

# 78LXXM

# LINEAR INTEGRATED CIRCUIT

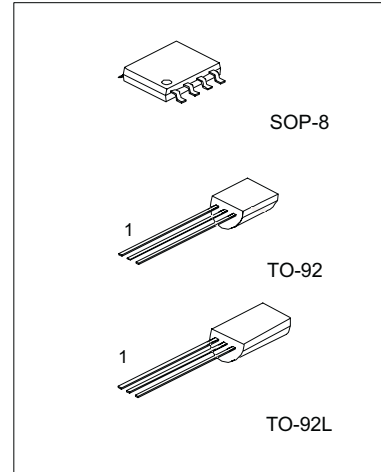
## 3-TERMINAL 0.2A POSITIVE VOLTAGE REGULATOR

### DESCRIPTION

The Contek 78LXXM family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 200mA.

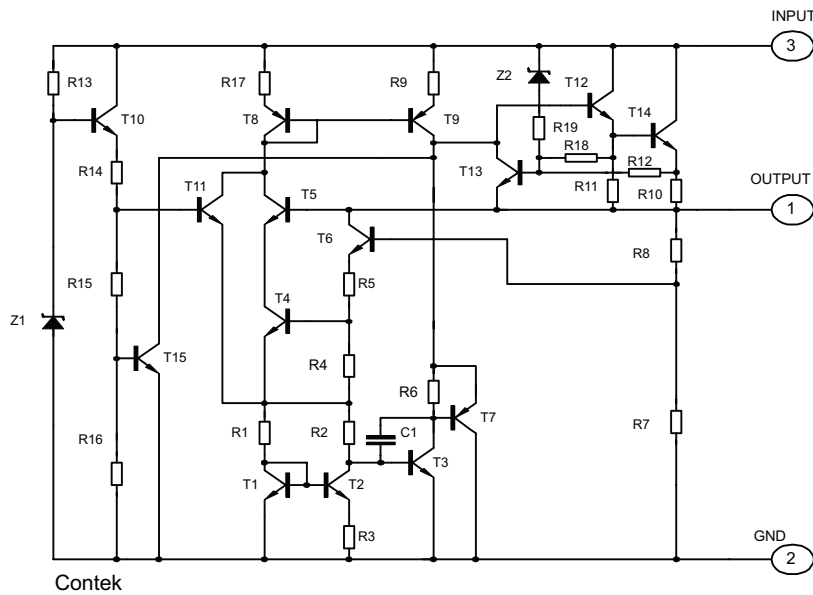
### FEATURES

- \*Output current up to 200mA
- \*Fixed output voltage of 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V available
- \*Thermal overload shutdown protection
- \*Short circuit current limiting



SOP-8: 1:Output 2,3,6,7:GND 8:Input  
4,5:N.C.  
TO-92: 1:Output 2:GND; 3:Input  
TO-92L: 1:Output 2:GND; 3:Input

### TEST CIRCUIT



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## ABSOLUTE MAXIMUM RATINGS

( Operating temperature range applies unless otherwise specified )

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Input voltage(for Vo=5~9V) (for Vo=12~24V)	V <sub>i</sub>		30	V
	V <sub>i</sub>		35	V
Output Current	I <sub>o</sub>		200	mA
Power Dissipation	PD			
		SOP-8	300	mW
		TO-92	300	
TO-92L	500			
Operating Junction Temperature Range	T <sub>OPR</sub>	-20	+150	C
Storage Temperature Range	T <sub>STG</sub>	-55	+150	C

## Contek 78L05M ELECTRICAL CHARACTERISTICS

( V<sub>I</sub>=10V, I<sub>o</sub>=40mA, 0 C <T<sub>j</sub><125 C, C<sub>1</sub>=0.33uF, C<sub>o</sub>=0.1uF, unless otherwise specified )(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>o</sub>	T <sub>j</sub> =25 C	4.9	5.0	5.1	V
		7V<=V <sub>i</sub> <=20V, I <sub>o</sub> =1mA - 40mA	4.9		5.1	V
		7V<=V <sub>i</sub> <=V <sub>MAX</sub> I <sub>o</sub> =1mA-200mA	4.9		5.1	V (note 2)
Load Regulation	ΔV <sub>o</sub>	T <sub>j</sub> =25 C, I <sub>o</sub> =1mA - 100mA		11	60	mV
		T <sub>j</sub> =25 C, I <sub>o</sub> =1mA - 40mA		5.0	30	mV
Line regulation	ΔV <sub>o</sub>	7V<=V <sub>i</sub> <=20V, T <sub>j</sub> =25 C		8	150	mV
		8V<=V <sub>i</sub> <=20V, T <sub>j</sub> =25 C		6	100	mV
Quiescent Current	I <sub>q</sub>			2.0	5.5	mA
Quiescent Current Change	ΔI <sub>q</sub>	8V<=V <sub>i</sub> <=20V			1.5	mA
		1mA<=I <sub>o</sub> <=40mA			0.1	mA
Output Noise Voltage	V <sub>N</sub>	10Hz<=f<=100kHz		40		uV
Temperature coefficient of V <sub>o</sub>	ΔV <sub>o</sub> /ΔT	I <sub>o</sub> =5mA		-0.65		mV/ C
Ripple Rejection	RR	8V<=V <sub>i</sub> <=20V, f=120Hz, T <sub>j</sub> =25 C	41	80		dB
Dropout Voltage	V <sub>d</sub>	T <sub>j</sub> =25 C		1.7		V

## Contek 78L06M ELECTRICAL CHARACTERISTICS

( V<sub>I</sub>=12V, I<sub>o</sub>=40mA, 0 C <T<sub>j</sub><125 C, C<sub>1</sub>=0.33uF, C<sub>o</sub>=0.1uF, unless otherwise specified )( Note 1 )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>o</sub>	T <sub>j</sub> =25 C	5.75	6.0	6.25	V
		8.5V<=V <sub>i</sub> <=20V, I <sub>o</sub> =1mA - 40mA	5.7		6.3	V
		8.5V<=V <sub>i</sub> <=V <sub>MAX</sub> , I <sub>o</sub> =1mA - 200mA	5.7		6.3	V (note 2)
Load Regulation	ΔV <sub>o</sub>	T <sub>j</sub> =25 C, I <sub>o</sub> =1mA - 100mA		12.8	80	mV
		T <sub>j</sub> =25 C, I <sub>o</sub> =1mA - 70mA		5.8	40	mV
Line regulation	ΔV <sub>o</sub>	8.5V<=V <sub>i</sub> <=20V, T <sub>j</sub> =25 C		64	175	mV
		9V<=V <sub>i</sub> <=20V, T <sub>j</sub> =25 C		54	125	mV
Quiescent Current	I <sub>q</sub>			3.9	6.0	mA
Quiescent Current Change	ΔI <sub>q</sub>	9V<=V <sub>i</sub> <=20V			1.5	mA



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PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
	$\Delta I_q$	1mA $\leq V_I \leq$ 40mA			0.1	mA
Output Noise Voltage	$V_N$	10Hz $\leq f \leq$ 100kHz		49		$\mu$ V
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_o = 5mA$		0.75		mV/°C
Ripple Rejection	RR	10V $\leq V_I \leq$ 20V, $f = 120Hz$ , $T_j = 25^\circ C$	40	46		dB
Dropout Voltage	$V_d$	$T_j = 25^\circ C$		1.7		V

## Contek 78L08M ELECTRICAL CHARACTERISTICS

( $V_I = 14V, I_o = 40mA, 0^\circ C < T_j < 125^\circ C, C_1 = 0.33\mu F, C_o = 0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j = 25^\circ C$	7.7	8.0	8.3	V
		10.5V $\leq V_I \leq$ 23V, $I_o = 1mA - 40mA$	7.6		8.4	V
		10.5V $\leq V_I \leq V_{MAX}$ , $I_o = 1mA - 200mA$	7.6		8.4	V (note 2)
Load Regulation	$\Delta V_o$	$T_j = 25^\circ C, I_o = 1mA - 100mA$		15	80	mV
		$T_j = 25^\circ C, I_o = 1mA - 70mA$		8.0	40	mV
Line regulation	$\Delta V_o$	10.5V $\leq V_I \leq$ 23V, $T_j = 25^\circ C$		10	175	mV
		11V $\leq V_I \leq$ 23V, $T_j = 25^\circ C$		8	125	mV
Quiescent Current	$I_q$			2.0	5.5	mA
Quiescent Current Change	$\Delta I_q$	11V $\leq V_I \leq$ 23V			1.5	mA
	$\Delta I_q$	1mA $\leq V_I \leq$ 40mA			0.1	mA
Output Noise Voltage	$V_N$	10Hz $\leq f \leq$ 100kHz		49		$\mu$ V
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_o = 5mA$		0.75		mV/°C
Ripple Rejection	RR	11V $\leq V_I \leq$ 23V, $f = 120Hz$ , $T_j = 25^\circ C$	39	70		dB
Dropout Voltage	$V_d$	$T_j = 25^\circ C$		1.7		V

## Contek 78L09M ELECTRICAL CHARACTERISTICS

( $V_I = 15V, I_o = 40mA, 0^\circ C < T_j < 125^\circ C, C_1 = 0.33\mu F, C_o = 0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j = 25^\circ C$	8.64	9.0	9.36	V
		11.5V $\leq V_I \leq$ 24V, $I_o = 1mA - 40mA$	8.55		9.45	V
		11.5V $\leq V_I \leq V_{MAX}$ , $I_o = 1mA - 200mA$	8.55		9.45	V (note 2)
Load Regulation	$\Delta V_o$	$T_j = 25^\circ C, I_o = 1mA - 100mA$		20	90	mV
		$T_j = 25^\circ C, I_o = 1mA - 40mA$		10	45	mV
Line regulation	$\Delta V_o$	11.5V $\leq V_I \leq$ 24V, $T_j = 25^\circ C$		90	200	mV
		13V $\leq V_I \leq$ 24V, $T_j = 25^\circ C$		100	150	mV
Quiescent Current	$I_q$			2.0	6.0	mA
Quiescent Current Change	$\Delta I_q$	13V $\leq V_I \leq$ 24V			1.5	mA
	$\Delta I_q$	1mA $\leq V_I \leq$ 40mA			0.1	mA
Output Noise Voltage	$V_N$	10Hz $\leq f \leq$ 100kHz		49		$\mu$ V
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_o = 5mA$		0.75		mV/°C
Ripple Rejection	RR	12V $\leq V_I \leq$ 23V, $f = 120Hz$ , $T_j = 25^\circ C$	38	44		dB
Dropout Voltage	$V_d$	$T_j = 25^\circ C$		1.7		V



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## Contek 78L10M ELECTRICAL CHARACTERISTICS

( $V_I=16V, I_O=40mA, 0\text{ C} < T_J < 125\text{ C}, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25 C	9.6	10.0	10.4	V
		12.5V<=Vi<=23V, Io=1mA - 40mA	9.5		10.5	V
		12.5V<=Vi<=VMAX, Io=1mA - 200mA	9.5		10.5	V (note 2)
Load Regulation	ΔVo	Tj=25 C, IO=1mA - 100mA		20	94	mV
		Tj=25 C, IO=1mA - 70mA		10	47	mV
Line regulation	ΔVo	12.5V<=Vi<=23V, Tj=25 C		100	220	mV
		14V<=Vi<=23V, Tj=25 C		200	170	mV
Quiescent Current	Iq			4.2	6.5	mA
Quiescent Current Change	ΔIq	12.5V<=Vi<=23V			1.5	mA
	ΔIq	1mA<=Vi<=40mA			0.1	mA
Output Noise Voltage	VN	10Hz<=f<=100kHz		74		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.95		mV/ C
Ripple Rejection	RR	15V<=Vi<=23V, f=120Hz, Tj=25 C	38	43		dB
Dropout Voltage	Vd	Tj=25 C		1.7		V

## Contek 78L12M ELECTRICAL CHARACTERISTICS

( $V_I=19V, I_O=40mA, 0\text{ C} < T_J < 125\text{ C}, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25 C	11.5	12	12.5	V
		14.5V<=Vi<=27V, Io=1mA - 40mA	11.4		12.6	V
		14.5V<=Vi<=VMAX, Io=1mA - 200mA	11.4		12.6	V (note 2)
Load Regulation	ΔVo	Tj=25 C, IO=1mA - 100mA		25	150	mV
		Tj=25 C, IO=1mA - 40mA		12	75	mV
Line regulation	ΔVo	14.5V<=Vi<=27V, Tj=25 C		25	300	mV
		16V<=Vi<=27V, Tj=25 C		20	250	mV
Quiescent Current	Iq			2.0	6.0	mA
Quiescent Current Change	ΔIq	16V<=Vi<=27V			1.5	mA
	ΔIq	1mA<=Vi<=40mA			0.1	mA
Output Noise Voltage	VN	10Hz<=f<=100kHz		80		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		-1.0		mV/ C
Ripple Rejection	RR	15V<=Vi<=25V, f=120Hz, Tj=25 C	37	65		dB
Dropout Voltage	Vd	Tj=25 C		1.7		V



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## Contek 78L15M ELECTRICAL CHARACTERISTICS

( $V_I=23V, I_o=40mA, 0\text{ C} < T_j < 125\text{ C}, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j=25\text{ C}$	14.4	15	15.6	V
		$17.5V \leq V_I \leq 30V, I_o=1mA - 40mA$	14.25		15.75	V
		$17.5V \leq V_I \leq V_{MAX}, I_o=1mA - 200mA$	14.25		15.75	V (note 2)
Load Regulation	$\Delta V_o$	$T_j=25\text{ C}, I_o=1mA - 100mA$		20	150	mV
		$T_j=25\text{ C}, I_o=1mA - 70mA$		25	150	mV
Line regulation	$\Delta V_o$	$17.5V \leq V_I \leq 30V, T_j=25\text{ C}$		25	150	mV
		$20V \leq V_I \leq 30V, T_j=25\text{ C}$		15	75	mV
Quiescent Current	$I_q$			2.2	6.5	mA
Quiescent Current Change	$\Delta I_q$	$20V \leq V_I \leq 30V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		90		$\mu V$
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_o=5mA$		-1.3		mV/ C
Ripple Rejection	RR	$18.5V \leq V_I \leq 28.5V, f=120Hz, T_j=25\text{ C}$	34	63		dB
Dropout Voltage	$V_d$	$T_j=25\text{ C}$		1.7		V

## Contek 78L18M ELECTRICAL CHARACTERISTICS

( $V_I=27V, I_o=40mA, 0\text{ C} < T_j < 125\text{ C}, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j=25\text{ C}$	17.3	18	18.7	V
		$21V \leq V_I \leq 33V, I_o=1mA - 40mA$	17.1		18.9	V
		$21V \leq V_I \leq V_{MAX}, I_o=1mA - 200mA$	17.1		18.9	V (note 2)
Load Regulation	$\Delta V_o$	$T_j=25\text{ C}, I_o=1mA - 100mA$		30	170	mV
		$T_j=25\text{ C}, I_o=1mA - 40mA$		15	85	mV
Line regulation	$\Delta V_o$	$21V \leq V_I \leq 33V, T_j=25\text{ C}$		145	300	mV
		$22V \leq V_I \leq 33V, T_j=25\text{ C}$		135	250	mV
Quiescent Current	$I_q$			2.0	6.0	mA
Quiescent Current Change	$\Delta I_q$	$21V \leq V_I \leq 33V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		150		$\mu V$
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_o=5mA$		-1.8		mV/ C
Ripple Rejection	RR	$23V \leq V_I \leq 33V, f=120Hz, T_j=25\text{ C}$	34	48		dB
Dropout Voltage	$V_d$	$T_j=25\text{ C}$		1.7		V



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# 78LXXM

# LINEAR INTEGRATED CIRCUIT

## Contek 78L24M ELECTRICAL CHARACTERISTICS

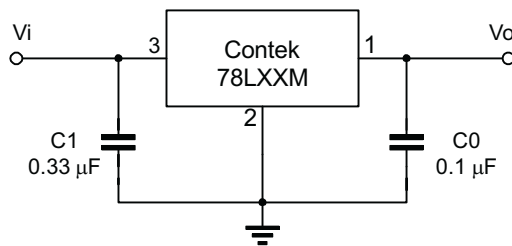
( $V_i=33V, I_o=40mA, 0\text{ C} < T_j < 125\text{ C}, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j=25\text{ C}$	23	24	25	V
		$27V \leq V_i \leq 38V, I_o=1mA - 40mA$	22.8		25.2	V
		$27V \leq V_i \leq V_{MAX}, I_o=1mA - 200mA$	22.8		25.2	V (note 2)
Load Regulation	$\Delta V_o$	$T_j=25\text{ C}, I_o=1mA - 100mA$		40	200	mV
		$T_j=25\text{ C}, I_o=1mA - 40mA$		20	100	mV
Line regulation	$\Delta V_o$	$27V \leq V_i \leq 38V, T_j=25\text{ C}$		160	300	mV
		$28V \leq V_i \leq 38V, T_j=25\text{ C}$		150	250	mV
Quiescent Current	$I_q$			2.2	6.0	mA
Quiescent Current Change	$\Delta I_q$	$27V \leq V_i \leq 38V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_i \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		200		$\mu V$
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_o=5mA$		-2.0		mV/ C
Ripple Rejection	RR	$27V \leq V_i \leq 38V, f=120Hz, T_j=25\text{ C}$	34	45		dB
Dropout Voltage	$V_d$	$T_j=25\text{ C}$		1.7		V

Note 1: The Maximum steady state usable output current are dependent on input voltage, heat sinking , lead length of the package and copper pattern of PCB. The data above represent pulse test conditions with junction temperatures specified at the initiation of test.

Note 2: Power dissipation < 0.5W

## APPLICATION CIRCUIT



Note 1: To specify an output voltage, substitute voltage value for " XXM".

Note 2: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.



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## TYPICAL PERFORMANCE CHARACTERISTICS

Fig.1 Ambient temperature vs. Power dissipation

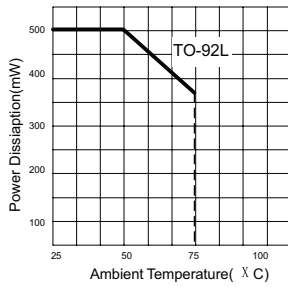


Fig.2 Contek78L05M Output Voltage vs. Ambient temperature

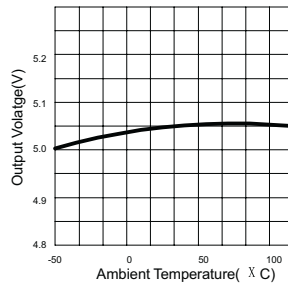


Fig.3 Contek78L12M Power dissipation vs. Ambient temperature

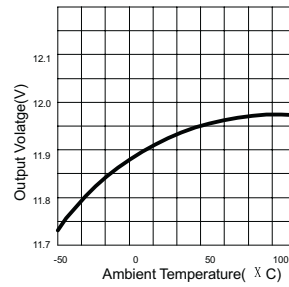


Fig.4 Output Characteristics (I<sub>p</sub>=0mA, T<sub>j</sub>=25 °C)

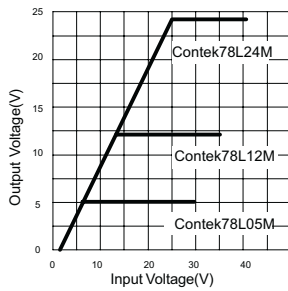


Fig.5 Contek78L05M Dropout Characteristics (T<sub>j</sub>=25 °C)

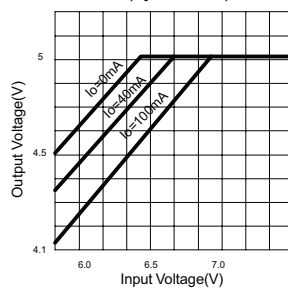


Fig.6 Short Circuit output current (T<sub>j</sub>=25 °C)

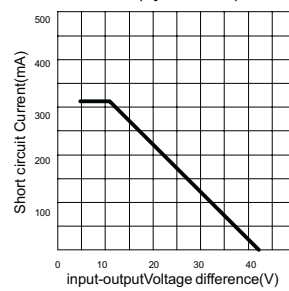


Fig.7 Contek78L12/24M quiescent current vs output current (T<sub>j</sub>=25 °C)

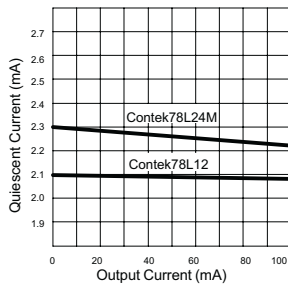


Fig.8 Contek78L05M Quiescent Current vs. Input Voltage (I<sub>o</sub>=0mA, T<sub>j</sub>=25 °C)

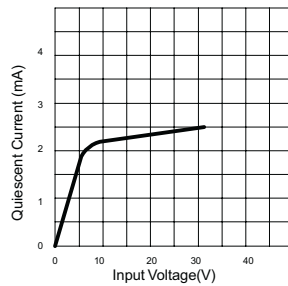


Fig.9 Peak output current vs Dropout voltage difference

