



LM2940

LINEAR INTEGRATED CIRCUIT

1A LOW-DROPOUT POSITIVE VOLTAGE REGULATOR

DESCRIPTION

The UTC **LM2940** is a low dropout regulator designed to provide output current up to 1A with a typically 500mV dropout Voltage and a maximum of 1V. It is capable of reducing the ground current when the differential between the input voltage and the output voltage outrun 3V.

UTC LM2940 offers low quiescent current (typically 30mA at 1A and an input-output differential of 5V). Higher quiescent currents only exist when the regulator is in the dropout mode ($V_{IN}-V_{OUT} \leq 3V$).

FEATURES

- * 500mV typically dropout at 1A
- * Output current in excess of 1A
- * Low quiescent current
- * Reversed-battery protection
- * Current limit and thermal shutdown.
- * Mirror image insertion protection

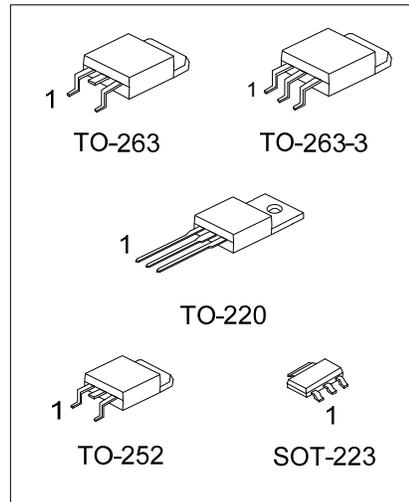
ORDERING INFORMATION

Order Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
LM2940-xx-AA3- R	LM2940L-xx-AA3-R	SOT-223	I	G	O	Tape Reel
LM2940-xx-TA3-T	LM2940L-xx-TA3-T	TO-220	I	G	O	Tube
LM2940-xx-TN3-R	LM2940L-xx-TN3-R	TO-252	I	G	O	Tape Reel
LM2940-xx-TN3-T	LM2940L-xx-TN3-T	TO-252	I	G	O	Tube
LM2940-xx-TQ2-R	LM2940L-xx-TQ2-R	TO-263	I	G	O	Tape Reel
LM2940-xx-TQ2-T	LM2940L-xx-TQ2-T	TO-263	I	G	O	Tube
LM2940-xx-TQ3-R	LM2940L-xx-TQ3-R	TO-263-3	I	G	O	Tape Reel
LM2940-xx-TQ3-T	LM2940L-xx-TQ3-T	TO-263-3	I	G	O	Tube

Note: 1.xx: output voltage, refer to Marking Information.

2.Pin Assignment: I: V_{IN} G: GND O: V_{OUT}

<p>LM2940L-xx-AA3-R</p>	<p>(1) R: Tape Reel, T: Tube (2) AA3: SOT-223, TA3: TO-220, TN3: TO-252, TQ2: TO-263, TQ3: TO-263-3 (3) xx: refer to Marking Information (4) L: Lead Free Plating, Blank: Pb/Sn</p>
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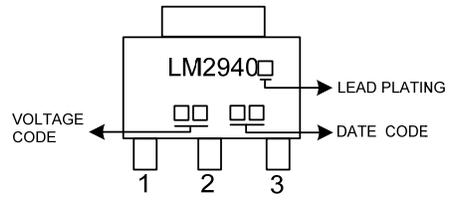
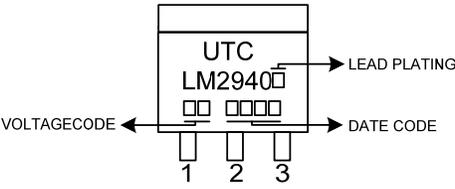


*Pb-free plating product number: LM2940L

LM2940

LINEAR INTEGRATED CIRCUIT

MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-223	50 : 5V 60 : 6V 80 : 8V 90 : 9V 10 : 10V 12 : 12V 15 : 15V	 <p>The diagram shows a top view of an SOT-223 package. It has three leads labeled 1, 2, and 3. The marking 'LM2940' is located at the top. Below it, there are two small squares representing the voltage code. To the right of the package, there are two arrows: one pointing to the top edge labeled 'LEAD PLATING' and another pointing to the two voltage code squares labeled 'DATE CODE'. An arrow on the left points to the voltage code squares labeled 'VOLTAGE CODE'.</p>
TO-220 TO-252 TO-263 TO-263-3	50 : 5V 60 : 6V 80 : 8V 90 : 9V 10 : 10V 12 : 12V 15 : 15V	 <p>The diagram shows a top view of a TO-220/TO-252/TO-263/TO-263-3 package. It has three leads labeled 1, 2, and 3. The marking 'UTC' is at the top, followed by 'LM2940'. Below that, there are two small squares representing the voltage code. To the right, there are two arrows: one pointing to the top edge labeled 'LEAD PLATING' and another pointing to the two voltage code squares labeled 'DATE CODE'. An arrow on the left points to the voltage code squares labeled 'VOLTAGE CODE'.</p>

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V_{IN}	26	V
Power Dissipation		P_D	Internally limited	
Junction Temperature		T_J	+150	°C
Operating Temperature	TO-220/TO-263-3/TO-263	T_{OPR}	-40 ~ +125	°C
	SOT-223		-40 ~ +85	°C
Storage Temperature		T_{STG}	-65 ~ +150	°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

($T_a=T_J=25^\circ\text{C}$, $V_{IN}=V_{OUT}+5\text{V}$, $I_{OUT}=1\text{A}$ and $C_{OUT}=22\mu\text{F}$, unless otherwise specified.)

For LM2940-5.0V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$6.25\text{V} \leq V_{IN} \leq 26\text{V}$, $5\text{mA} \leq I_{OUT} \leq 1\text{A}$	4.85	5.00	5.15	V
Line Regulation	ΔV_{OUT}	$V_{OUT}+2\text{V} \leq V_{IN} \leq 26\text{V}$, $I_{OUT}=5\text{mA}$		20	50	mV
Load Regulation	ΔV_{OUT}	$50\text{mA} \leq I_{OUT} \leq 1\text{A}$		35	50	mV
Output Impedance	R_{OUT}	100 mA DC and 20mArms, $f_o=120\text{Hz}$		35		$\text{m}\Omega$
Quiescent Current	I_Q	$V_{OUT}+2\text{V} \leq V_{IN} \leq 26\text{V}$, $I_{OUT}=5\text{mA}$		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, $I_{OUT}=5\text{mA}$		150		μVrms
Ripple Rejection	RR	$f_o=120\text{Hz}$, 1Vrms, $I_{OUT}=100\text{mA}$	54	72		dB
Long Term Stability				20		$\text{mV}/1000\text{Hr}$
Dropout Voltage	V_D	$I_{OUT}=1\text{A}$		0.5	0.8	V
		$I_{OUT}=100\text{mA}$		0.13	0.15	
Short Circuit Current	I_{SC}	(Note)		2.5		A
Maximum Line Transient	T_{IN}	$R_{OUT}=100\Omega$, $T \leq 100\text{ms}$	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	$R_{OUT}=100\Omega$	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	$R_{OUT}=100\Omega$, $T \leq 100\text{ms}$	-50	-75		V

For LM2940-6.0V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$7.5\text{V} \leq V_{IN} \leq 26\text{V}$, $5\text{mA} \leq I_{OUT} \leq 1\text{A}$	5.82	6.00	6.18	V
Line Regulation	ΔV_{OUT}	$V_{OUT}+2\text{V} \leq V_{IN} \leq 26\text{V}$, $I_{OUT}=5\text{mA}$		20	60	mV
Load Regulation	ΔV_{OUT}	$50\text{mA} \leq I_{OUT} \leq 1\text{A}$		40	60	mV
Output Impedance	R_{OUT}	100 mA DC and 20mArms, $f_o=120\text{Hz}$		40		$\text{m}\Omega$
Quiescent Current	I_Q	$V_{OUT}+2\text{V} \leq V_{IN} \leq 26\text{V}$, $I_{OUT}=5\text{mA}$		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, $I_{OUT}=5\text{mA}$		180		μVrms
Ripple Rejection	RR	$f_o=120\text{Hz}$, 1Vrms, $I_{OUT}=100\text{mA}$	60	72		dB
Long Term Stability				20		$\text{mV}/1000\text{Hr}$
Dropout Voltage	V_D	$I_{OUT}=1\text{A}$		0.5	0.8	V
		$I_{OUT}=100\text{mA}$		0.13	0.15	
Short Circuit Current	I_{SC}	(Note)		2.5		A
Maximum Line Transient	T_{IN}	$R_{OUT}=100\Omega$, $T \leq 100\text{ms}$	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	$R_{OUT}=100\Omega$	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	$R_{OUT}=100\Omega$, $T \leq 100\text{ms}$	-50	-75		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LM2940-8.0V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$9.4V \leq V_{IN} \leq 26V, 5mA \leq I_{OUT} \leq 1A$	7.76	8.00	8.24	V
Line regulation	ΔV_{OUT}	$V_{OUT} + 2V \leq V_{IN} \leq 26V, I_{OUT} = 5mA$		20	80	mV
Load Regulation	ΔV_{OUT}	$50mA \leq I_{OUT} \leq 1A$		55	80	mV
Output Impedance	R_{OUT}	100 mA DC and 20mArms, $f_o = 120Hz$		55		$m\Omega$
Quiescent Current	I_Q	$V_{OUT} + 2V \leq V_{IN} \leq 26V, I_{OUT} = 5mA$		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, $I_{OUT} = 5mA$		240		μV_{rms}
Ripple Rejection	RR	$f_o = 120Hz, 1V_{rms}, I_{OUT} = 100mA$	54	66		dB
Long Term Stability				32		mV/ 1000Hr
Dropout Voltage	V_D	$I_{OUT} = 1A$		0.5	0.8	V
		$I_{OUT} = 100mA$		0.13	0.15	
Short Circuit Current	I_{SC}	(Note)		2.5		A
Maximum Line Transient	T_{IN}	$R_{OUT} = 100\Omega, T \leq 100ms$	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	$R_{OUT} = 100\Omega$	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	$R_{OUT} = 100\Omega, T \leq 100ms$	-50	-75		V

For LM2940-9.0V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$10.5V \leq V_{IN} \leq 26V, 5mA \leq I_{OUT} \leq 1A$	8.73	9.00	9.27	V
Line regulation	ΔV_{OUT}	$V_{OUT} + 2V \leq V_{IN} \leq 26V, I_{OUT} = 5mA$		20	90	mV
Load Regulation	ΔV_{OUT}	$50mA \leq I_{OUT} \leq 1A$		60	90	mV
Output Impedance	R_{OUT}	100 mA DC and 20mArms, $f_o = 120Hz$		60		$m\Omega$
Quiescent Current	I_Q	$V_{OUT} + 2V \leq V_{IN} \leq 26V, I_{OUT} = 5mA$		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, $I_{OUT} = 5mA$		270		μV_{rms}
Ripple Rejection	RR	$f_o = 120Hz, 1V_{rms}, I_{OUT} = 100mA$	52	64		dB
Long Term Stability				34		mV/ 1000Hr
Dropout Voltage	V_D	$I_{OUT} = 1A$		0.5	0.8	V
		$I_{OUT} = 100mA$		0.13	0.15	
Short Circuit Current	I_{SC}	(Note)		2.5		A
Maximum Line Transient	T_{IN}	$R_{OUT} = 100\Omega, T \leq 100ms$	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	$R_{OUT} = 100\Omega$	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	$R_{OUT} = 100\Omega, T \leq 100ms$	-50	-75		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LM2940-10V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$11.5V \leq V_{IN} \leq 26V, 5mA \leq I_{OUT} \leq 1A$	9.70	10.00	10.30	V
Line regulation	ΔV_{OUT}	$V_{OUT} + 2V \leq V_{IN} \leq 26V, I_{OUT} = 5mA$		20	100	mV
Load Regulation	ΔV_{OUT}	$50mA \leq I_{OUT} \leq 1A$		65	100	mV
Output Impedance	R_{OUT}	100 mA DC and 20mArms, $f_o=120Hz$		65		m Ω
Quiescent Current	I_Q	$V_{OUT} + 2V \leq V_{IN} \leq 26V, I_{OUT} = 5mA$		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, $I_{OUT} = 5mA$		300		μV_{rms}
Ripple Rejection	RR	$f_o=120Hz, 1V_{rms}, I_{OUT} = 100mA$	51	63		dB
Long Term Stability				36		mV/ 1000Hr
Dropout Voltage	V_D	$I_{OUT} = 1A$		0.5	0.8	V
		$I_{OUT} = 100mA$		0.13	0.15	
Short Circuit Current	I_{SC}	(Note)		2.5		A
Maximum Line Transient	T_{IN}	$R_{OUT}=100\Omega, T \leq 100ms$	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	$R_{OUT}=100\Omega$	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	$R_{OUT}=100\Omega, T \leq 100ms$	-50	-75		V

UTC LM2940-12V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$13.6V \leq V_{IN} \leq 26V, 5mA \leq I_{OUT} \leq 1A$	11.64	12.00	12.36	V
Line regulation	ΔV_{OUT}	$V_{OUT} + 2V \leq V_{IN} \leq 26V, I_{OUT} = 5mA$		20	120	mV
Load Regulation	ΔV_{OUT}	$50mA \leq I_{OUT} \leq 1A$		55	120	mV
Output Impedance	R_{OUT}	100 mADC and 20mArms, $f_o=120Hz$		80		m Ω
Quiescent Current	I_Q	$V_{OUT} + 2V \leq V_{IN} \leq 26V, I_{OUT} = 5mA$		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, $I_{OUT} = 5mA$		360		μV_{rms}
Ripple Rejection	RR	$f_o=120Hz, 1V_{rms}, I_{OUT} = 100mA$	54	66		dB
Long Term Stability				48		mV/ 1000Hr
Dropout Voltage	V_D	$I_{OUT} = 1A$		0.5	0.8	V
		$I_{OUT} = 100mA$		0.11	0.15	
Short Circuit Current	I_{SC}	(Note)		2.5		A
Maximum Line Transient	T_{IN}	$R_{OUT}=100\Omega, T \leq 100ms$	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	$R_{OUT}=100\Omega$	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	$R_{OUT}=100\Omega, T \leq 100ms$	-50	-75		V

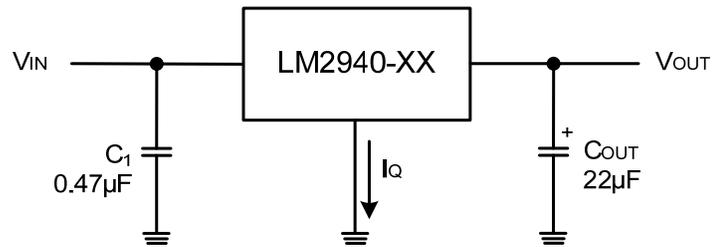
■ ELECTRICAL CHARACTERISTICS(Cont.)

UTC LM2940-15V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$16.75V \leq V_{IN} \leq 26V, 5mA \leq I_{OUT} \leq 1A$	14.55	15.00	15.45	V
Line regulation	ΔV_{OUT}	$V_{OUT} + 2V \leq V_{IN} \leq 26V, I_{OUT} = 5mA$		20	150	mV
Load Regulation	ΔV_{OUT}	$50mA \leq I_{OUT} \leq 1A$		70	150	mV
Output Impedance	R_{OUT}	100 mADC and 20mArms, fo=120Hz		100		mΩ
Quiescent Current	I_Q	$V_{OUT} + 2V \leq V_{IN} \leq 26V, I_{OUT} = 5mA$		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, $I_{OUT} = 5mA$		450		μVrms
Ripple Rejection	RR	fo=120Hz, 1Vrms, $I_{OUT} = 100mA$	52	64		dB
Long Term Stability				60		mV/ 1000Hr
Dropout Voltage	V_D	$I_{OUT} = 1A$		0.5	0.8	V
		$I_{OUT} = 100mA$		0.11	0.15	
Short Circuit Current	I_{SC}	(Note)		2.5		A
Maximum Line Transient	T_{IN}	$R_{OUT} = 100\Omega, T \leq 100ms$	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	$R_{OUT} = 100\Omega$	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	$R_{OUT} = 100\Omega, T \leq 100ms$	-50	-75		V

Note: Output current will decrease with temperature increase but will not drop below 1A at the maximum specified temperature.

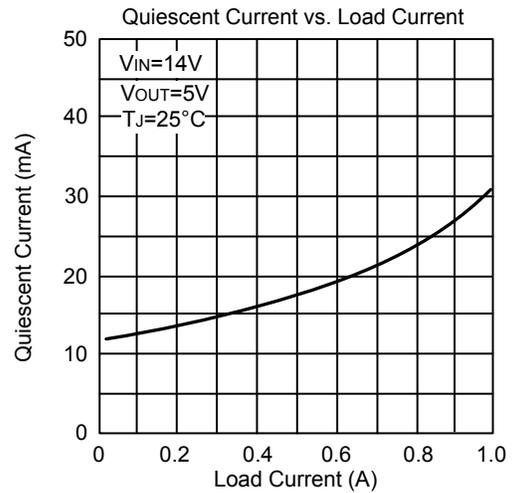
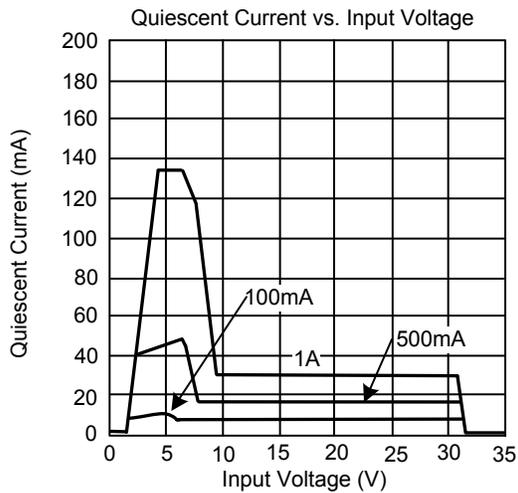
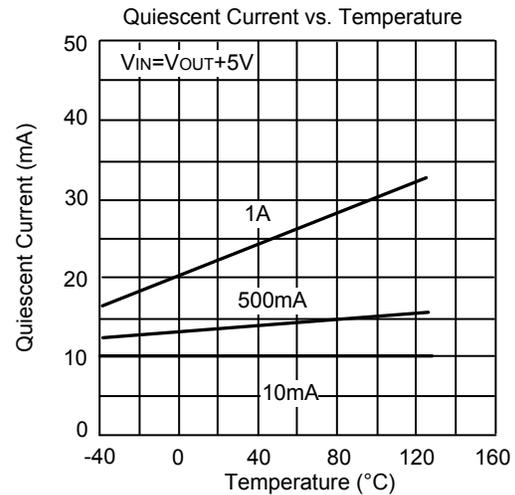
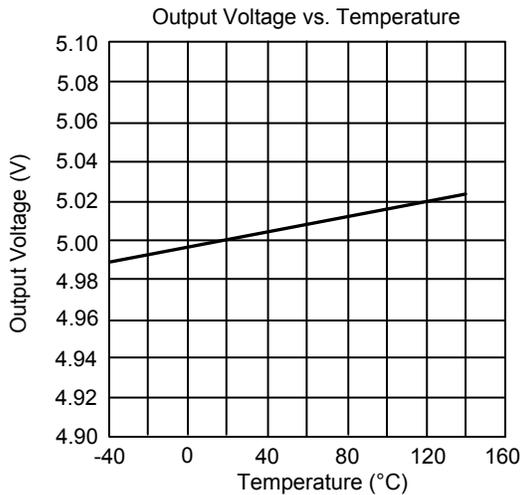
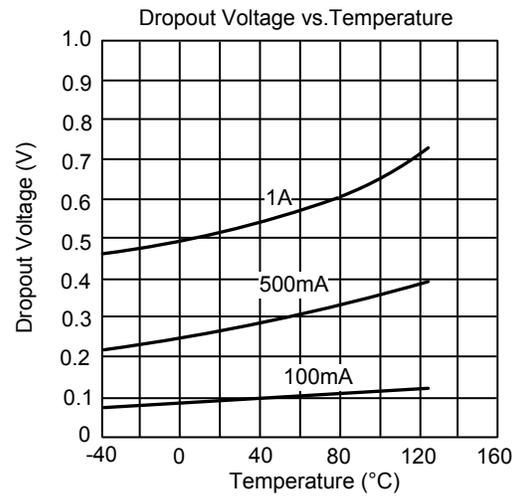
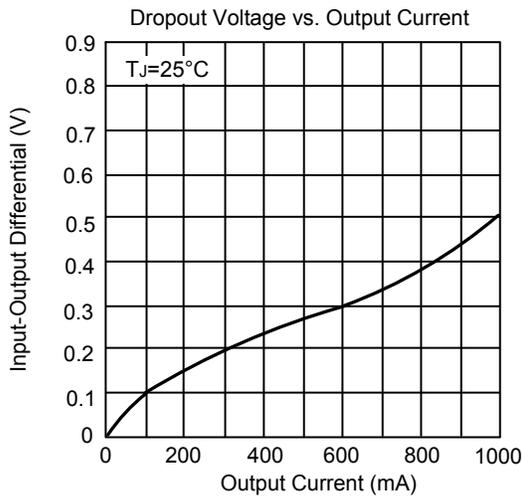
■ TYPICAL APPLICATION



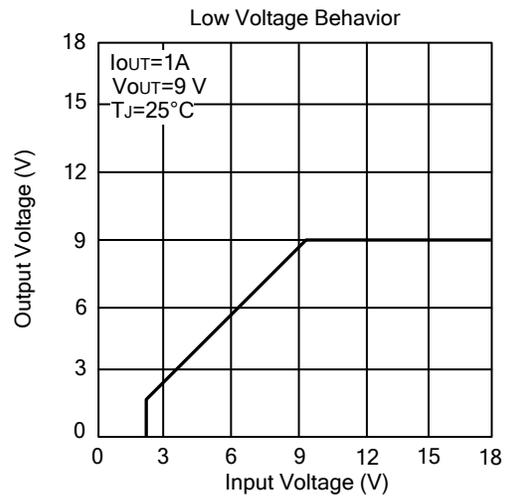
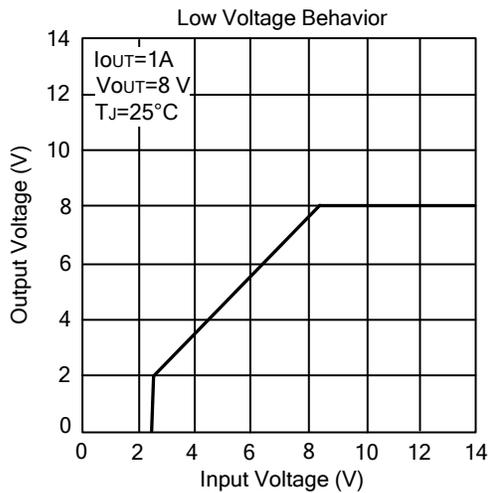
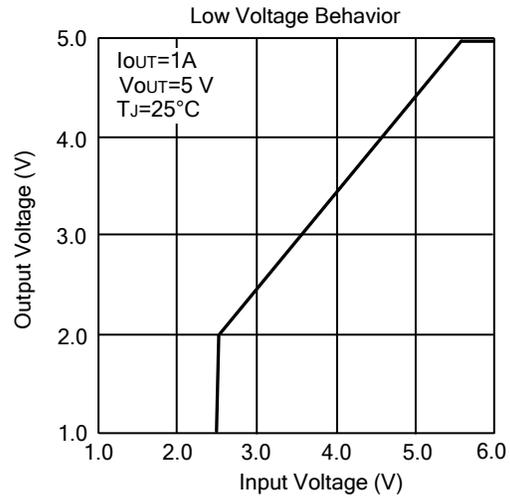
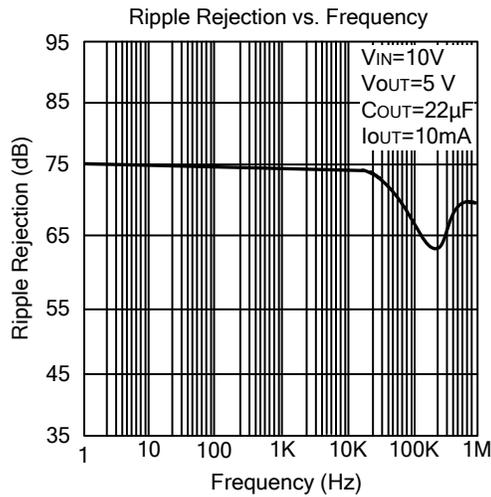
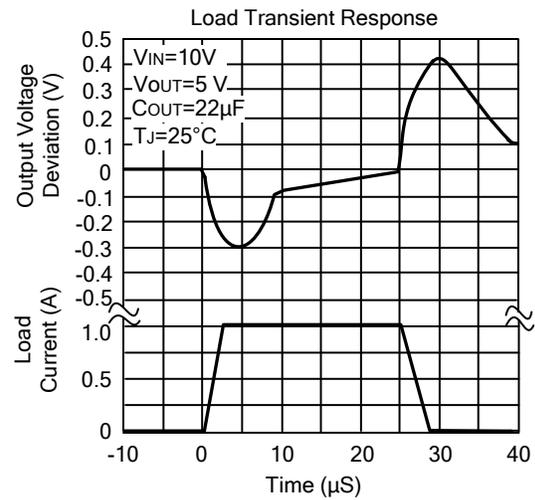
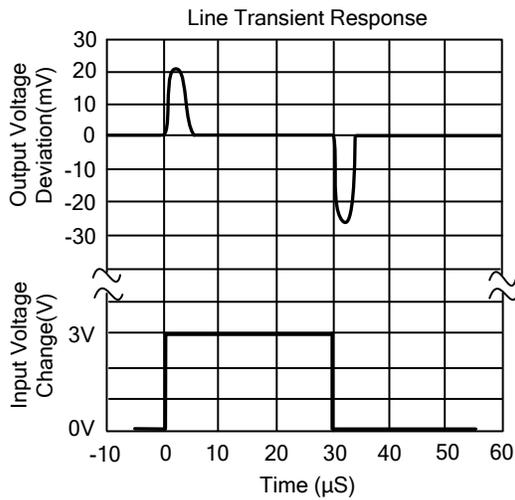
Note: 1. C_1 is required if regulator is located far from power supply filter.

2. C_{OUT} must be higher than 22µF for stability, and locate as close as possible to the regulator.

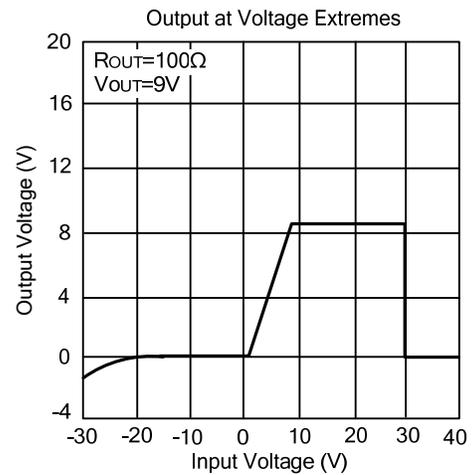
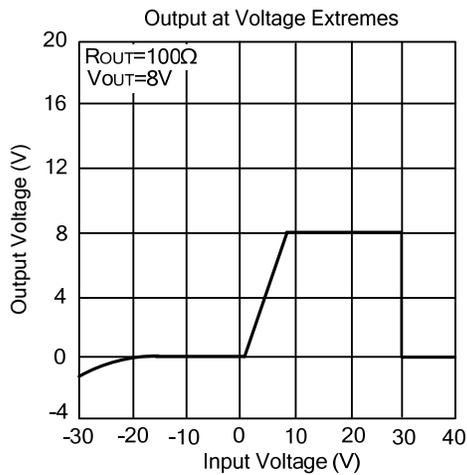
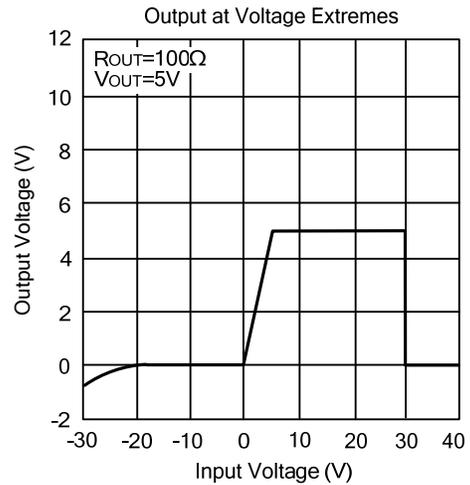
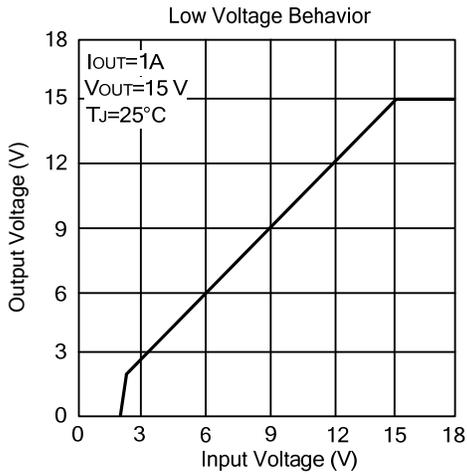
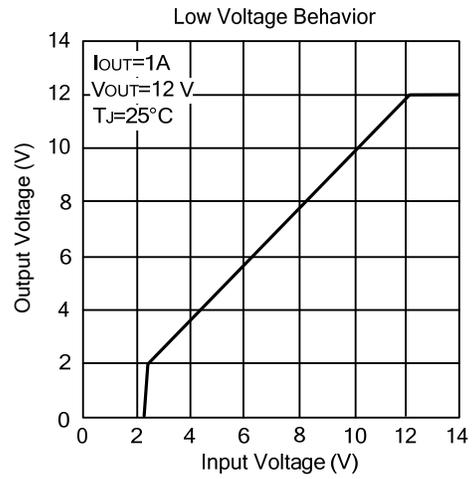
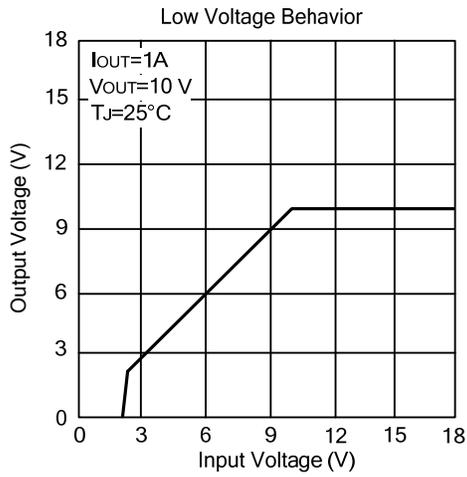
TYPICAL CHARACTERISTICS



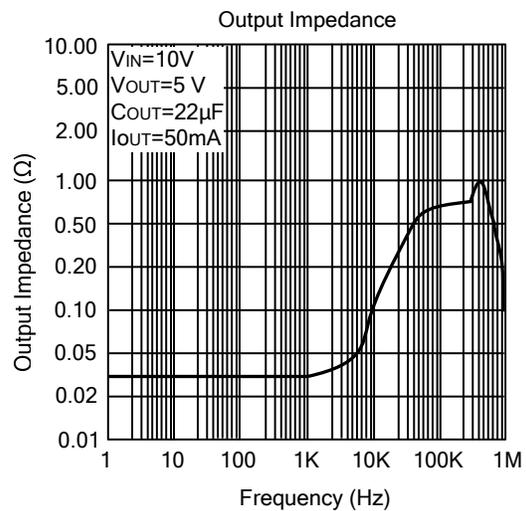
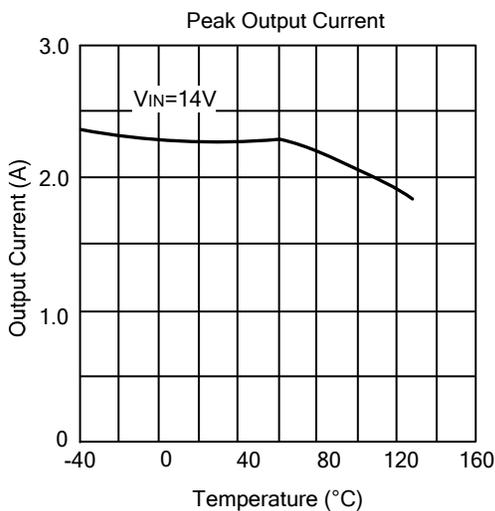
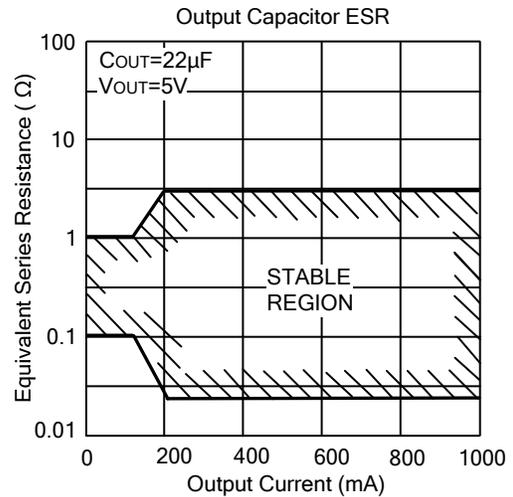
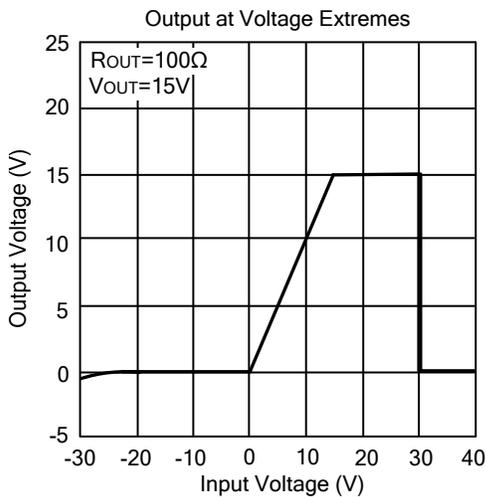
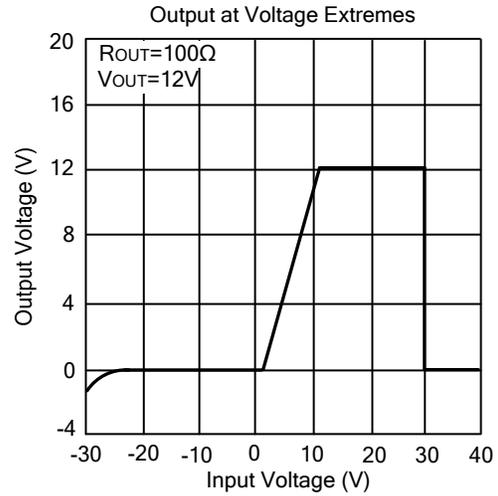
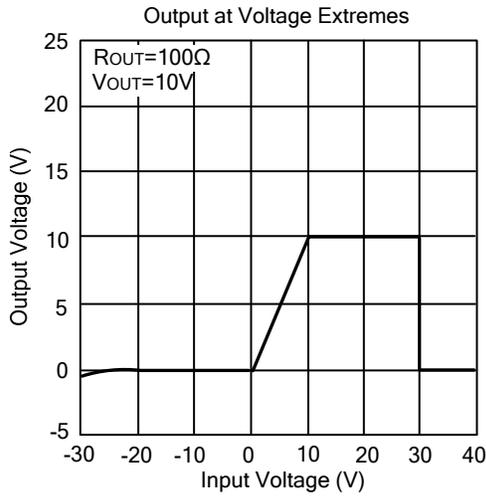
■ TYPICAL CHARACTERISTICS (Cont.)



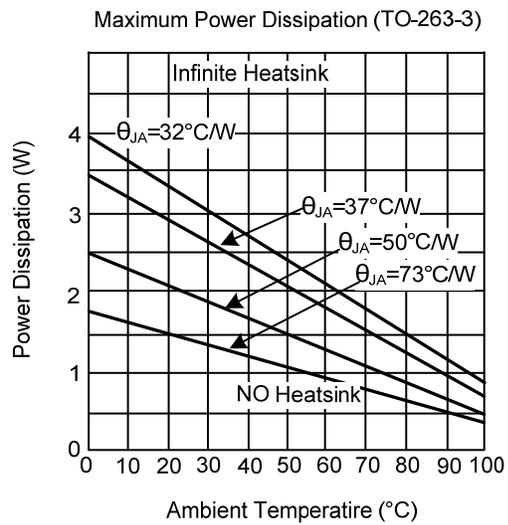
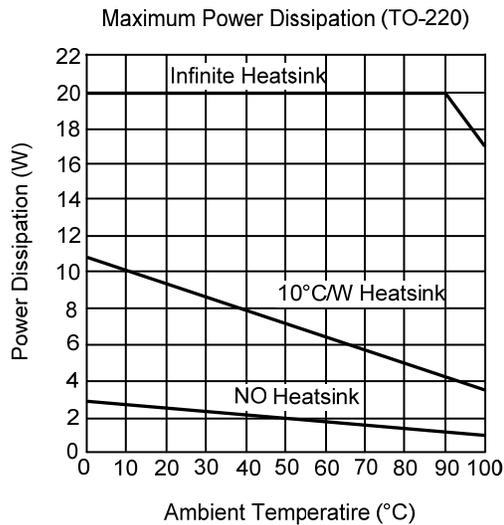
■ TYPICAL CHARACTERISTICS (Cont.)



TYPICAL CHARACTERISTICS (Cont.)



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