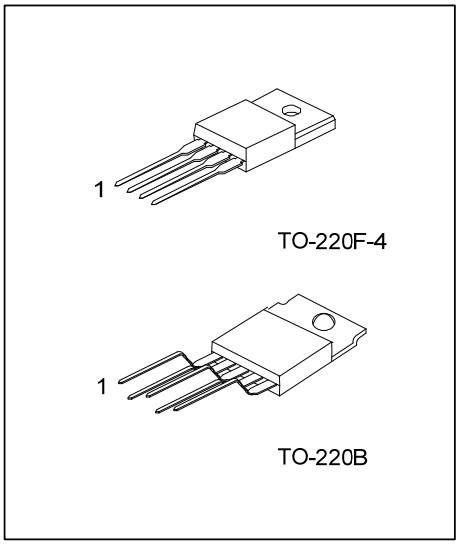
RXXLD20

LINEAR INTEGRATED CIRCUIT

2A OUTPUT TYPE LOW POWER-LOSS VOLTAGE REGULATOR



■ FEATURES

* Low power-loss(Dropout voltage: 0.5V(max) at I_{OUT}=2.0A)
* 2.0A output type
* Output voltage precision: ±3.0%
* Built-in ON/OFF control function and over-current protection circuit.
* Thermal shutdown protection.

■ ORDERING INFORMATION

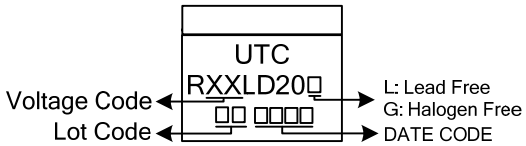
Ordering Number		Package	Pin Assignment					Packing
Lead Free	Halogen Free		1	2	3	4	5	
RXXLD20L-TB5-T	RXXLD20G-TB5-T	TO-220B	N	I	O	G	F	Tube
RXXLD20L-TF4-T	RXXLD20G-TF4-T	TO-220F-4	I	O	G	F	-	Tube

Note: Pin Assignment: N: NC, I: INPUT, O: OUTPUT, G: GND, F: ON/OFF

RXXLD20L-TB5-D-T
(1) Packing Type
(2) Pin Assignment
(3) Package Type
(4) Lead Free
(5) Voltage Code

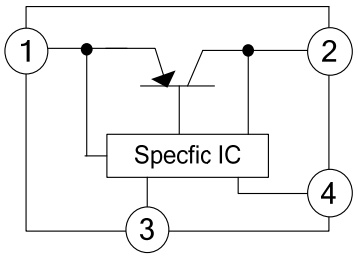
(1) T: Tube, R: Tape Reel
(2) refer to Assignment
(3) TB5: TO-220B, TF4: TO-220F-4
(4) L: Lead Free, G: Halogen Free
(5) XX: refer to Marking Information

■ MARKING INFORMATION

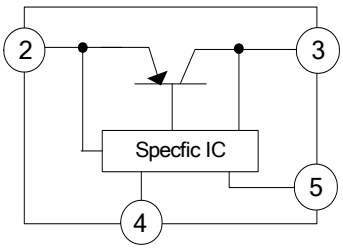
PACKAGE	VOLTAGE CODE	MARKING
TO-220F-4 TO-220B	33 :3.3V 35 :3.5V 05 :5.0V 06 :6.0V 08: 8.0V 09 :9.0V 10 :10V 12 :12V 15 :15V	

■ BLOCK DIAGRAM

TO-220F-4



TO-220B



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

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage(Note1)		V_{IN}	20	V
ON/OFF Control Terminal Voltage (Note1)		Vc	20	V
Output Current		I_{OUT}	2.0	A
Power Dissipation	No Heat Sink	P_D	1.4	W
	With Heat Sink		15	W
Junction Temperature (Note2)		T_J	150	°C
Operating Temperature		T_{OPR}	-40 ~ +85	°C
Storage Temperature		T_{STG}	-40 ~ +150	°C

Note 1: All are open except GND and applicable terminals.
2: Overheat protection may operate at $125 \leqq T_J \leqq 150$°C

■ ELECTRICAL CHARACTERISTICS (Refer to the test circuits, unless otherwise specified, T_A=25°C)

For R33LD20(3.3V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		V_{OUT}	V_{IN}=5V, I_{OUT}=1A	3.201	3.3	3.399	V
Line Regulation		ΔV_{OUT}	V_{IN}=4 ~ 10V, I_{OUT}=5mA		0.1	2.5	%
Load Regulation		ΔV_{OUT}	V_{IN}=5V, I_{OUT}=5mA ~ 2.0A		0.1	2.0	%
Temperature Coefficient of Output Voltage		T_CV_O	T_J=0 ~ 125°C,I_{OUT}=5mA		±0.02		%/°C
Ripple Rejection		RR	Refer to Fig.2	45	55		dB
Dropout Voltage		V_D	(Note 1), I_{OUT}=2A			0.5	V
Voltage for Control(Note 2)	ON	$V_{C(ON)}$	V_{IN}=5V	2.0			V
	OFF	$V_{C(OFF)}$	V_{IN}=5V			0.8	V
Current for Control	ON	$I_{C(ON)}$	V_C=2.7V,V_{IN}=5V			20	μA
	OFF	$I_{C(OFF)}$	V_C=0.4V, V_{IN}=5V			-0.4	mA
Quiescent Current		I_Q	I_{OUT}=0A, V_{IN}=5V			10	mA

For R35LD20(3.5V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		V_{OUT}	V_{IN}=5.5V, I_{OUT}=1A	3.395	3.5	3.605	V
Line Regulation		ΔV_{OUT}	V_{IN}=4.5 ~ 10.5V, I_{OUT}=5mA		0.1	2.5	%
Load Regulation		ΔV_{OUT}	V_{IN}=5.5V, I_{OUT}=5mA ~ 2.0A		0.1	2.0	%
Temperature Coefficient of Output Voltage		T_CV_O	T_J=0 ~ 125°C,I_{OUT}=5mA		±0.02		%/°C
Ripple Rejection		RR	Refer to Fig.2	45	55		dB
Dropout Voltage		V_D	(Note 1), I_{OUT}=2A			0.5	V
Voltage for Control (Note 2)	ON	$V_{C(ON)}$	V_{IN}=5V	2.0			V
	OFF	$V_{C(OFF)}$	V_{IN}=5V			0.8	V
Current for Control	ON	$I_{C(ON)}$	V_C=2.7V,V_{IN}=5.5V			20	μA
	OFF	$I_{C(OFF)}$	V_C=0.4V, V_{IN}=5.5V			-0.4	mA
Quiescent Current		I_Q	I_{OUT}=0A, V_{IN}=5.5V			10	mA

■ ELECTRICAL CHARACTERISTICS(Cont.)

For R05LD20(5V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		V_{OUT}	V_{IN} =7V, I_{OUT}=1A	4.85	5.0	5.15	V
Line Regulation		ΔV_{OUT}	V_{IN} =6 ~ 12V, I_{OUT}=5mA		0.5	2.5	%
Load Regulation		ΔV_{OUT}	V_{IN} =7V, I_{OUT}=5mA ~ 2.0A		0.1	2.0	%
Temperature Coefficient of Output Voltage		T_CV_O	T_J=0 ~ 125°C, I_{OUT}=5mA		±0.02		%/°C
Ripple Rejection		RR	Refer to Fig.2	45	55		dB
Dropout Voltage		V_D	(Note 1), I_{OUT}=2A			0.5	V
Voltage for Control (Note 2)	ON	$V_{C(ON)}$	V_{IN} =7V	2.0			V
	OFF	$V_{C(OFF)}$	V_{IN} =7V			0.8	V
Current for Control	ON	$I_{C(ON)}$	V_C=2.7V, V_{IN} =7V			20	μA
	OFF	$I_{C(OFF)}$	V_C=0.4V, V_{IN} =7V			-0.4	mA
Quiescent Current		I_Q	I_{OUT} =0A, V_{IN} =7V			10	mA

For R06LD20(6V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		V_{OUT}	V_{IN} =8V, I_{OUT}=1A	5.82	6.0	6.18	V
Line Regulation		ΔV_{OUT}	V_{IN} =7 ~ 13V, I_{OUT}=5mA		0.5	2.5	%
Load Regulation		ΔV_{OUT}	V_{IN} =8V, I_{OUT}=5mA ~ 2.0A		0.1	2.0	%
Temperature Coefficient of Output Voltage		T_CV_O	T_J=0 ~ 125°C, I_{OUT}=5mA		±0.02		%/°C
Ripple Rejection		RR	Refer to Fig.2	45	55		dB
Dropout Voltage		V_D	(Note 1), I_{OUT}=2A			0.5	V
Voltage for Control (Note 2)	ON	$V_{C(ON)}$	V_{IN} =8V	2.0			V
	OFF	$V_{C(OFF)}$	V_{IN} =8V			0.8	V
Current for Control	ON	$I_{C(ON)}$	V_C=2.7V, V_{IN} =8V			20	μA
	OFF	$I_{C(OFF)}$	V_C=0.4V, V_{IN} =8V			-0.4	mA
Quiescent Current		I_Q	I_{OUT} =0A, V_{IN} =8V			10	mA

For R08LD20(8V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		V_{OUT}	V_{IN} =10V, I_{OUT}=1A	7.76	8.0	8.24	V
Line Regulation		ΔV_{OUT}	V_{IN} =9~15V, I_{OUT}=5mA		0.5	2.5	%
Load Regulation		ΔV_{OUT}	V_{IN} =10V, I_{OUT}=5mA~2.0A		0.1	2.0	%
Temperature Coefficient of Output Voltage		T_CV_O	T_J=0~125°C, I_{OUT}=5mA		±0.02		%/°C
Ripple Rejection		RR	Refer to Fig.2	45	55		dB
Dropout Voltage		V_D	(Note 1), I_{OUT}=2A			0.5	V
Voltage for Control (Note 2)	ON	$V_{C(ON)}$	V_{IN} =10V	2.0			V
	OFF	$V_{C(OFF)}$	V_{IN} =10V			0.8	V
Current for Control	ON	$I_{C(ON)}$	V_C=2.7V, V_{IN} =10V			20	μA
	OFF	$I_{C(OFF)}$	V_C=0.4V, V_{IN} =10V			-0.4	mA
Quiescent Current		I_Q	I_{OUT} =0A, V_{IN} =10V			10	mA

■ ELECTRICAL CHARACTERISTICS(Cont.)

For R09LD20(9V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		V_{OUT}	V_{IN} =11V, I_{OUT}=1A	8.73	9.0	9.27	V
Line Regulation		ΔV_{OUT}	V_{IN} =10~16V, I_{OUT}=5mA		0.5	2.5	%
Load Regulation		ΔV_{OUT}	V_{IN} =11V, I_{OUT}=5mA~2.0A		0.1	2.0	%
Temperature Coefficient of Output Voltage		T_CV_O	T_J=0~125°C, I_{OUT}=5mA		±0.02		%/°C
Ripple Rejection		RR	Refer to Fig.2	45	55		dB
Dropout Voltage		V_D	(Note 1), I_{OUT}=2A			0.5	V
Voltage for Control (Note 2)	ON	$V_{C(ON)}$	V_{IN} =11V	2.0			V
	OFF	$V_{C(OFF)}$	V_{IN} =11V			0.8	V
Current for Control	ON	$I_{C(ON)}$	V_C=2.7V, V_{IN} =11V			20	μA
	OFF	$I_{C(OFF)}$	V_C=0.4V, V_{IN} =11V			-0.4	mA
Quiescent Current		I_Q	I_{OUT} =0A, V_{IN} =11V			10	mA

For R10LD20(10V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		V_{OUT}	V_{IN} =12V, I_{OUT}=1A	9.7	10.0	10.3	V
Line Regulation		ΔV_{OUT}	V_{IN} =11~17V, I_{OUT}=5mA		0.5	2.5	%
Load Regulation		ΔV_{OUT}	V_{IN} =12V, I_{OUT}=5mA~2.0A		0.1	2.0	%
Temperature Coefficient of Output Voltage		T_CV_O	T_J=0~125°C, I_{OUT}=5mA		±0.02		%/°C
Ripple Rejection		RR	Refer to Fig.2	45	55		dB
Dropout Voltage		V_D	(Note 1), I_{OUT}=2A			0.5	V
Voltage for Control (Note 2)	ON	$V_{C(ON)}$	V_{IN} =12V	2.0			V
	OFF	$V_{C(OFF)}$	V_{IN} =12V			0.8	V
Current for Control	ON	$I_{C(ON)}$	V_C=2.7V, V_{IN} =12V			20	μA
	OFF	$I_{C(OFF)}$	V_C=0.4V, V_{IN} =12V			-0.4	mA
Quiescent Current		I_Q	I_{OUT} =0A, V_{IN} =12V			10	mA

For R12LD20(12V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		V_{OUT}	V_{IN} =14V, I_{OUT}=1A	11.64	12.0	12.36	V
Line Regulation		ΔV_{OUT}	V_{IN} =13~19V, I_{OUT}=5mA		0.5	2.5	%
Load Regulation		ΔV_{OUT}	V_{IN} =14V, I_{OUT}=5mA~2.0A		0.1	2.0	%
Temperature Coefficient of Output Voltage		T_CV_O	T_J=0~125°C, I_{OUT}=5mA		±0.02		%/°C
Ripple Rejection		RR	Refer to Fig.2	45	55		dB
Dropout Voltage		V_D	(Note 1), I_{OUT}=2A			0.5	V
Voltage for Control (Note 2)	ON	$V_{C(ON)}$	V_{IN} =14V	2.0			V
	OFF	$V_{C(OFF)}$	V_{IN} =14V			0.8	V
Current for Control	ON	$I_{C(ON)}$	V_C=2.7V, V_{IN} =14V			20	μA
	OFF	$I_{C(OFF)}$	V_C=0.4V, V_{IN} =14V			-0.4	mA
Quiescent Current		I_Q	I_{OUT} =0A, V_{IN} =14V			10	mA

■ ELECTRICAL CHARACTERISTICS(Cont.)

For R15LD20(15V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		V_{OUT}	V_{IN} =17V, I_{OUT}=1A	14.55	15.0	15.45	V
Line Regulation		ΔV_{OUT}	V_{IN} =16~20V, I_{OUT}=5mA		0.5	2.5	%
Load Regulation		ΔV_{OUT}	V_{IN} =17V, I_{OUT}=5mA~2.0A		0.1	2.0	%
Temperature Coefficient of Output Voltage		T_CV_O	T_J=0~125°C, I_{OUT}=5mA		±0.02		%/°C
Ripple Rejection		RR	Refer to Fig.2	45	55		dB
Dropout Voltage		V_D	(Note 1), I_{OUT}=2A			0.5	V
Voltage for Control (Note 2)	ON	$V_{C(ON)}$	V_{IN} =17V	2.0			V
	OFF	$V_{C(OFF)}$	V_{IN} =17V			0.8	V
Current for Control	ON	$I_{C(ON)}$	V_C=2.7V, V_{IN} =17V			20	μA
	OFF	$I_{C(OFF)}$	V_C=0.4V, V_{IN} =17V			-0.4	mA
Quiescent Current		I_Q	I_{OUT} =0A, V_{IN} =17V			10	mA

Note: 1. Input voltage shall be the value when output voltage is 95% in comparison with the initial value.
2. In case of opening control terminal(pin 5 of TO-220B, pin 4 of TO-220F-4), output voltage turns on.

■ TEST CIRCUITS

Note : ◯: TO-220F-4, ( ): TO-220B

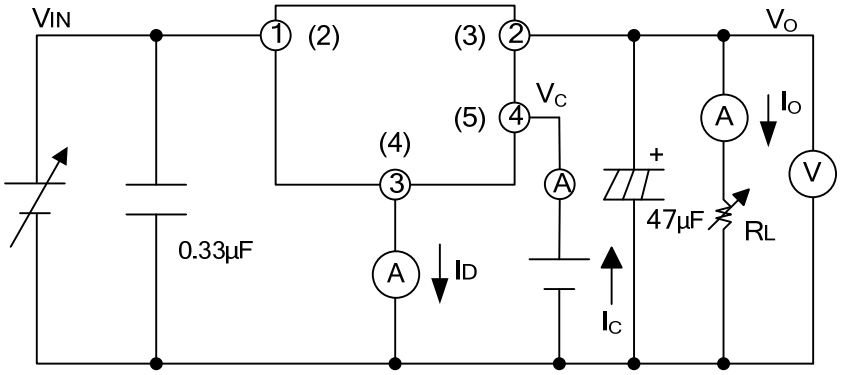
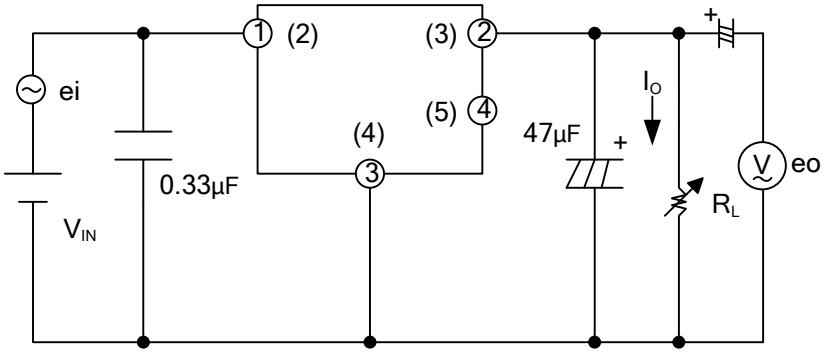


Fig.1



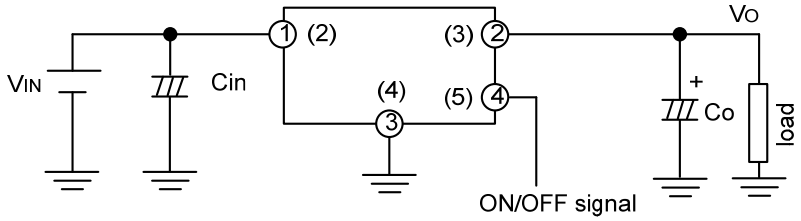
VIN=5V(R33LD20)
5.5V(R35LD20)
7V(R05LD20)
8V(R06LD20)
10V(R08LD20)

VIN=11V(R09LD20)
12V(R10LD20)
14V(R12LD20)
17V(R15LD20)

f=120Hz
ei=0.5Vrms
Io=0.5A
RR=20log (ei/eo)

Fig.2 For Ripple Rejection

■ TYPICAL APPLICATION



( ) : TO-220B
◯ : TO-220F-4

ON/OFF signal
High or Open:Output ON
Low :Output OFF

■ TYPICAL CHARACTERISTICS

Fig.3 Power Dissipation vs. Ambient Temperature

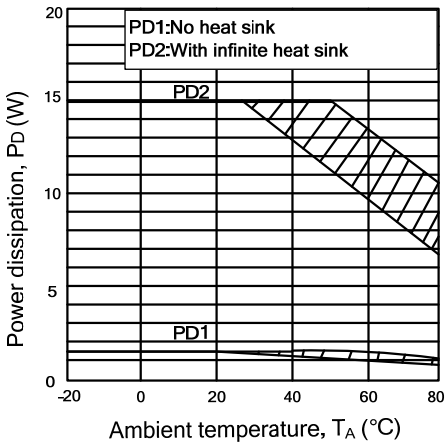
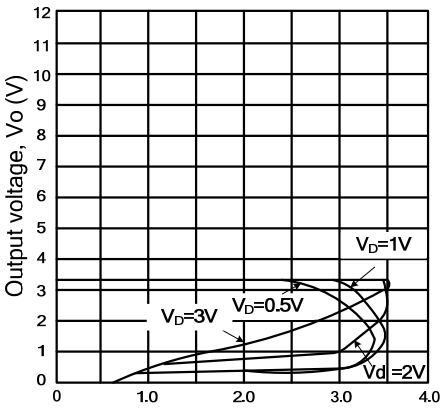


Fig.4 Overcurrent Protection Characteristics(Typical Value) (R33LD20)



Note: Oblique line portion:Overheat protection may operate in this area.

Fig.5 Overcurrent Protection Characteristics (Typical Value)(R05LD20)

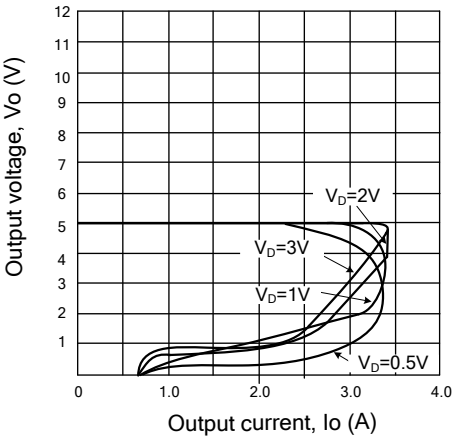


Fig.6 Overcurrent Protection Characteristics (Typical Value)(R09LD20)

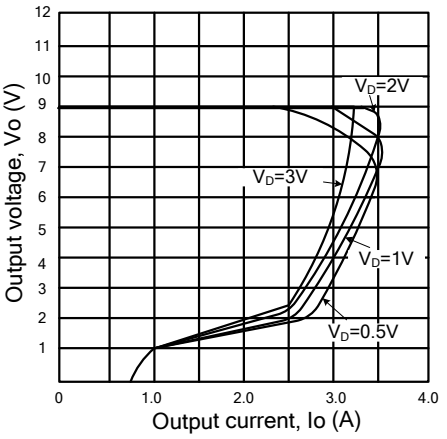


Fig.7 Overcurrent Protection Characteristics (Typical Value)(R12LD20)

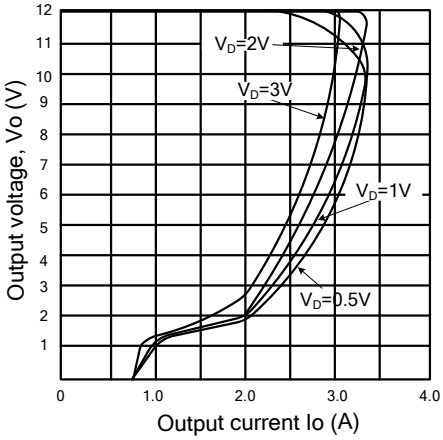
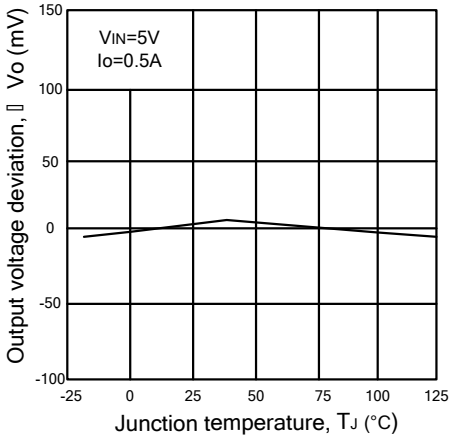


Fig.8 Output Voltage Deviation vs .Junction Temperature (R03LD20)



■ TYPICAL CHARACTERISTICS(Cont.)

Fig.9 Output Voltage Deviation vs .Junction Temperature (R05LD20)

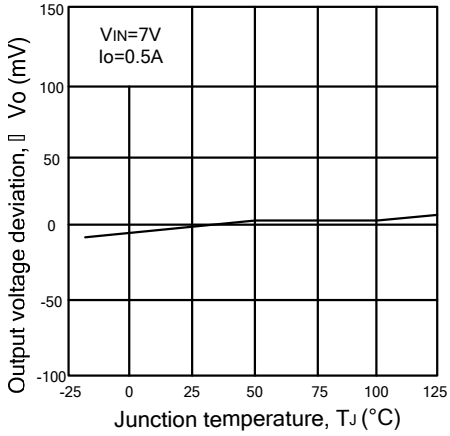


Fig.10 Output Voltage Deviation vs .Junction Temperature (R09LD20)

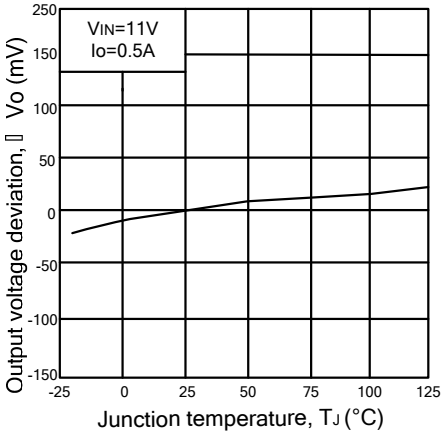


Fig.11 Output Voltage Deviation vs .Junction Temperature (R12LD20)

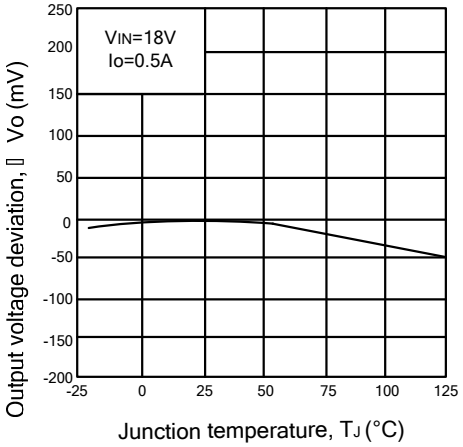


Fig.12 Output Voltage vs .Input Voltage (R33LD20)

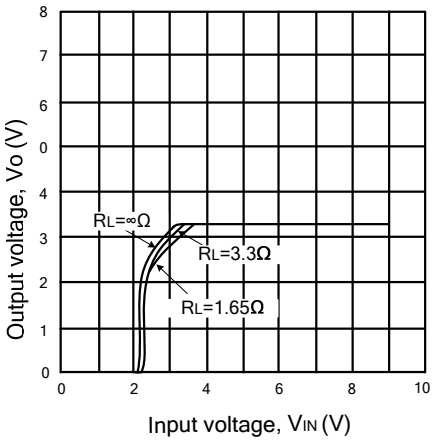


Fig.13 Output Voltage vs .Input Voltage (R05LD20)

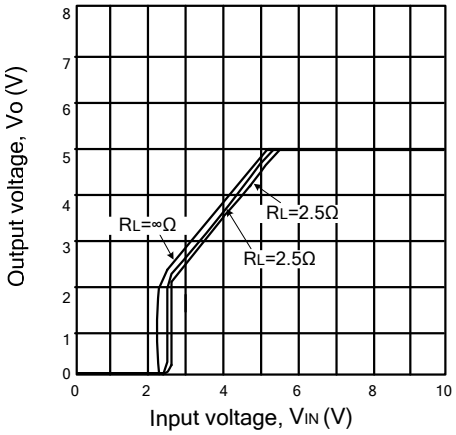
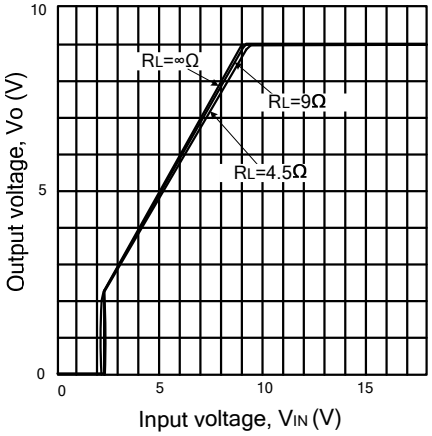


Fig.14 Output Voltage vs .Input Voltage (R09LD20)



■ TYPICAL CHARACTERISTICS(Cont.)

Fig.15 Output Voltage vs .Input Voltage (R12LD20)

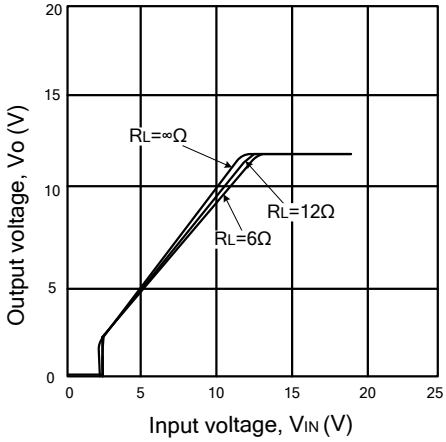


Fig.16 Circuit Operating Current vs .Input Voltage (R33LD20)

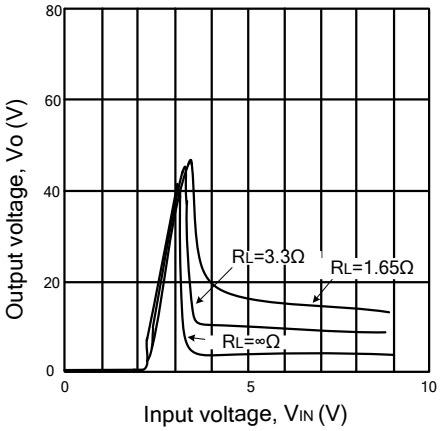


Fig.17 Circuit Operating Current vs .Input Voltage (R05LD20)

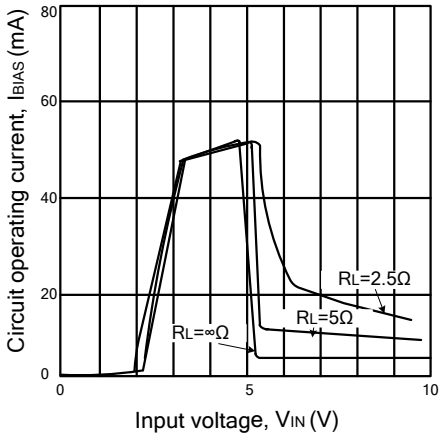


Fig.18 Circuit Operating Current vs .Input Voltage (R09LD20)

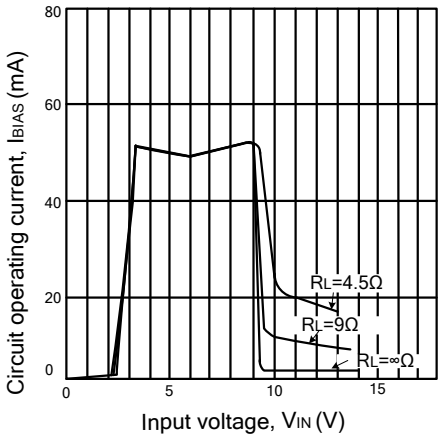


Fig.19 Circuit Operating Current vs .Input Voltage (R12LD20)

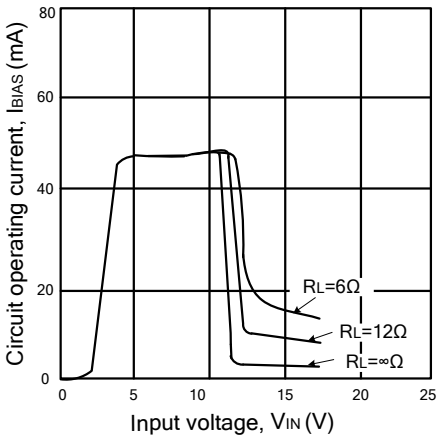
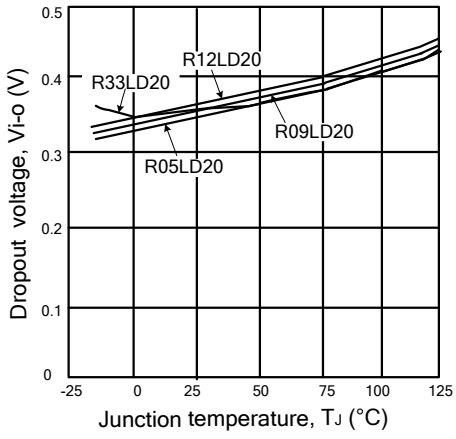


Fig.20 Dropout Voltage vs .Junction Temperature



■ TYPICAL CHARACTERISTICS(Cont.)

Fig.21 Quiescent Current vs .Junction Temperature

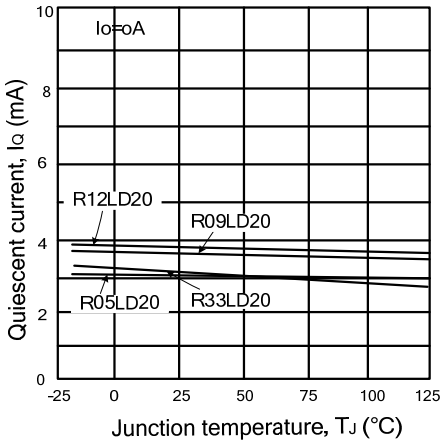


Fig.22 Ripple Rejection vs .Input Ripple Frequency