	$V_{IN}=4.0V, V_{OUT} \geq V_{OUT} \times 0.96$	400			mA
Supply Current	I_{SS}	$V_{IN}=4.0V, V_{EN}=V_{IN}$		30.0	50.0	μA
EN Input Bias Current	I_{EH}	$V_{EN}=V_{IN}$			0.1	μA
	I_{EL}	$V_{EN}=0, V_{IN}=4.0V \text{ to } 8V$		1.0	3.0	μA
EN Input Threshold	V_{EH}	$V_{IN}=4.0V \text{ to } 8V$	$V_{IN}/2+0.8$		V_{IN}	V
	V_{EL}	$V_{IN}=4.0V \text{ to } 8V$	0		0.4	V
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$I_{OUT}=40mA, 4V \leq V_{IN} \leq 8.0V$		0.2	0.5	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{OPR} \times V_{OUT}}$	$I_{OUT}=40mA$		± 100		ppm/ $^{\circ}C$

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LR1106-31

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$V_{IN}=4.1V, I_{OUT}=40mA$	3.038	3.100	3.162	V
Input Voltage	V_{IN}				8	V
Load Regulation	ΔV_{OUT}	$V_{IN}=4.1V, 1mA \leq I_{OUT} \leq 200mA$		40	100	mV
Dropout Voltage	V_{D1}	$I_{OUT}=100mA$		150	220	mV
	V_{D2}	$I_{OUT}=200mA$		300	420	
Maximum Output Current	$I_{OUT(MAX)}$	$V_{IN}=4.1V, V_{OUT} \geq V_{OUT} \times 0.96$	400			mA
Supply Current	I_{SS}	$V_{IN}=4.1V, V_{EN}=V_{IN}$		30.0	50.0	μA
EN Input Bias Current	I_{EH}	$V_{EN}=V_{IN}$			0.1	μA
	I_{EL}	$V_{EN}=0, V_{IN}=4.1V \text{ to } 8V$		1.0	3.0	μA
EN Input Threshold	V_{EH}	$V_{IN}=4.1V \text{ to } 8V$	$V_{IN}/2+0.8$		V_{IN}	V
	V_{EL}	$V_{IN}=4.1V \text{ to } 8V$	0		0.4	V
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$I_{OUT}=40mA, 4V \leq V_{IN} \leq 8.0V$		0.2	0.5	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{OPR} \times V_{OUT}}$	$I_{OUT}=40mA$		± 100		ppm/ $^{\circ}C$

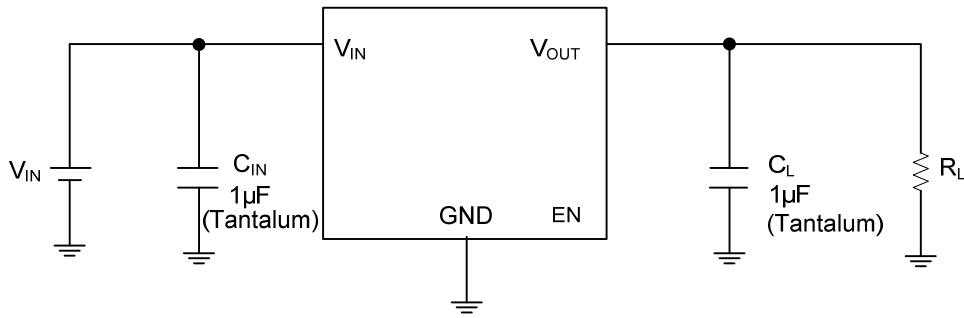
For LR1106-33

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$V_{IN}=4.3V, I_{OUT}=40mA$	3.234	3.300	3.366	V
Input Voltage	V_{IN}				8	V
Load Regulation	ΔV_{OUT}	$V_{IN}=4.3V, 1mA \leq I_{OUT} \leq 200mA$		40	100	mV
Dropout Voltage	V_{D1}	$I_{OUT}=100mA$		150	220	mV
	V_{D2}	$I_{OUT}=200mA$		300	420	
Maximum Output Current	$I_{OUT(MAX)}$	$V_{IN}=4.3V, V_{OUT} \geq V_{OUT} \times 0.96$	400			mA
Supply Current	I_{SS}	$V_{IN}=4.3V, V_{EN}=V_{IN}$		30.0	50.0	μA
EN Input Bias Current	I_{EH}	$V_{EN}=V_{IN}$			0.1	μA
	I_{EL}	$V_{EN}=0, V_{IN}=4.3V \text{ to } 8V$		1.0	3.0	μA
EN Input Threshold	V_{EH}	$V_{IN}=4.3V \text{ to } 8V$	$V_{IN}/2+0.8$		V_{IN}	V
	V_{EL}	$V_{IN}=4.3V \text{ to } 8V$	0		0.4	V
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$I_{OUT}=40mA, 4.3V \leq V_{IN} \leq 8.0V$		0.2	0.5	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{OPR} \times V_{OUT}}$	$I_{OUT}=40mA$		± 100		ppm/ $^{\circ}C$

For LR1106-50

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$V_{IN}=6.0V, I_{OUT}=40mA$	4.900	5.000	5.100	V
Input Voltage	V_{IN}				8	V
Load Regulation	ΔV_{OUT}	$V_{IN}=6.0V, 1mA \leq I_{OUT} \leq 200mA$		40	100	mV
Dropout Voltage	V_{D1}	$I_{OUT}=100mA$		100	180	mV
	V_{D2}	$I_{OUT}=200mA$		200	320	
Maximum Output Current	$I_{OUT(MAX)}$	$V_{IN}=6.0V, V_{OUT} \geq V_{OUT} \times 0.96$	400			mA
Supply Current	I_{SS}	$V_{IN}=6.0V, V_{EN}=V_{IN}$		30.0	50.0	μA
EN Input Bias Current	I_{EH}	$V_{EN}=V_{IN}$			0.1	μA
	I_{EL}	$V_{EN}=0, V_{IN}=6.0V \text{ to } 8V$		1.0	3.0	μA
EN Input Threshold	V_{EH}	$V_{IN}=6.0V \text{ to } 8V$	$V_{IN}/2+0.8$		V_{IN}	V
	V_{EL}	$V_{IN}=6.0V \text{ to } 8V$	0		0.4	V
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$I_{OUT}=40mA, 6.0V \leq V_{IN} \leq 8.0V$		0.2	0.5	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{OPR} \times V_{OUT}}$	$I_{OUT}=40mA$		± 100		ppm/ $^{\circ}C$

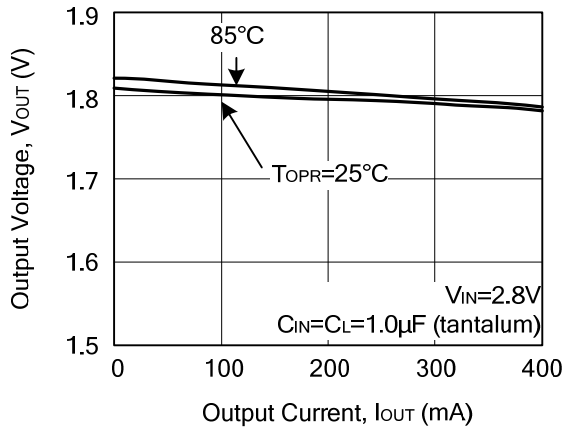
■ TYPICAL APPLICATION CIRCUIT



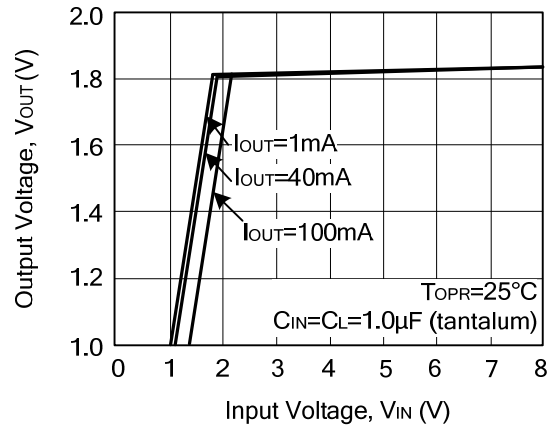
TYPICAL CHARACTERISTICS

(1) LR1106-18

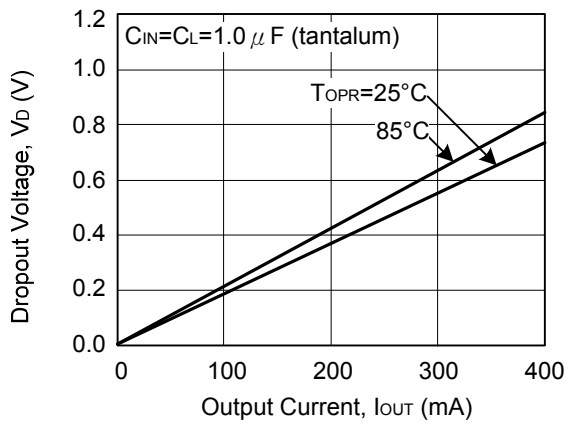
Output Voltage vs. Output Current



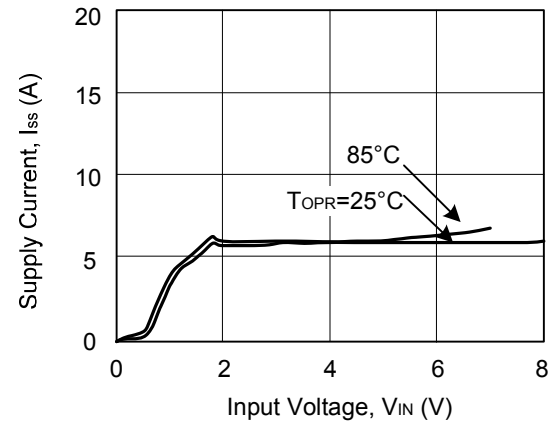
Output Voltage vs. Input Voltage



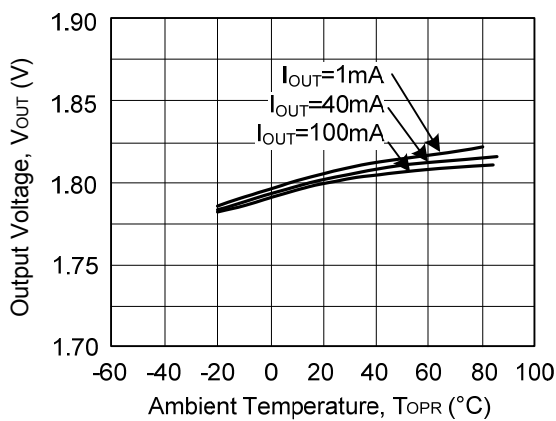
Dropout Voltage vs. Output Current



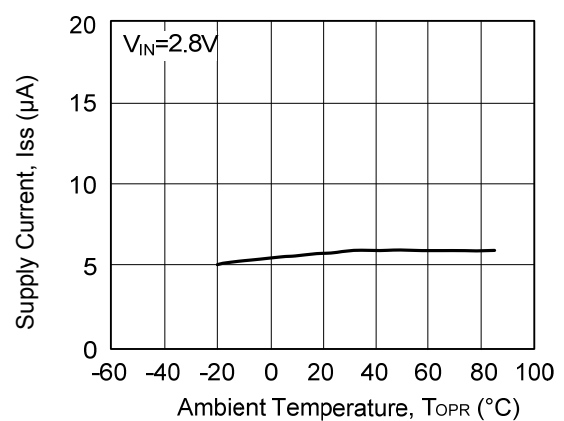
Supply Current vs. Input Voltage



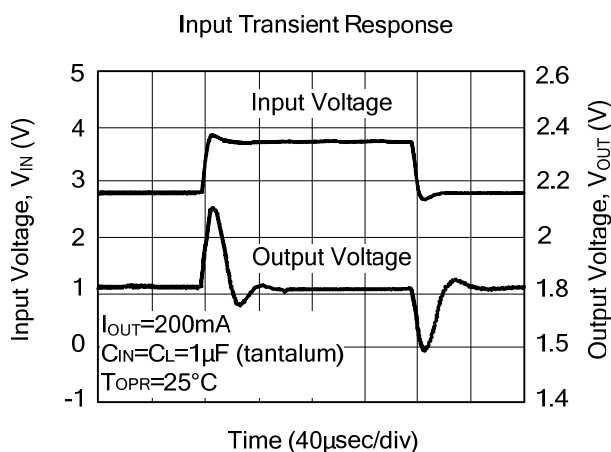
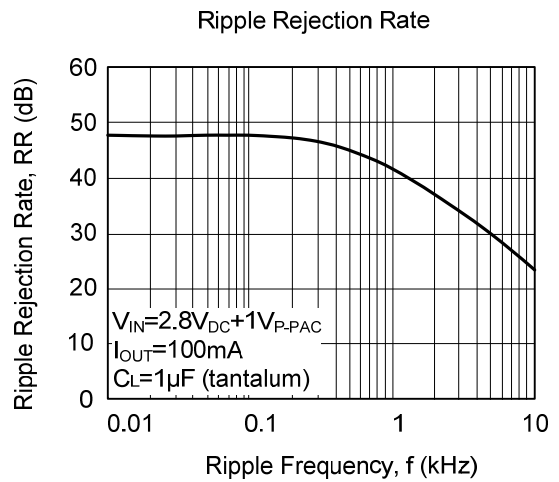
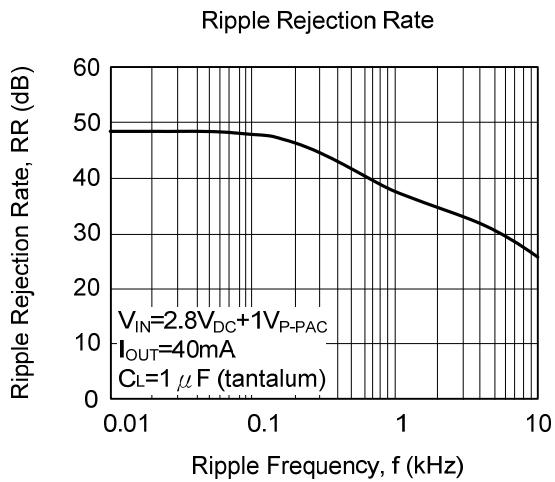
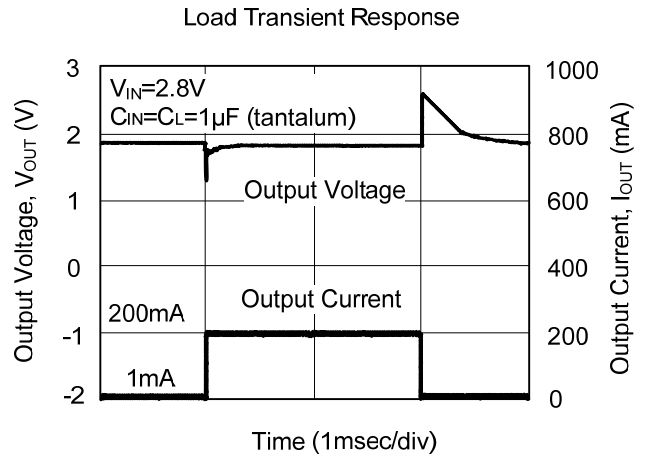
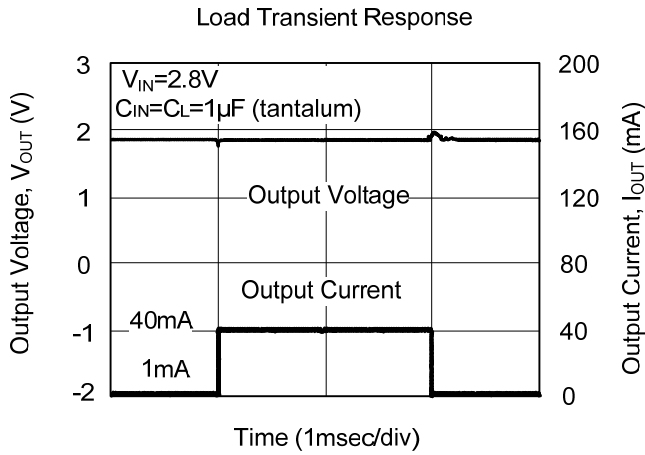
Output Voltage vs Ambient Temperature



Supply Current vs Ambient Temperature

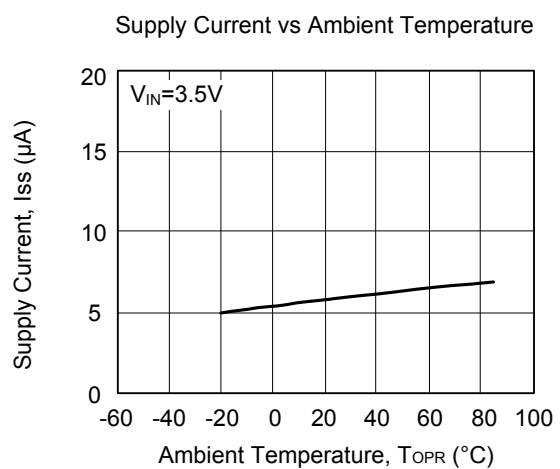
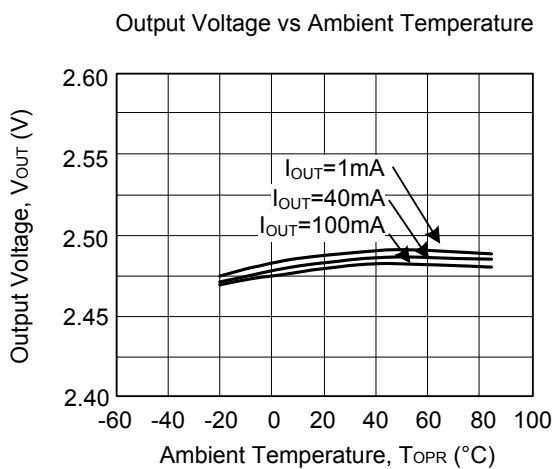
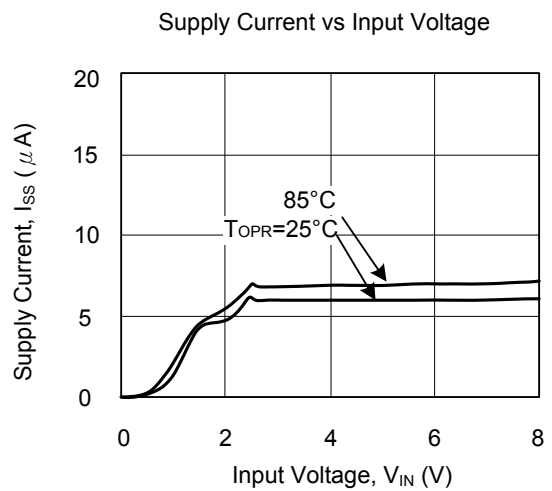
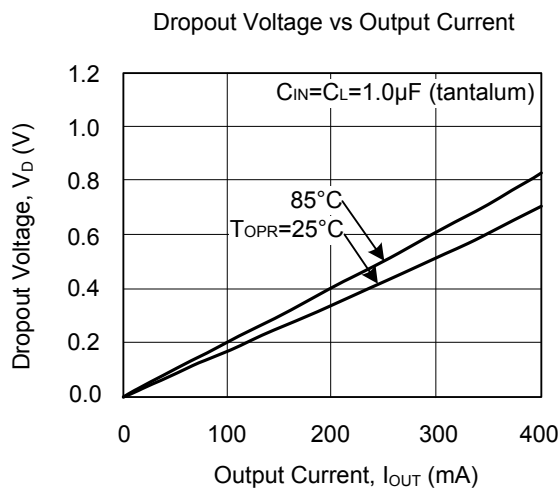
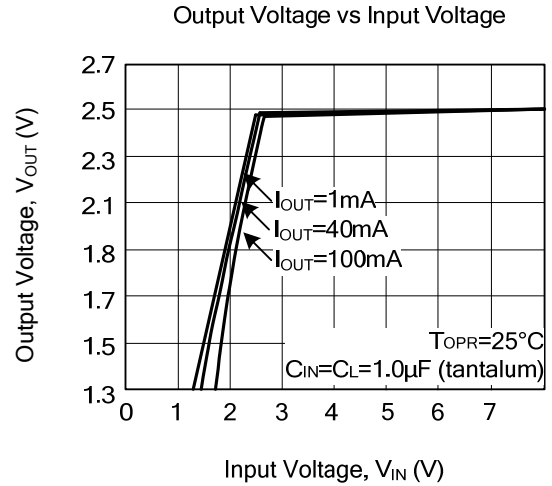
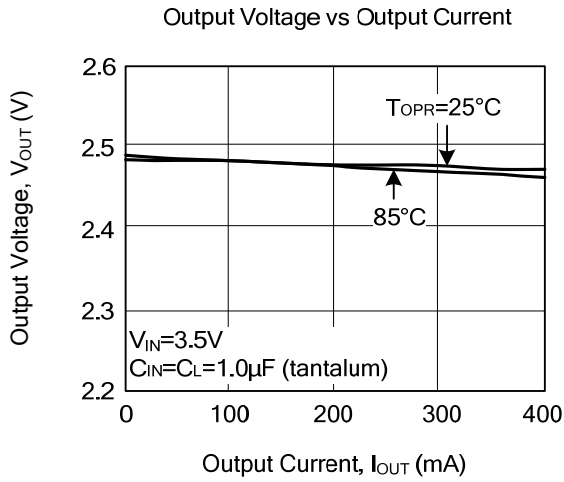


■ TYPICAL CHARACTERISTICS (Cont.)

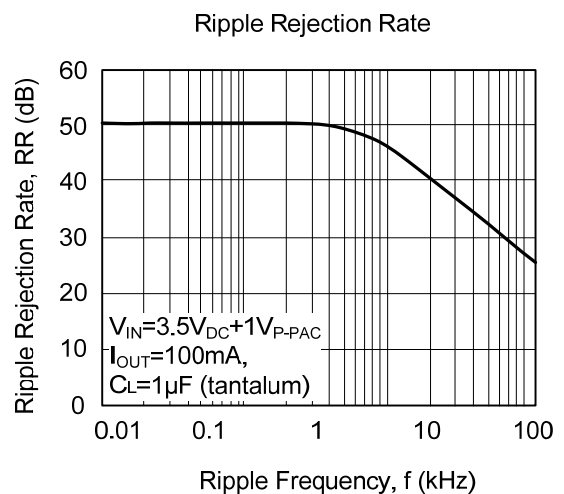
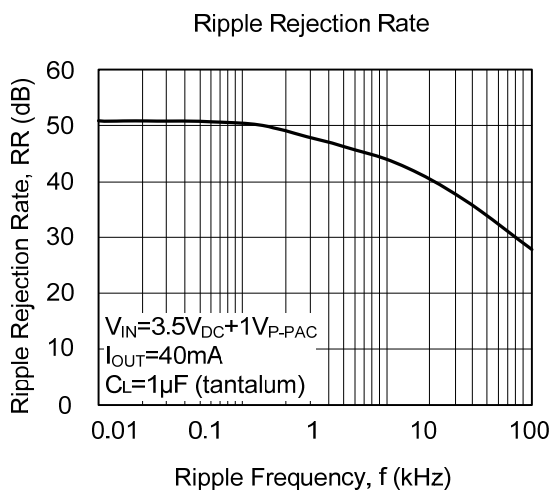
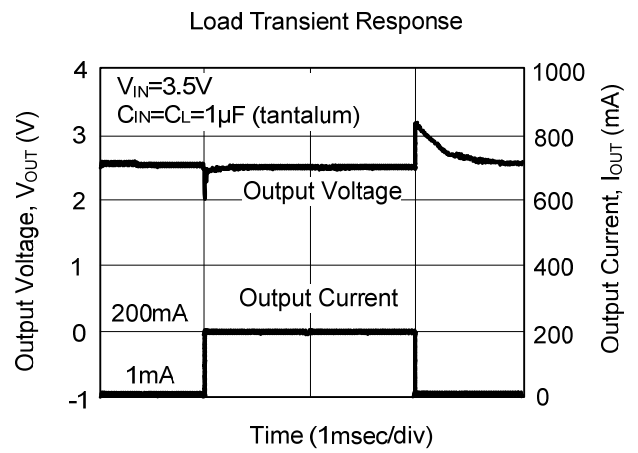
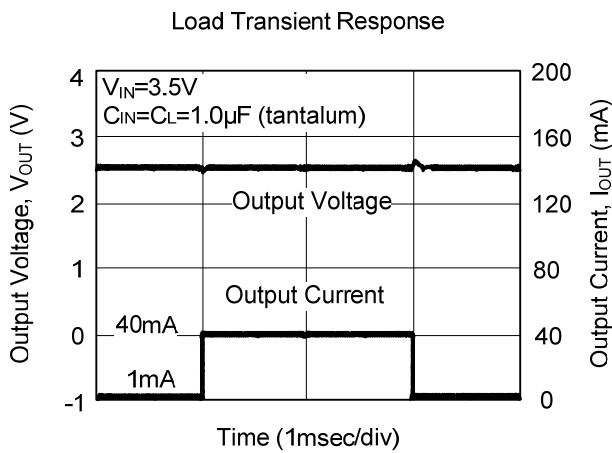
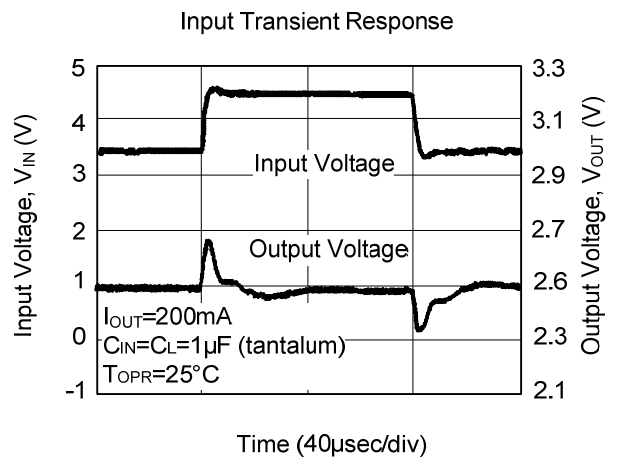
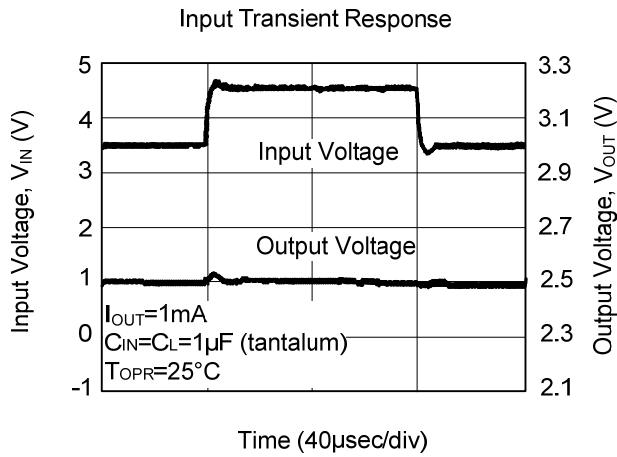


■ TYPICAL CHARACTERISTICS (Cont.)

(2) LR1106-25

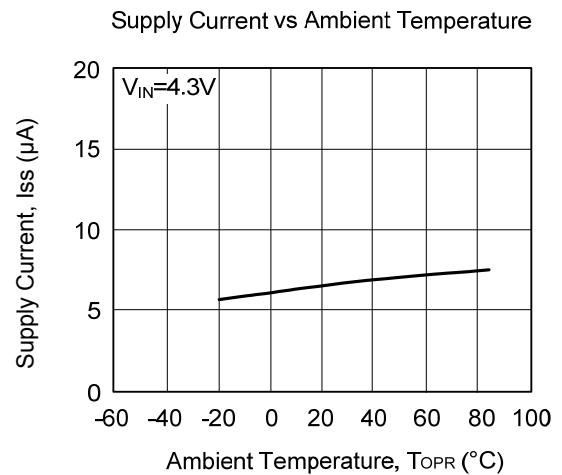
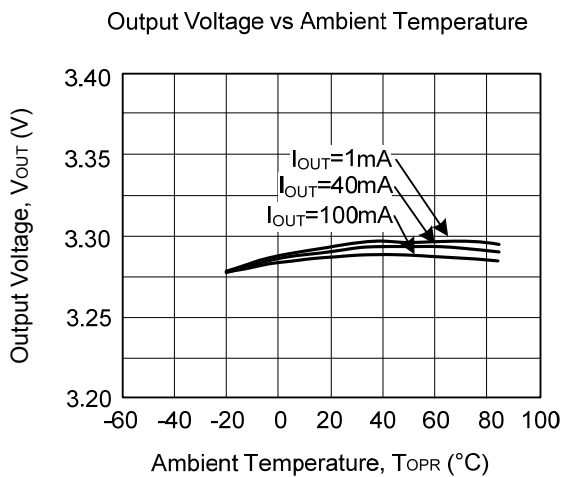
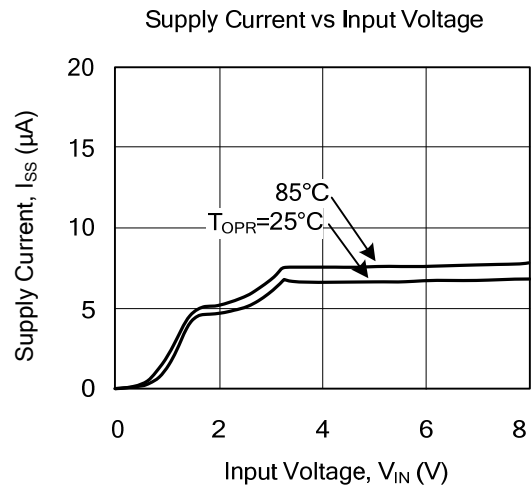
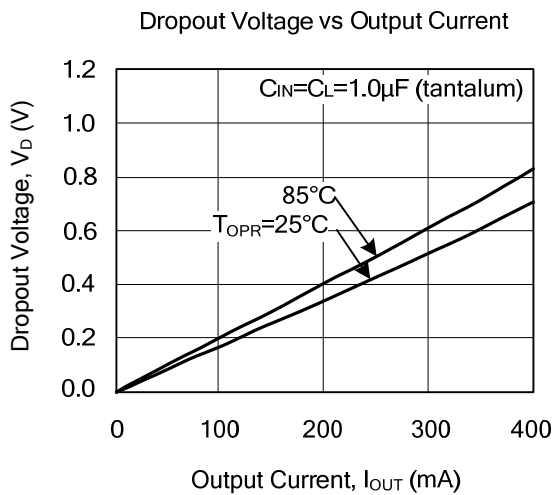
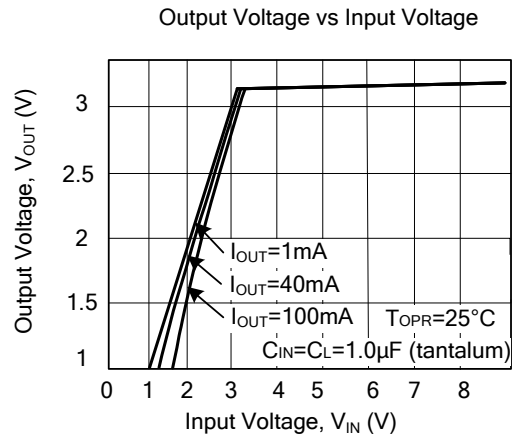
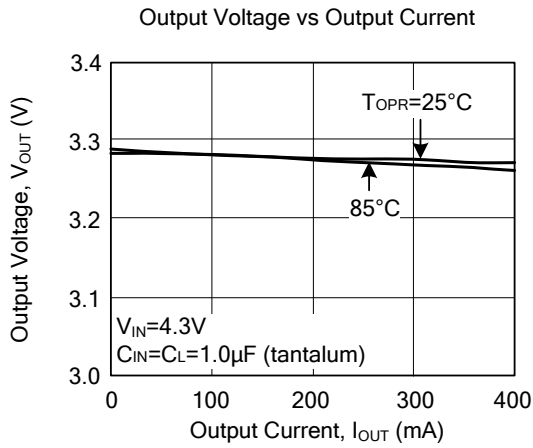


■ TYPICAL CHARACTERISTICS (Cont.)

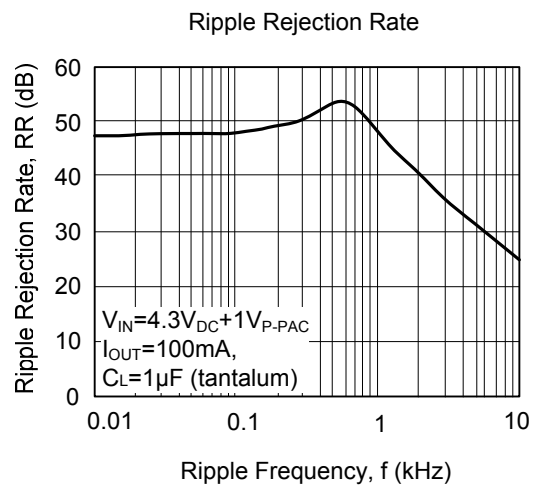
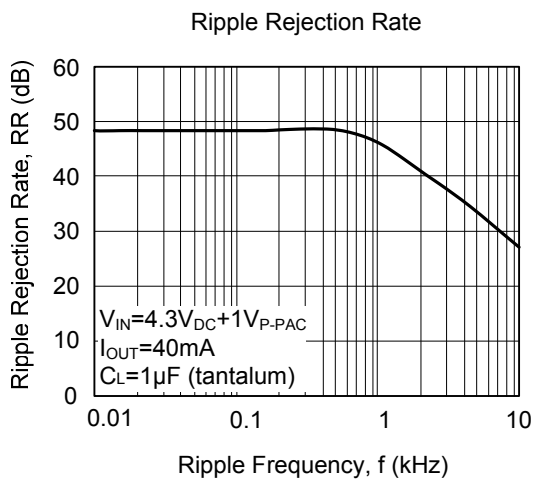
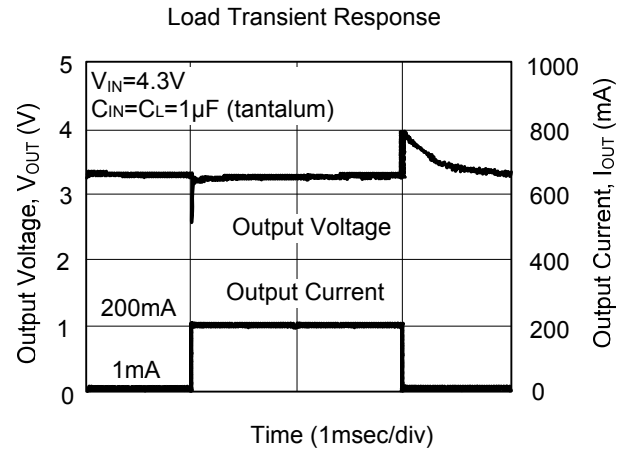
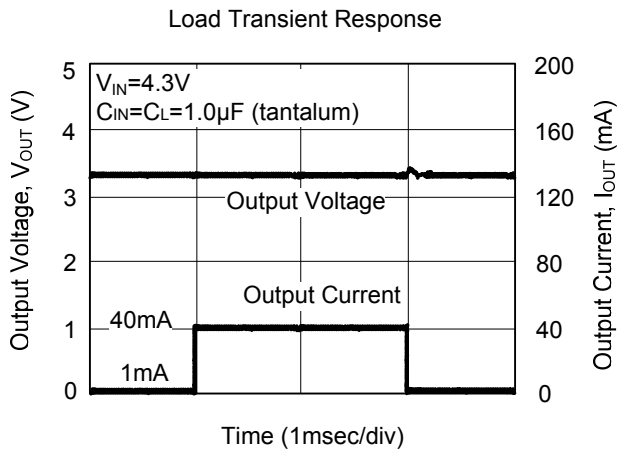
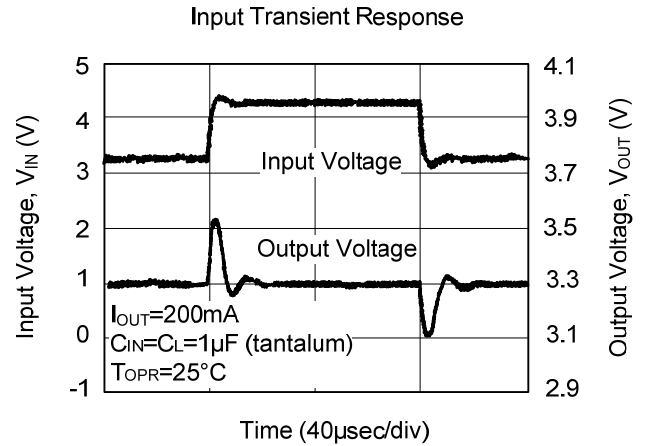
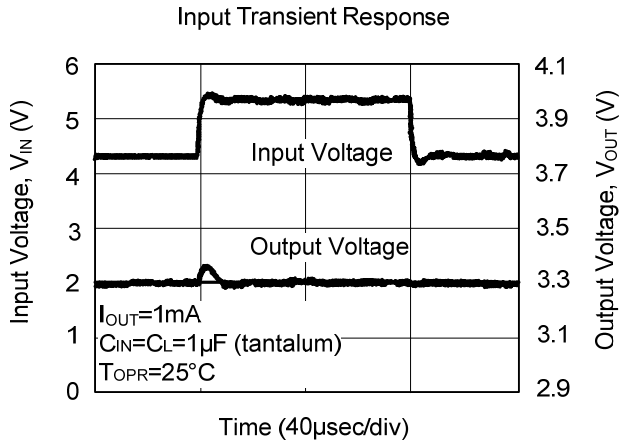


■ TYPICAL CHARACTERISTICS (Cont.)

(3) LR1106-33

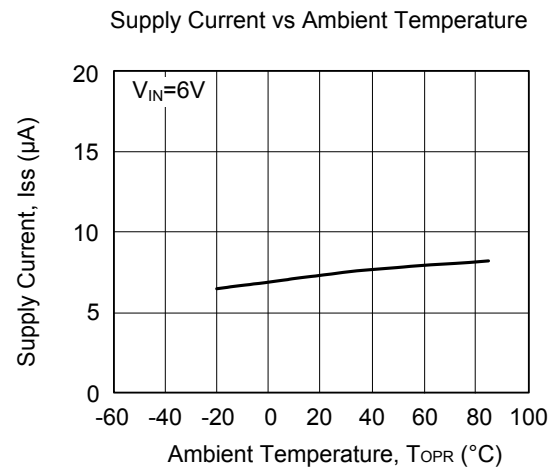
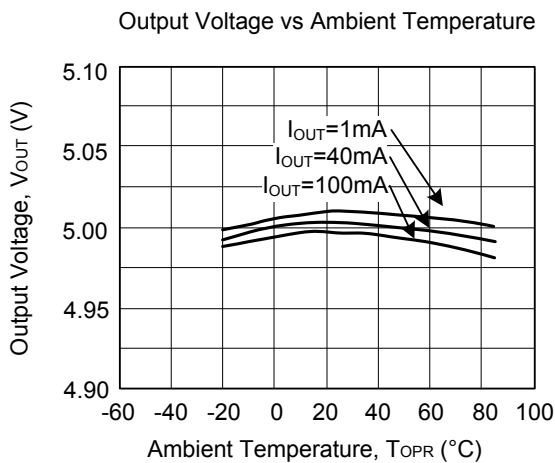
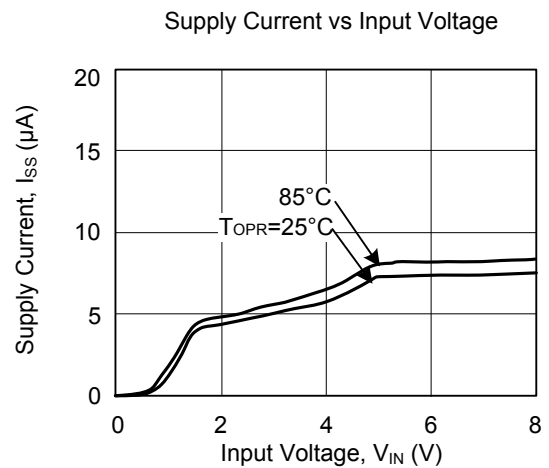
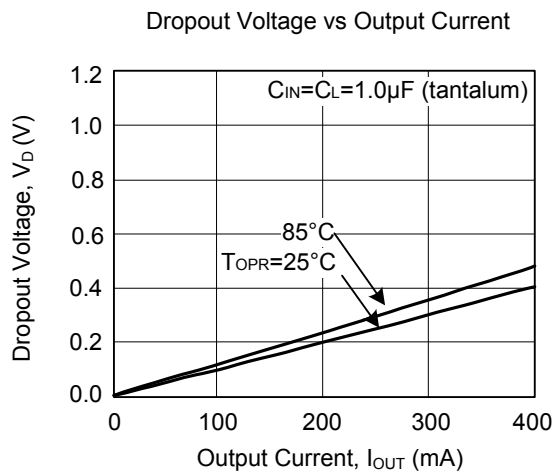
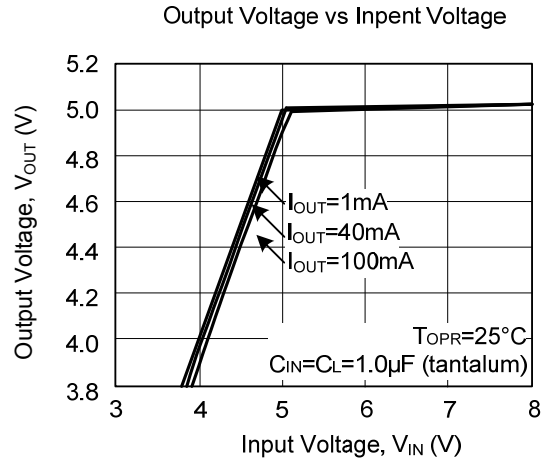
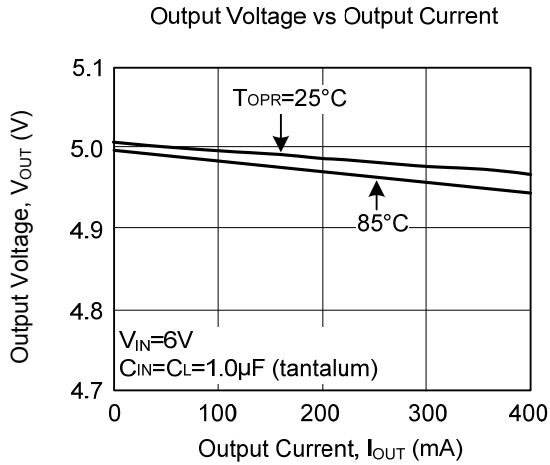


■ TYPICAL CHARACTERISTICS (Cont.)

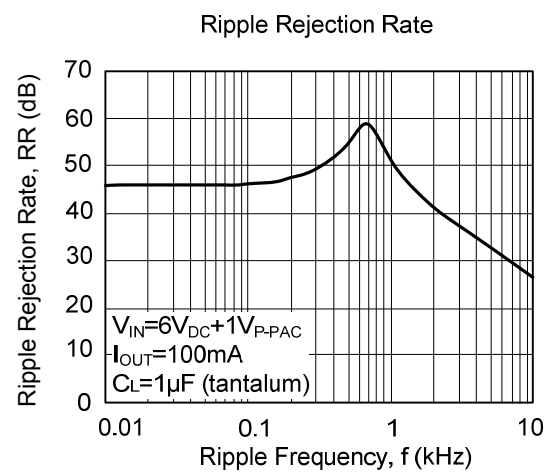
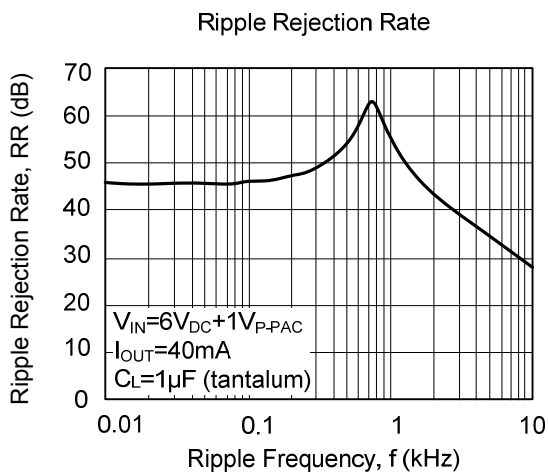
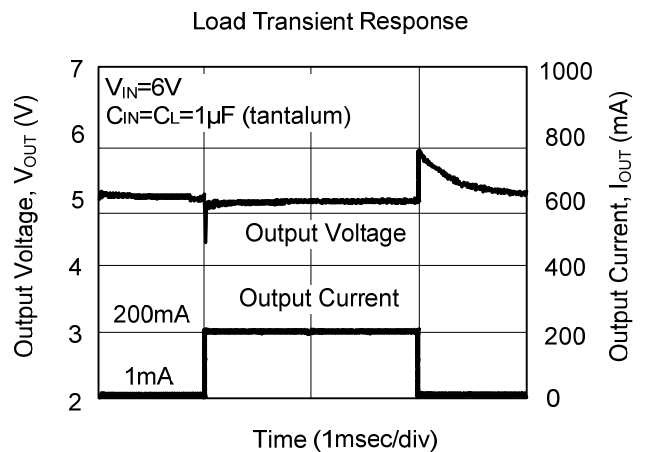
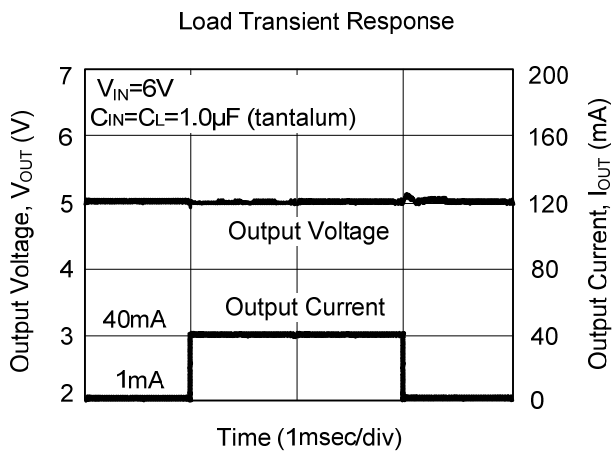
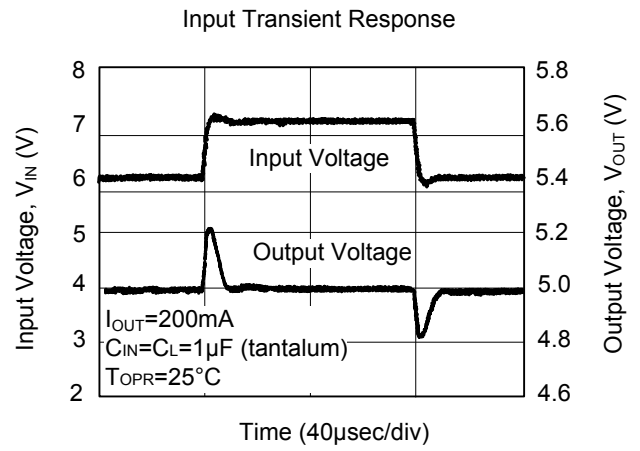
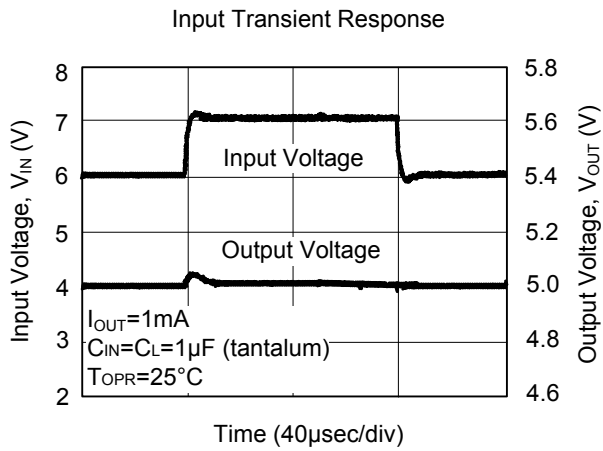


■ TYPICAL CHARACTERISTICS (Cont.)

(4) LR1106-50



■ TYPICAL CHARACTERISTICS (Cont.)



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