UNISONIC TECHNOLOGIES CO., LTD

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

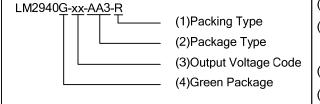
- * 500mV Typically Dropout at 1A
- * Output Current in Excess of 1A
- * Low Quiescent Current
- * Reversed-Battery Protection
- * Current Limit and Thermal Shutdown.
- * Mirror Image Insertion Protection

ORDERING INFORMATION

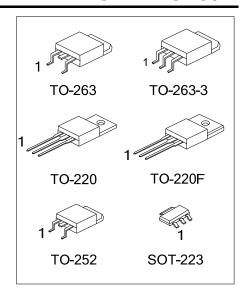
Ordering Number		Pin A	Assignr	Dooking	
Halogen Free	Package	1	2	3	Packing
LM2940G-xx-AA3-R	SOT-223	I	G	0	Tape Reel
LM2940G-xx-TA3-T	TO-220	I	G	0	Tube
LM2940G-xx-TF3-T	TO-220F	I	G	0	Tube
LM2940G-xx-TN3-R	TO-252	I	G	0	Tape Reel
LM2940G-xx-TQ2-R	TO-263	I	G	0	Tape Reel
LM2940G-xx-TQ2-T	TO-263	I	G	0	Tube
LM2940G-xx-TQ3-R	TO-263-3	I	G	0	Tape Reel
LM2940G-xx-TQ3-T	TO-263-3	I	G	0	Tube
	Halogen Free LM2940G-xx-AA3-R LM2940G-xx-TA3-T LM2940G-xx-TF3-T LM2940G-xx-TN3-R LM2940G-xx-TQ2-R LM2940G-xx-TQ2-T LM2940G-xx-TQ3-R	Halogen Free LM2940G-xx-AA3-R SOT-223 LM2940G-xx-TA3-T TO-220 LM2940G-xx-TF3-T TO-220F LM2940G-xx-TN3-R TO-252 LM2940G-xx-TQ2-R TO-263 LM2940G-xx-TQ2-T TO-263 LM2940G-xx-TQ3-R TO-263-3	Halogen Free 1 LM2940G-xx-AA3-R SOT-223 I LM2940G-xx-TA3-T TO-220 I LM2940G-xx-TF3-T TO-220F I LM2940G-xx-TN3-R TO-252 I LM2940G-xx-TQ2-R TO-263 I LM2940G-xx-TQ2-T TO-263 I LM2940G-xx-TQ3-R TO-263-3 I	Halogen Free 1 2 LM2940G-xx-AA3-R SOT-223 I G LM2940G-xx-TA3-T TO-220 I G LM2940G-xx-TF3-T TO-220F I G LM2940G-xx-TN3-R TO-252 I G LM2940G-xx-TQ2-R TO-263 I G LM2940G-xx-TQ2-T TO-263 I G LM2940G-xx-TQ3-R TO-263-3 I G	Halogen Free 1 2 3 LM2940G-xx-AA3-R SOT-223 I G O LM2940G-xx-TA3-T TO-220 I G O LM2940G-xx-TF3-T TO-220F I G O LM2940G-xx-TN3-R TO-252 I G O LM2940G-xx-TQ2-R TO-263 I G O LM2940G-xx-TQ2-T TO-263 I G O LM2940G-xx-TQ3-R TO-263-3 I G O

Notes: 1. xx: Output Voltage, refer to Marking Information.

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



- (1) R: Tape Reel, T: Tube
- (2) AA3: SOT-223, TA3: TO-220, TF3: TO-220F TN3: TO-252, TQ2: TO-263, TQ3: TO-263-3
- (3) xx: refer to Marking Information
- (4) G: Halogen Free and Lead Free, L: Lead Free



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MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-223	50:5V 60:6V 80:8V 90:9V 10:10V 12:12V 15:15V	Voltage Code 1 2 3 LM2940G Date Code
TO-220 TO-252 TO-263 TO-263-3		Voltage Code LM2940 Li: Lead Free G: Halogen Free Date Code 1 2 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
Ambient Operating	TO-220/TO-220F TO-263-3/TO-263	T _{OPR}	-40 ~ +125	°C
Temperature	SOT-223/ TO-252		-40 ~ +85	
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.

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	SOT-223		174	
	TO-220/TO-220F	0	60	°C/W
	TO-263/TO-263-3	θ_{JA}	80	-0/00
	TO-252		125	
	TO-220/TO-263		4	
	TO-263-3		4	
Junction to Case	TO-220F	θ_{JC}	6	°C/W
	TO-252		12	
	SOT-223		15	

■ ELECTRICAL CHARACTERISTICS

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

For LM2940-5.0V

1 OI LIVIZ340-3.0 V			_	_	_	
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V _{OUT}	$6.25V \le V_{IN} \le 26V, 5mA \le I_{OUT} \le 1A$	4.85	5.00	5.15	V
Line Regulation	$\triangle V_{OUT}$	$V_{OUT}+2V \le V_{IN} \le 26V$, $I_{OUT}=5mA$		20	50	mV
Load Regulation	$\triangle V_{OUT}$	50mA ≤ I _{OUT} ≤ 1A		35	50	mV
Output Impedance	R _{OUT}	100 mA DC and 20mA _{RMS} , f _O =120Hz		35		mΩ
Quiescent Current	IQ	$V_{OUT}+2V \le V_{IN} \le 26V$, $I_{OUT}=5mA$		10	15	mA
Output Noise Voltage	e _N	10Hz-100kHz, I _{OUT} =5mA		150		μV_{RMS}
Ripple Rejection	RR	f _O =120Hz, 1V _{RMS} , I _{OUT} =100mA	54	72		dB
Long Term Stability				20		mV/1000Hr
Drangut Valtage	W	I _{OUT} =1A		0.5	8.0	V
Dropout Voltage	V_D	I _{OUT} =100mA		0.13	0.15	V
Short Circuit Current	I _{SC}	(Note)		2.5		Α
Maximum Line Transient	T _{IN}	R _{OUT} =100Ω, T ≤ 100ms	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	R _{OUT} =100Ω	-15	-30		V
Reverse Polarity Transient	V_{TRRI}	R _{OUT} =100Ω, T ≤ 100ms	-50	-75		V
Input Voltage	V IRRI	1001-10022, 1 = 100113	30	, ,		'

ELECTRICAL CHARACTERISTICS(Cont.)

For LM2940-6.0V						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V _{OUT}	$7.5V \le V_{IN} \le 26V, 5mA \le I_{OUT} \le 1A$	5.82	6.00	6.18	V
Line Regulation	$\triangle V_{OUT}$	$V_{OUT}+2V \le V_{IN} \le 26V$, $I_{OUT}=5mA$		20	60	mV
Load Regulation	$\triangle V_{OUT}$	50mA ≤ I _{OUT} ≤ 1A		40	60	mV
Output Impedance	R _{OUT}	100 mA DC and 20mA _{RMS} , f _O =120Hz		40		mΩ
Quiescent Current	IQ	$V_{OUT}+2V \le V_{IN} \le 26V$, $I_{OUT}=5mA$		10	15	mA
Output Noise Voltage	e _N	10Hz-100kHz, I _{OUT} =5mA		180		μV_{RMS}
Ripple Rejection	RR	f _O =120Hz, 1V _{RMS} , I _{OUT} =100mA	60	72		dB
Long Term Stability		7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7		20		mV/1000Hr
•		I _{OUT} =1A		0.5	0.8	
Dropout Voltage	V_D	I _{OUT} =100mA		0.13	0.15	V
Short Circuit Current	I _{SC}	(Note)		2.5		Α
Maximum Line Transient	T _{IN}	R _{OUT} =100Ω, T ≤ 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} =100Ω, T ≤ 100ms	-50	-75		V
For LM2940-8.0V	I		I	I	I	I
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}	$V_{OUT} + 2V \le V_{IN} \le 26V$, $I_{OUT} = 5mA$		20	80	mV
Load Regulation	△V _{OUT}	50mA ≤ I _{OUT} ≤1A		55	80	mV
Output Impedance	R _{OUT}	100 mA DC and 20mA _{RMS} , f _O =120Hz		55		mΩ
Quiescent Current	IQ	$V_{OUT} + 2V \le V_{IN} \le 26V$, $I_{OUT} = 5mA$		10	15	mA
Output Noise Voltage	e _N	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		10 12012, 11 NW3, 1001		32		mV/1000Hi
		I _{OUT} =1A		0.5	0.8	
Dropout Voltage	V_D	I _{OUT} =100mA		0.13	0.15	V
Short Circuit Current	I _{SC}	(Note)		2.5		Α
Maximum Line Transient	T _{IN}	R _{OUT} =100Ω, T ≤ 100ms	60	75		V
Reverse Polarity DC Input Voltage	V _{RIN}	R _{OUT} =100Ω	-15	-30		V
Reverse Polarity Transient Input						
Voltage	V_{TRRI}	R _{OUT} =100Ω, T ≤ 100ms	-50	-75		V
For LM2940-9.0V				I		I
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}	$V_{OUT} + 2V \le V_{IN} \le 26V$, $I_{OUT} = 5mA$		20	90	mV
Load Regulation	△Vout	50mA ≤ I _{OUT} ≤ 1A		60	90	mV
Output Impedance	R _{OUT}	100 mA DC and 20mA _{RMS} , f _O =120Hz		60		mΩ
Quiescent Current	IQ	$V_{OUT} + 2V \le VIN \le 26V$, $I_{OUT} = 5mA$		10	15	mA
Output Noise Voltage	e _N	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	1 11 1		ÿ.	34		mV/1000Hi
		I _{OUT} =1A		0.5	0.8	
Dropout Voltage	V_D	I _{OUT} =100mA		0.13	0.15	V
Short Circuit Current	I _{SC}	(Note)		2.5	0.10	Α
Maximum Line Transient	T _{IN}	$R_{OUT}=100\Omega$, T ≤ 100 ms	60	75		V
Reverse Polarity DC Input Voltage	V _{RIN}	R _{OUT} =100Ω, 1 ⊆ 100ms	-15	-30		V
	v KIN	1.001 - 10075	- 13	-50		V

R_{OUT}=100Ω, T ≤ 100ms

 V_{TRRI}

Reverse Polarity Transient Input

Voltage

-50

-75

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LM2940-10V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$11.5V \le V_{IN} \le 26V$, $5mA \le I_{OUT} \le 1A$	9.70	10.00	10.30	V
Line regulation	$\triangle V_{OUT}$	V_{OUT} +2V $\leq V_{IN} \leq 26V$, I_{OUT} =5mA		20	100	mV
Load Regulation	$\triangle V_{OUT}$	50mA ≤ I _{OUT} ≤ 1A		65	100	mV
Output Impedance	R _{OUT}	100mA DC and 20mA _{RMS} , f _O =120Hz		65		mΩ
Quiescent Current	ΙQ	V_{OUT} +2V $\leq V_{IN} \leq 26V$, I_{OUT} =5mA		10	15	mA
Output Noise Voltage	e _N	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
Draw and Maltage	\/	I _{OUT} =1A		0.5	0.8	\/
Dropout Voltage	V_D	I _{OUT} =100mA		0.13	0.15	V
Short Circuit Current	I _{SC}	(Note)		2.5		Α
Maximum Line Transient	T_IN	R _{OUT} =100Ω, T ≤ 100ms	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	R _{OUT} =100Ω	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	R _{OUT} =100Ω, T ≤ 100ms	-50	-75		V

UTC LM2940-12V

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$13.6V \le V_{IN} \le 26V$, $5mA \le I_{OUT} \le 1A$	11.64	12.00	12.36	V
Line regulation	$\triangle V_{OUT}$	V_{OUT} +2V $\leq V_{IN} \leq 26V$, I_{OUT} =5mA		20	120	mV
Load Regulation	$\triangle V_{OUT}$	50mA ≤ I _{OUT} ≤ 1A		55	120	mV
Output Impedance	R_{OUT}	100mA DC and 20mA _{RMS} , f _O =120Hz		80		mΩ
Quiescent Current	ΙQ	V_{OUT} +2V $\leq V_{IN} \leq 26V$, I_{OUT} =5mA		10	15	mA
Output Noise Voltage	e_N	10Hz-100kHz, I _{OUT} =5mA		360		μV_{RMS}
Ripple Rejection	RR	f _O =120Hz, 1V _{RM} s, I _{OUT} =100mA	54	66		dB
Long Term Stability				48		mV/1000Hr
Drangut Valtage	M	I _{OUT} =1A		0.5	8.0	V
Dropout Voltage	V_D	I _{OUT} =100mA		0.11	0.15	V
Short Circuit Current	I _{SC}	(Note)		2.5		Α
Maximum Line Transient	T_IN	R _{OUT} =100Ω, T ≤ 100ms	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	R _{OUT} =100Ω	-15	-30		V
Reverse Polarity Transient Input Voltage	V_{TRRI}	R _{OUT} =100Ω, T ≤ 100ms	-50	-75		V

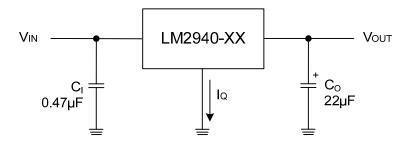
■ ELECTRICAL CHARACTERISTICS(Cont.)

UTC LM2940-15V

OTO LIVIZOTO-TOV						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$16.75V \le V_{IN} \le 26V$, $5mA \le I_{OUT} \le 1A$	14.55	15.00	15.45	V
Line regulation	$\triangle V_{OUT}$	V_{OUT} +2V $\leq V_{IN} \leq 26V$, I_{OUT} =5mA		20	150	mV
Load Regulation	$\triangle V_{OUT}$	50mA ≤ I _{OUT} ≤ 1A		70	150	mV
Output Impedance	R_{OUT}	100mA DC and 20mA _{RMS} , f _O =120Hz		100		mΩ
Quiescent Current	ΙQ	V_{OUT} +2V $\leq V_{IN} \leq 26V$, I_{OUT} =5mA		10	15	mA
Output Noise Voltage	e_N	10Hz-100kHz, I _{OUT} =5mA		450		μV_{RMS}
Ripple Rejection	RR	f _O =120Hz, 1V _{RMS} , I _{OUT} =100mA	52	64		dB
Long Term Stability				60		mV/1000Hr
Dranaut Valtage	\/	I _{OUT} =1A		0.5	0.8	V
Dropout Voltage	V_D	I _{OUT} =100mA		0.11	0.15	V
Short Circuit Current	I _{SC}	(Note)		2.5		Α
Maximum Line Transient	T_IN	R _{OUT} =100Ω, T ≤ 100ms	60	75		V
Reverse Polarity DC Input Voltage	V_{RIN}	R _{OUT} =100Ω	-15	-30		V
Reverse Polarity Transient Input	V_{TRRI}	R _{OUT} =100Ω, T ≤ 100ms	-50	-75		V
Voltage	- HXIXI					

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

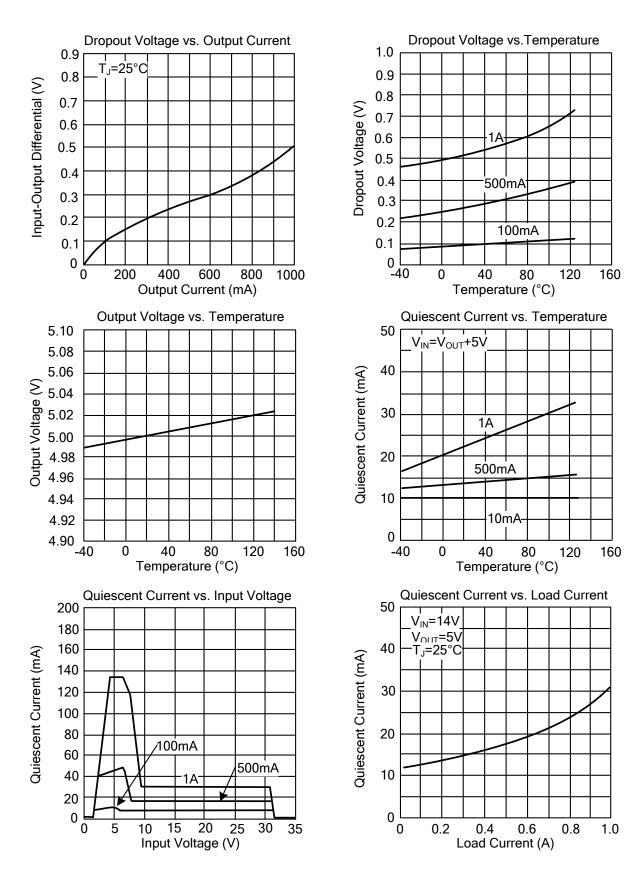
■ TYPICAL APPLICATION

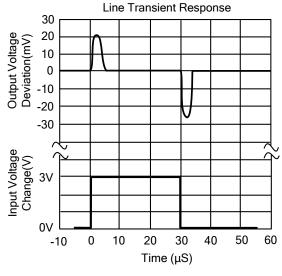


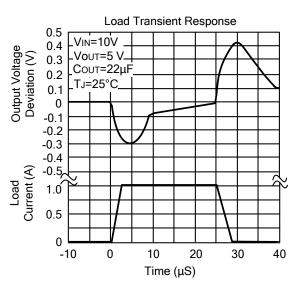
Note: 1. C_1 is required if regulator is located far from power supply filter.

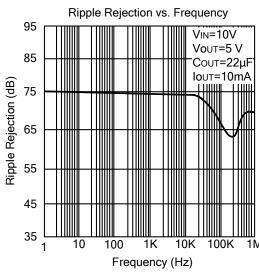
2. C_{O} must be higher than 22 μF for stability, and locate as close as possible to the regulator.

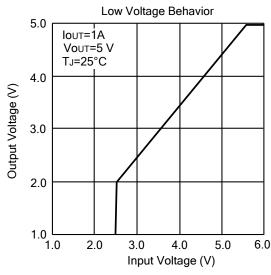
■ TYPICAL CHARACTERISTICS

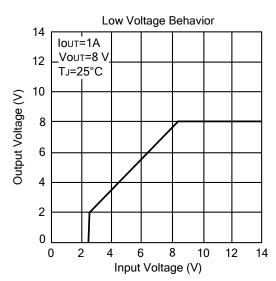


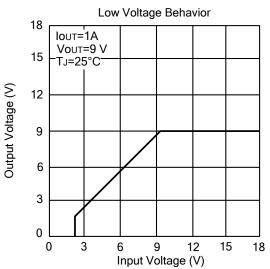


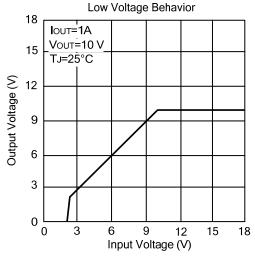


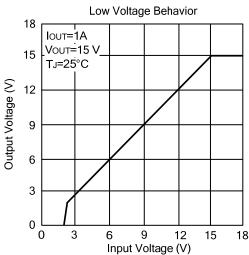


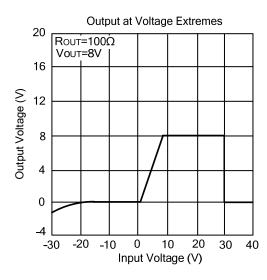


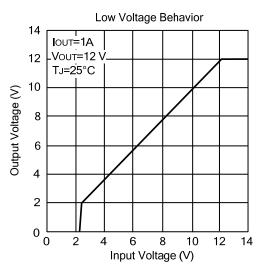


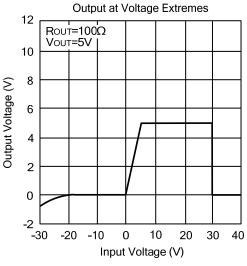


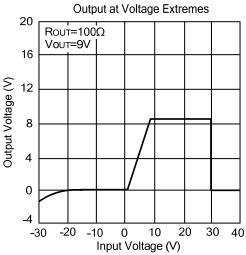


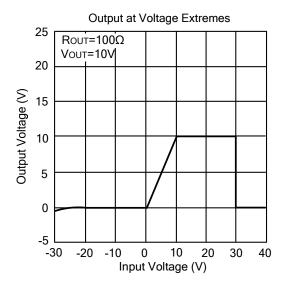


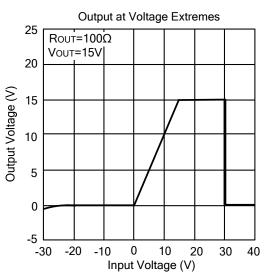


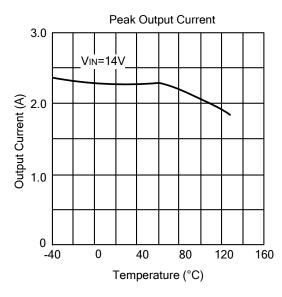


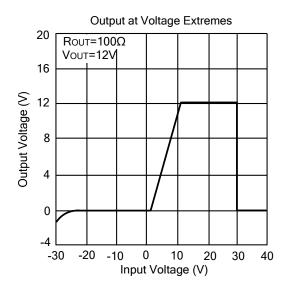


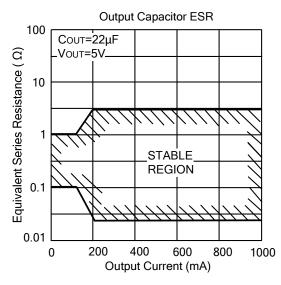


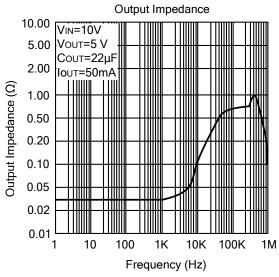


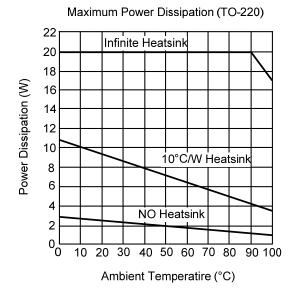


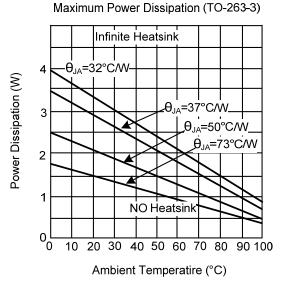












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