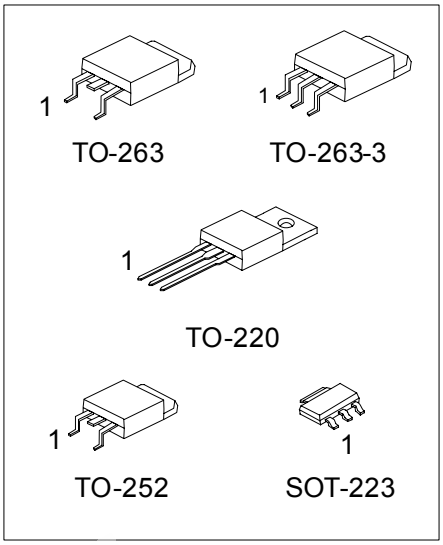
1A LOW-DROPOUT POSITIVE VOLTAGE REGULATOR



*Pb-free plating product number: LM2940L

■ 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}≤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.

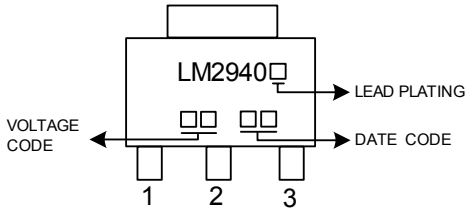
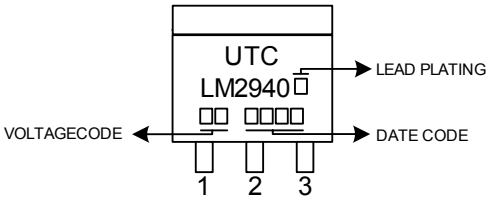
2.Pin Assignment: I: V_{IN} G: GND O:V_{OUT}

LM2940L-xx-AA3-R

(1)Packing Type
(2)Package Type
(3)Output Voltage Code
(4)Lead Plating

(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

■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-223	10 :10V 12 :12V 15 :15V 50 : 5V 80 : 8V 90 : 9V	
TO-220 TO-252 TO-263 TO-263-3		

■ 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°C, V_{IN}=V_{OUT}+5V, I_{OUT}=1A and C_{OUT}=22μF, unless otherwise specified.)

For LM2940-5.0V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	6.25V ≤ V_{IN} ≤ 26V, 5mA ≤ I_{OUT} ≤ 1A	4.85	5.00	5.15	V
Line Regulation	△V_{OUT}	V_{OUT}+2V ≤ V_{IN} ≤ 26V, I_{OUT}=5mA		20	50	mV
Load Regulation	△V_{OUT}	50mA ≤ I_{OUT} ≤ 1A		35	50	mV
Output Impedance	Ro	100 mA DC and 20mArms, fo=120Hz		35		mΩ
Quiescent Current	I_Q	V_{OUT}+2V ≤ V_{IN} ≤ 26V, I_{OUT}=5mA		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, I_{OUT}=5mA		150		μVrms
Ripple Rejection	RR	fo=120Hz, 1Vrms, I_{OUT}=100mA	60	72		dB
Long Term Stability				20		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)	1.6	1.9		A
Maximum Line Transient	T_{IN}	Ro=100Ω, T ≤ 100ms	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	Ro=100Ω	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	Ro=100Ω, T ≤ 100ms	-50	-75		V

For LM2940-8.0V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	9.4V ≤ V_{IN} ≤ 26V, 5mA ≤ I_{OUT} ≤ 1A	7.76	8.00	8.24	V
Line regulation	△V_{OUT}	V_{OUT} +2V ≤ V_{IN} ≤ 26V, I_{OUT}=5mA		20	80	mV
Load Regulation	△V_{OUT}	50mA ≤ I_{OUT} ≤1A		55	80	mV
Output Impedance	Ro	100 mA DC and 20mArms, fo=120Hz		55		mΩ
Quiescent Current	I_Q	V_{OUT} +2V ≤ V_{IN} ≤ 26V, I_{OUT} =5mA		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, I_{OUT} =5mA		240		μVrms
Ripple Rejection	RR	fo=120Hz, 1Vrms, 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		0.11	0.15	
Short Circuit Current	I_{SC}	(Note)	1.6	1.9		A
Maximum Line Transient	T_{IN}	Ro=100Ω, T ≤ 100ms	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	Ro=100Ω	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	Ro=100Ω, T ≤ 100ms	-50	-75		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LM2940-9.0V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	10.5V ≤ V_{IN} ≤ 26V, 5mA ≤ I_{OUT} ≤ 1A	8.73	9.00	9.27	V
Line regulation	△V_{OUT}	V_{OUT} +2V ≤ V_{IN} ≤ 26V, I_{OUT} =5mA		20	90	mV
Load Regulation	△V_{OUT}	50mA ≤ I_{OUT} ≤ 1A		60	90	mV
Output Impedance	Ro	100 mA DC and 20mArms, fo=120Hz		60		mΩ
Quiescent Current	I_Q	V_{OUT} +2V ≤ VIN ≤ 26V, I_{OUT} =5mA		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, I_{OUT} =5mA		270		μVrms
Ripple Rejection	RR	fo=120Hz, 1Vrms, 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		0.11	0.15	
Short Circuit Current	I_{SC}	(Note)	1.6	1.9		A
Maximum Line Transient	T_{IN}	Ro=100Ω, T ≤ 100ms	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	Ro=100Ω	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	Ro=100Ω, T ≤ 100ms	-50	-75		V

For LM2940-10V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	11.5V ≤ V_{IN} ≤ 26V, 5mA ≤ I_{OUT} ≤ 1A	9.70	10.00	10.30	V
Line regulation	△V_{OUT}	V_{OUT} +2V ≤ V_{IN} ≤ 26V, I_{OUT} =5mA		20	100	mV
Load Regulation	△V_{OUT}	50mA ≤ I_{OUT} ≤ 1A		65	100	mV
Output Impedance	Ro	100 mA DC and 20mArms, fo=120Hz		65		mΩ
Quiescent Current	I_Q	V_{OUT} +2V ≤ V_{IN} ≤ 26V, I_{OUT} =5mA		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, I_{OUT} =5mA		300		μVrms
Ripple Rejection	RR	fo=120Hz, 1Vrms, 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		0.11	0.15	
Short Circuit Current	I_{SC}	(Note)	1.6	1.9		A
Maximum Line Transient	T_{IN}	Ro=100Ω, T ≤ 100ms	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	Ro=100Ω	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	Ro=100Ω, T ≤ 100ms	-50	-75		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

UTC LM2940-12V

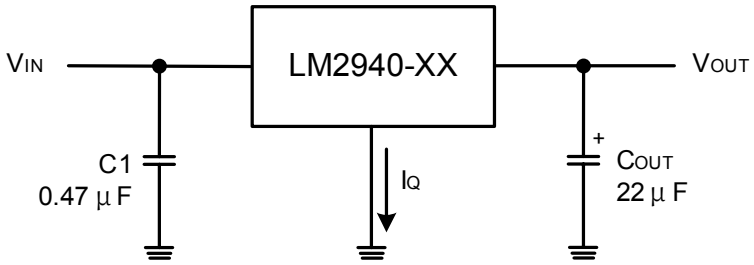
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	13.6V ≤ V_{IN} ≤ 26V, 5mA ≤ I_{OUT} ≤ 1A	11.64	12.00	12.36	V
Line regulation	△V_{OUT}	V_{OUT} +2V ≤ V_{IN} ≤ 26V, I_{OUT} =5mA		20	120	mV
Load Regulation	△V_{OUT}	50mA ≤ I_{OUT} ≤ 1A		55	120	mV
Output Impedance	Ro	100 mADC and 20mArms, fo=120Hz		80		mΩ
Quiescent Current	I_Q	V_{OUT} +2V ≤ V_{IN} ≤ 26V, I_{OUT} =5mA		10	15	mA
Output Noise Voltage	eN	10Hz-100kHz, I_{OUT} =5mA		360		μVrms
Ripple Rejection	RR	fo=120Hz, 1Vrms, 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)	1.6	1.9		A
Maximum Line Transient	T_{IN}	Ro=100Ω, T ≤ 100ms	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	Ro=100Ω	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	Ro=100Ω, T≤100ms	-50	-75		V

UTC LM2940-15V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	16.75V ≤ V_{IN} ≤ 26V, 5mA ≤ I_{OUT} ≤ 1A	14.55	15.00	15.45	V
Line regulation	△V_{OUT}	V_{OUT} +2V ≤ V_{IN} ≤ 26V, I_{OUT} =5mA		20	150	mV
Load Regulation	△V_{OUT}	50mA ≤ I_{OUT} ≤ 1A		70	150	mV
Output Impedance	Ro	100 mADC and 20mArms, fo=120Hz		100		mΩ
Quiescent Current	I_Q	V_{OUT} +2V ≤ V_{IN} ≤ 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)	1.6	1.9		A
Maximum Line Transient	T_{IN}	Ro=100Ω, T ≤ 100ms	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	Ro=100Ω	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	Ro=100Ω, T ≤ 100ms	-50	-75		V

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

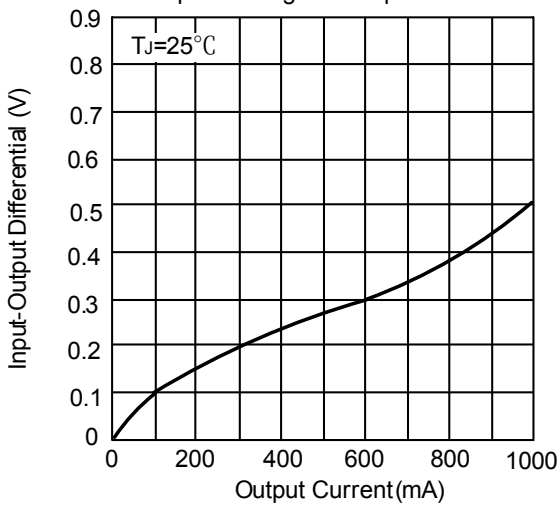
■ TYPICAL APPLICATION



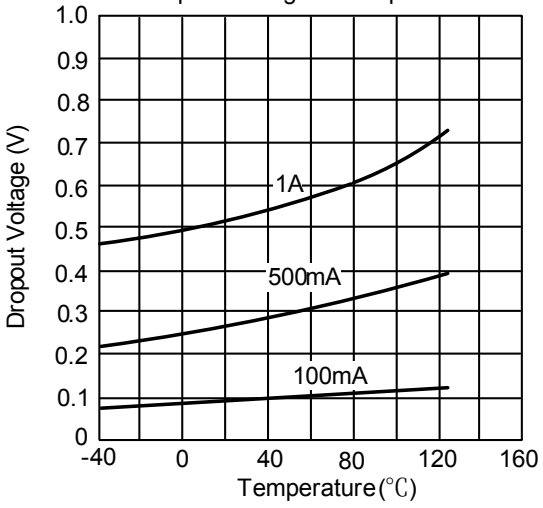
Note: 1.C1 is required if regulator is located far from power supply filter.
2.C_{OUT} must be higher than 22µF for stability, and locate as close as possible to the regulator.

■ TYPICAL CHARACTERISTICS

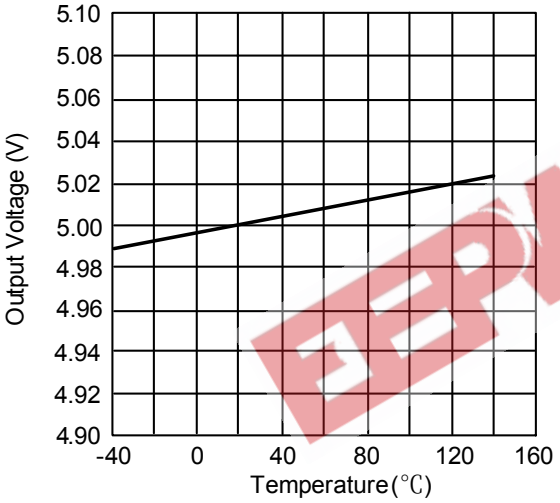
Dropout Voltage vs. Output Current



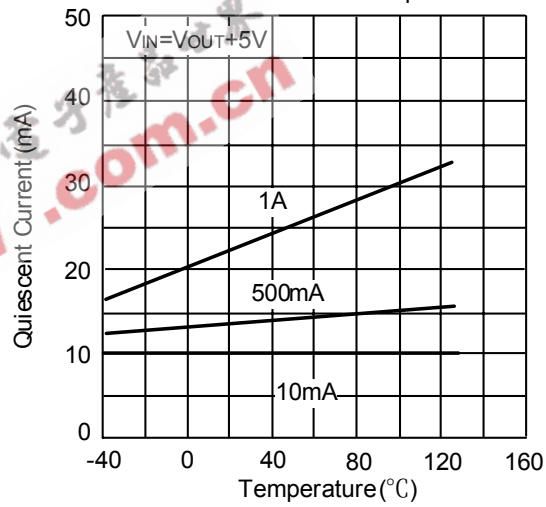
Dropout Voltage vs. Temperature



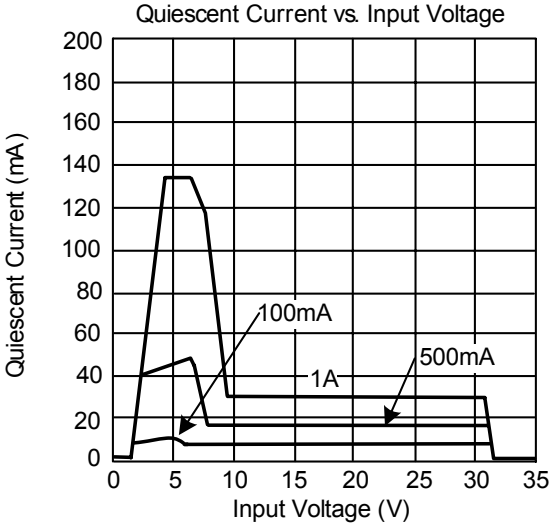
Output Voltage vs. Temperature



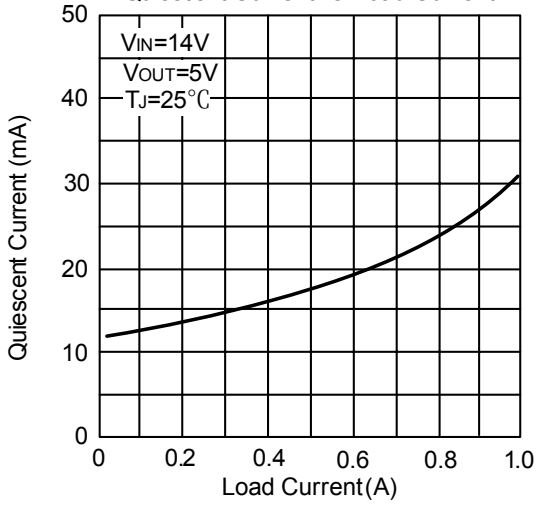
Quiescent Current vs. Temperature



Quiescent Current vs. Input Voltage

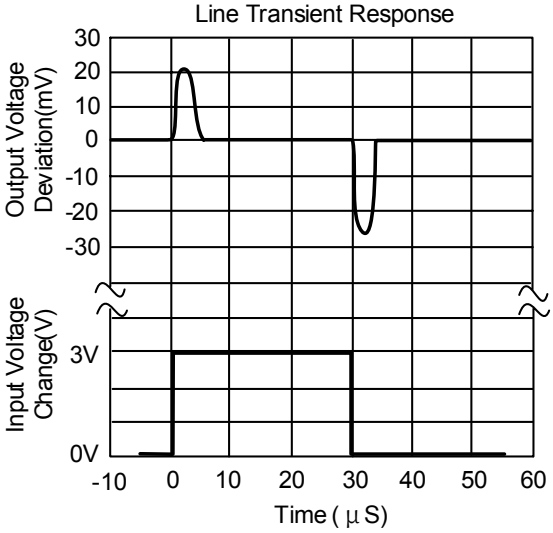


Quiescent Current vs. Load Current

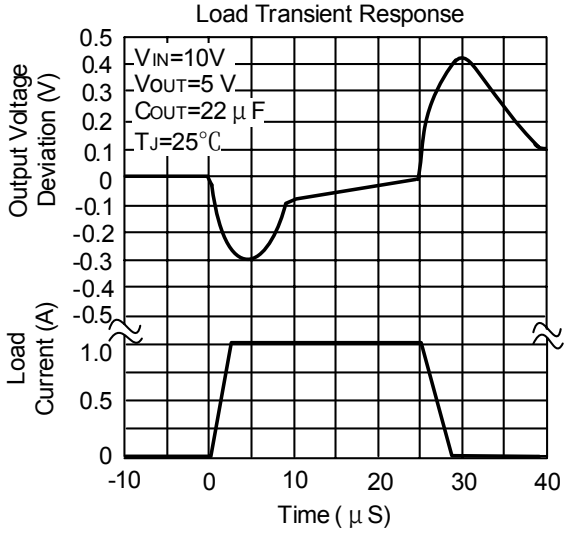


■ TYPICAL CHARACTERISTICS (Cont.)

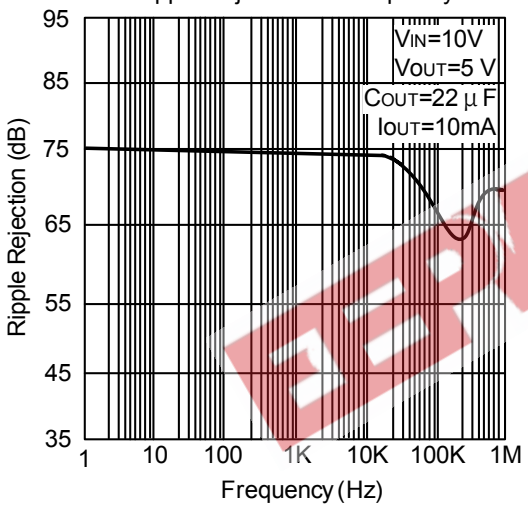
Line Transient Response



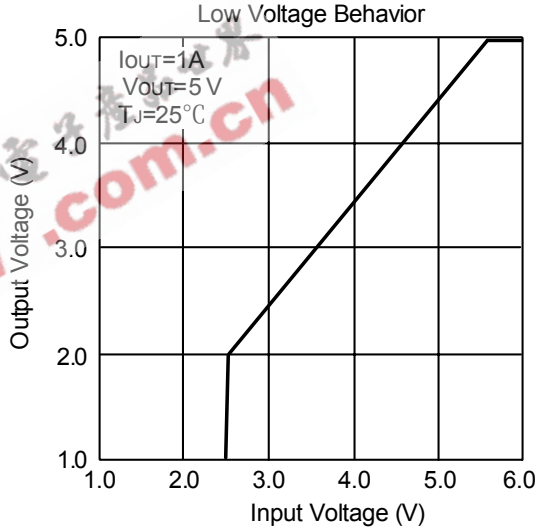
Load Transient Response



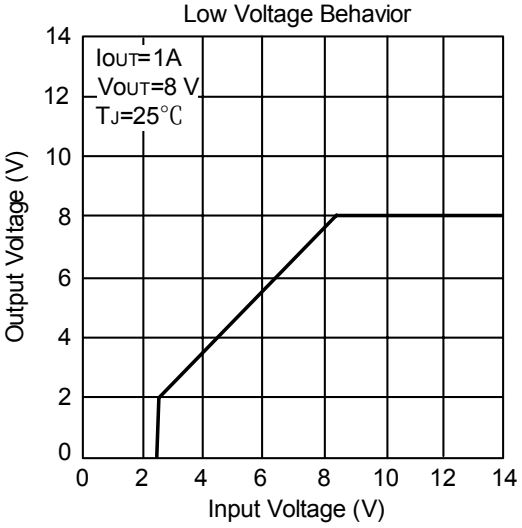
Ripple Rejection vs. Frequency



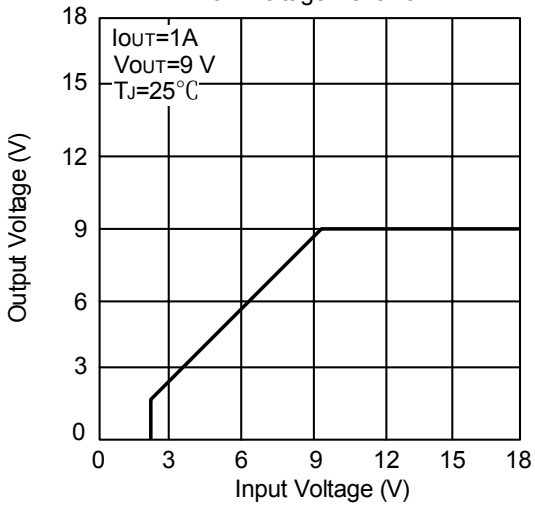
Low Voltage Behavior



Low Voltage Behavior

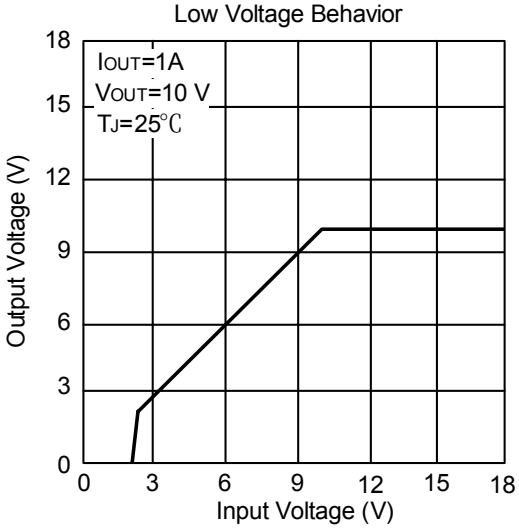


Low Voltage Behavior

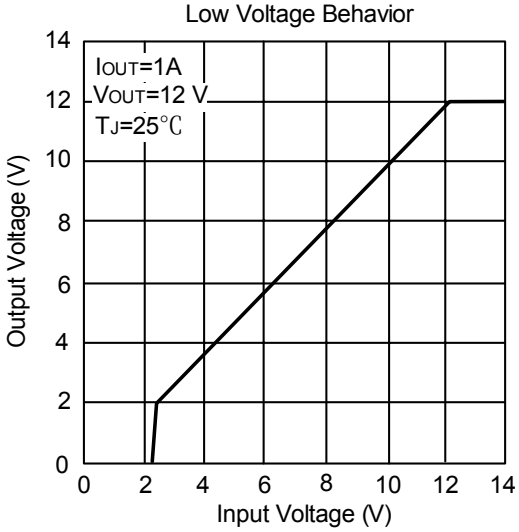


■ TYPICAL CHARACTERISTICS (Cont.)

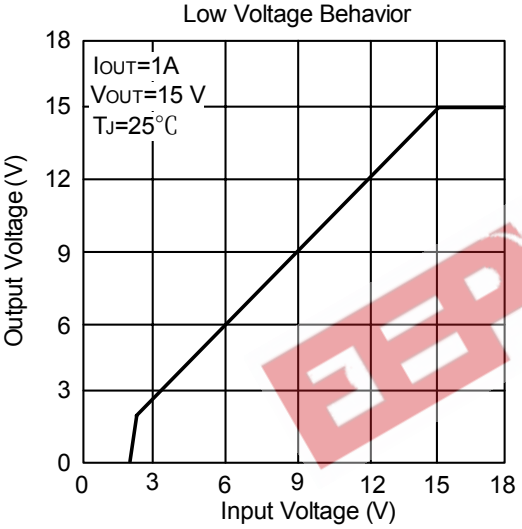
Low Voltage Behavior



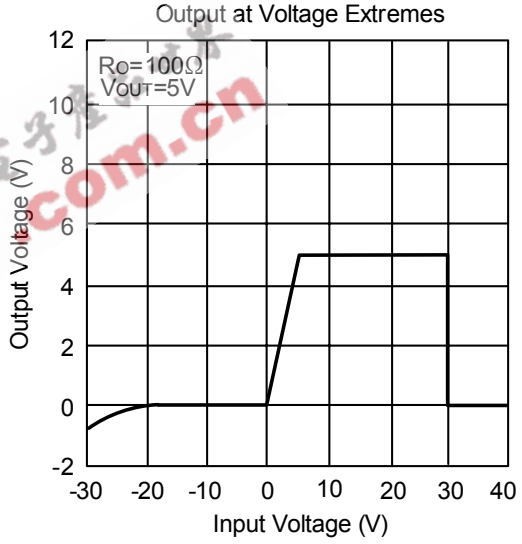
Low Voltage Behavior



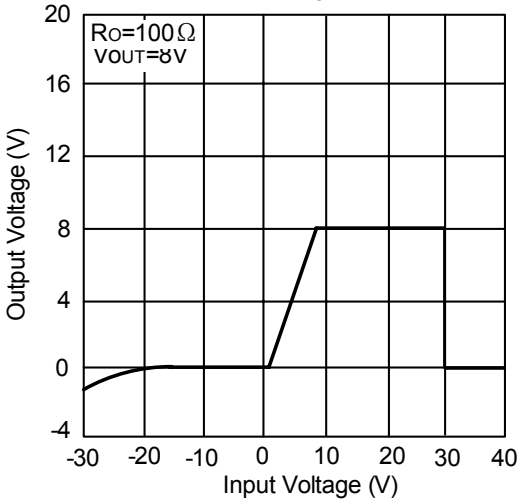
Low Voltage Behavior



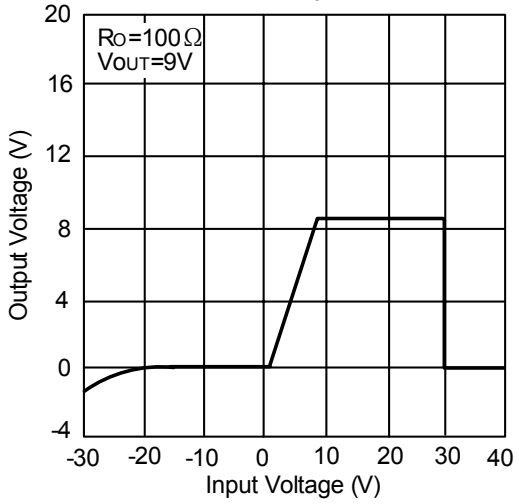
Output at Voltage Extremes



Output at Voltage Extremes

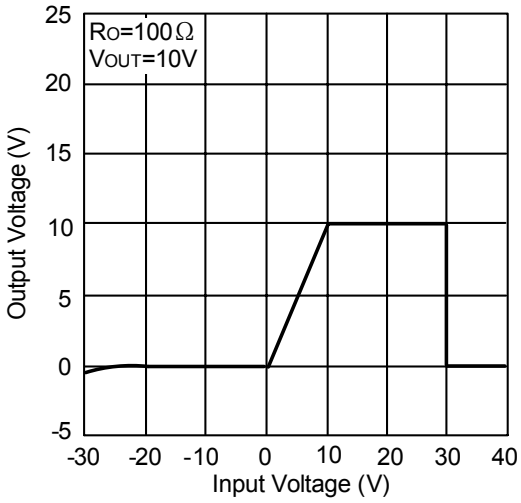


Output at Voltage Extremes

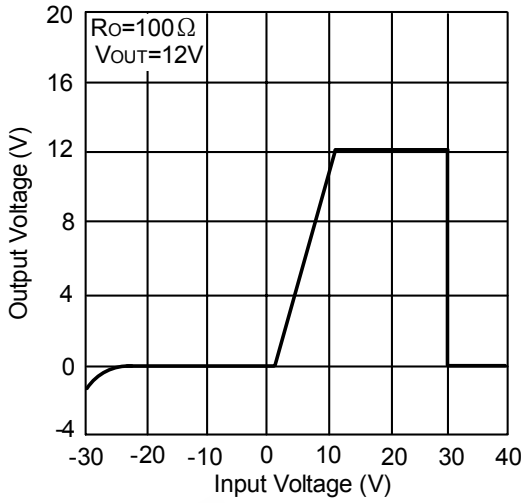


■ TYPICAL CHARACTERISTICS (Cont.)

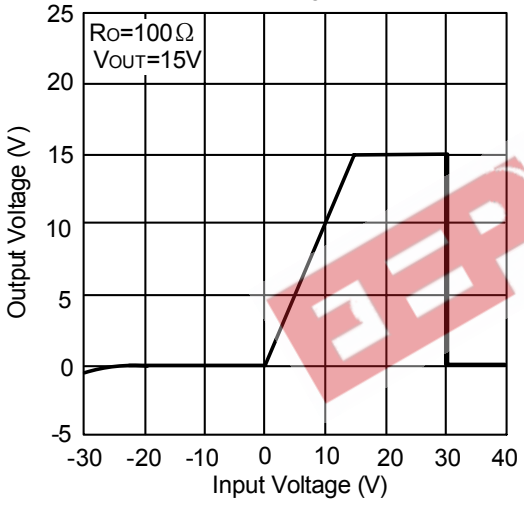
Output at Voltage Extremes



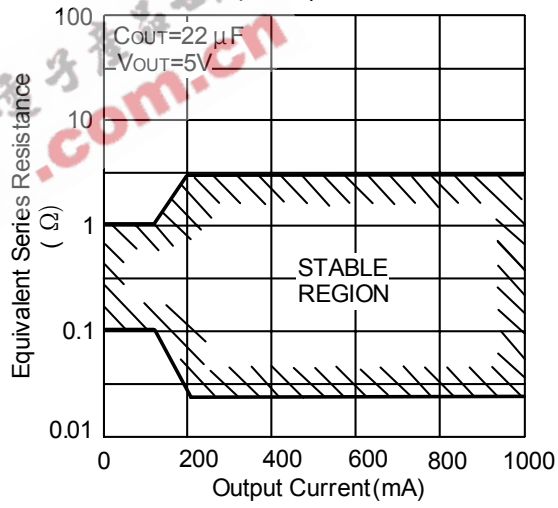
Output at Voltage Extremes



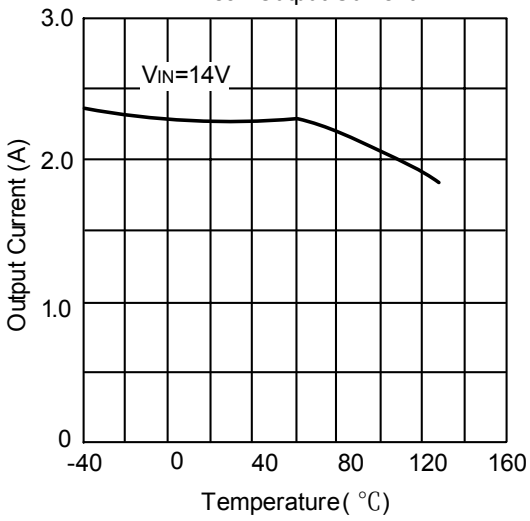
Output at Voltage Extremes



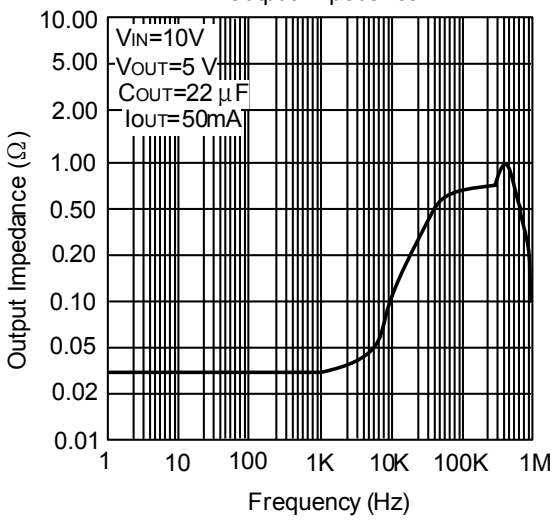
Output Capacitor ESR



Peak Output Current

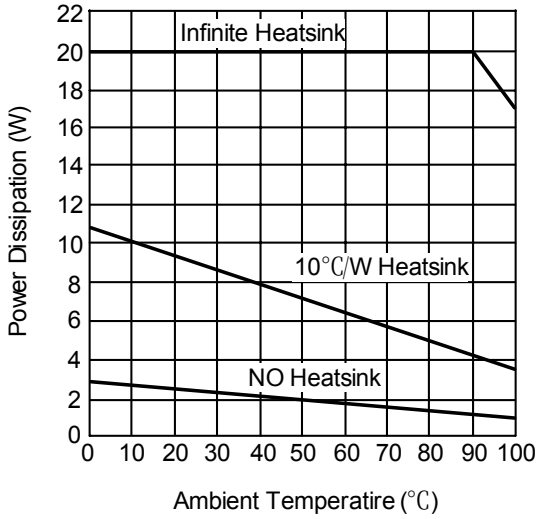


Output Impedance



■ TYPICAL CHARACTERISTICS (Cont.)

Maximum Power Dissipation (TO-220)



Maximum Power Dissipation (TO-263-3)