AUK Semiconductor

S78LxxF

Positive-Voltage Regulators

Descriptions

This series of fixed-voltage monolithic integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of Noise and distribution problems associated with single-point regulation. In addition, they can be used with power-pass elements to make high-current voltage regulators. Each of these regulators can deliver up to 100mA of output current.

The internal limiting and thermal shutdown features of these regulators make them essentially immune to overload. When used as a replacement for a Zener diode-resistor combination, on effective improvement in output impedance can be obtained together with lover-bias current.

Features

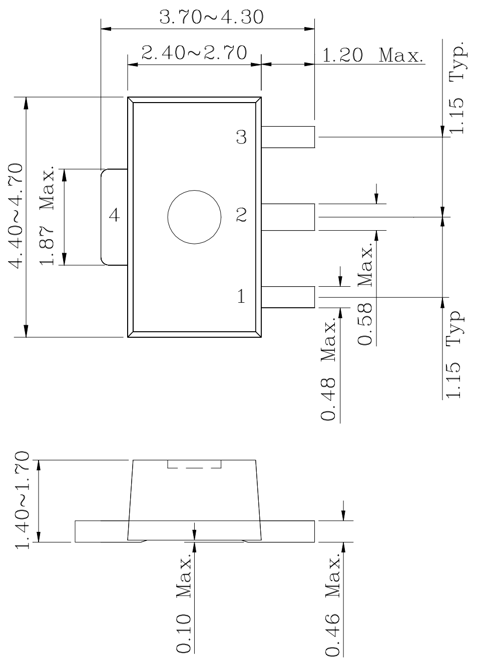
- 3-Terminal Regulators
- Output Current of 100mA
- Thermal Shutdown Protection
- Short-Circuit Limit Protection

Ordering Information

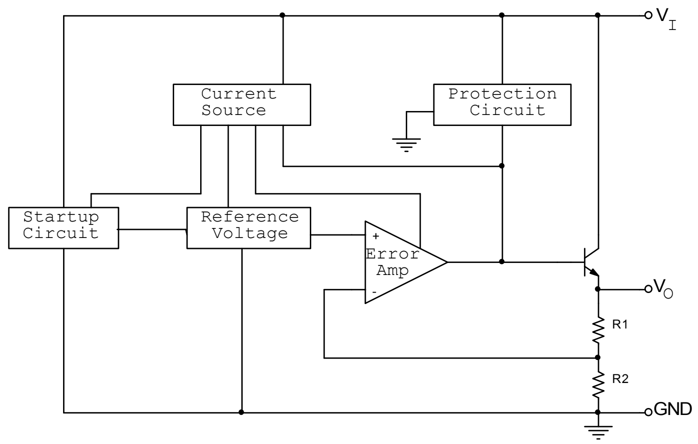
Type NO.	Marking	Package Code
S78LxxF	□□	SOT-89

□□:Voltage Code (05:5V, 06:6V, 08:8V, 09:9V, 10:10V,12:12V,15:15V,18:18V,24:24V)

Outline Dimensions (Unit : mm)



BLOCK DIAGRAM



PIN Connections

1. Output
2,4. GND
3. Input

Absolute maximum ratings

[Ta=25°C]

Characteristics	Symbol	Rating		Unit
Input Voltage	V_I	S78L05F Thru S78L10F	30	V
		S78L12F Thru S78L18F	35	
		S78L24F	40	
Power Dissipation	P_D *	500		mW
Junction Temperature	T_J	150		℃
Operating temperature range	T_{opr}	-40 ~ +85		℃
Storage temperature range	T_{stg}	-55 ~ +150		℃

* With PCB(50mm^2 copper area) at glass epoxy board (t=1.7mm, area=50×50mm)

Device Selection Guide

Device	Output Voltage
S78L05F	5.0V
S78L06F	6.0V
S78L08F	8.0V
S78L09F	9.0V
S78L10F	10V
S78L12F	12V
S78L15F	15V
S78L18F	18V
S78L24F	24V

Electrical Characteristics

(Electrical Characteristics at V_I=10V, I_O=40mA, C_I=0.33 µF, C_O=0.1 µF, 0°C ≤T_J≤125°C, Unless otherwise specified)

Parameter	Symbol	Test Condition*		S78L05F			Unit
				Min.	Typ.	Max.	
Output Voltage**	V_O		T_J=25°C	4.80	5.00	5.20	V
		I_O=1mA ~ 40mA V_I=7V ~ 20V		4.75	-	5.25	
		I_O=1mA ~ 70mA V_I=10V		4.75	-	5.25	
Line Regulation	$\triangle V_{O(\triangle VI)}$	V_I=7V ~ 20V	T_J=25°C	-	32	150	mV
		V_I=8V ~ 20V		-	26	100	
Load Regulation	$\triangle V_{O(\triangle IL)}$	I_O=1mA ~ 100mA	T_J=25°C	-	15	60	mV
		I_O=1mA ~ 40mA		-	8	30	
Quiescent Current	I_{QC}		T_J=25°C	-	3.8	6	mA
Quiescent Current Change	$\triangle I_{QC}$	V_I=8V ~ 20V		-	-	1.5	mA
		I_O=1mA ~ 40mA		-	-	0.1	
Dropout Voltage	V_{DROP}		T_J=25°C	-	1.7	-	V
Ripple Rejection	RR	V_I=8V ~ 18V, f=120Hz		41	49	-	dB

Electrical Characteristics

(Electrical Characteristics at V_I=11V, I_O=40mA, C_I=0.33 µF, C_O=0.1 µF, 0°C ≤T_J≤125°C, Unless otherwise specified)

Parameter	Symbol	Test Condition*		S78L06F			Unit
				Min.	Typ.	Max.	
Output Voltage**	V_O		T_J=25°C	5.75	6.00	6.25	V
		I_O=1mA ~ 40mA V_I=8V ~ 20V		5.70	-	6.30	
		I_O=1mA ~ 70mA V_I=11V		5.70	-	6.30	
Line Regulation	$\triangle V_{O(\triangle VI)}$	V_I=8V ~ 20V	T_J=25°C	-	35	175	mV
		V_I=9V ~ 20V		-	29	125	
Load Regulation	$\triangle V_{O(\triangle IL)}$	I_O=1mA ~ 100mA	T_J=25°C	-	16	80	mV
		I_O=1mA ~ 40mA		-	9	40	
Quiescent Current	I_{QC}		T_J=25°C	-	3.9	6	mA
Quiescent Current Change	$\triangle I_{QC}$	V_I=9V ~ 20V		-	-	1.5	mA
		I_O=1mA ~ 40mA		-	-	0.1	
Dropout Voltage	V_{DROP}		T_J=25°C	-	1.7	-	V
Ripple Rejection	RR	V_I=9V ~ 19V, f=120Hz		40	48	-	dB

Electrical Characteristics

(Electrical Characteristics at V_I=14V, I_O=40mA, C_I=0.33 ㎌, C_O=0.1 ㎌, 0°C ≤T_J≤125°C, Unless otherwise specified)

Parameter	Symbol	Test Condition*		S78L08F Min.	Typ.	Max.	Unit
Output Voltage**	V_O		T_J=25°C	7.7	8.0	8.3	V
		I_O=1mA ~ 40mA V_I=10.5V ~ 23V		7.6	-	8.4	
		I_O=1mA ~ 70mA V_I=14V		7.6	-	8.4	
Line Regulation	$\triangle V_{O(\triangle VI)}$	V_I=10.5V ~ 23V	T_J=25°C	-	42	175	mV
		V_I=11V ~ 23V		-	36	125	
Load Regulation	$\triangle V_{O(\triangle IL)}$	I_O=1mA ~ 100mA	T_J=25°C	-	18	80	mV
		I_O=1mA ~ 40mA		-	10	40	
Quiescent Current	I_{QC}		T_J=25°C	-	4	6	mA
Quiescent Current Change	$\triangle I_{QC}$	V_I=11V ~ 23V		-	-	1.5	mA
		I_O=1mA ~ 40mA		-	-	0.1	
Dropout Voltage	V_{DROP}		T_J=25°C	-	1.7	-	V
Ripple Rejection	RR	V_I=13V ~ 23V, f=120Hz		37	46	-	dB

Electrical Characteristics

(Electrical Characteristics at V_I=16V, I_O=40mA, C_I=0.33 ㎌, C_O=0.1 ㎌, 0°C ≤T_J≤125°C, Unless otherwise specified)

Parameter	Symbol	Test Condition*		S78L09F Min.	Typ.	Max.	Unit
Output Voltage**	V_O		T_J=25°C	8.60	9.00	9.40	V
		I_O=1mA ~ 40mA V_I=12V ~ 24V		8.55	-	9.45	
		I_O=1mA ~ 70mA V_I=16V		8.55	-	9.45	
Line Regulation	$\triangle V_{O(\triangle VI)}$	V_I=12V ~ 24V	T_J=25°C	-	45	175	mV
		V_I=13V ~ 24V		-	40	125	
Load Regulation	$\triangle V_{O(\triangle IL)}$	I_O=1mA ~ 100mA	T_J=25°C	-	19	90	mV
		I_O=1mA ~ 40mA		-	11	40	
Quiescent Current	I_{QC}		T_J=25°C	-	4.1	6	mA
Quiescent Current Change	$\triangle I_{QC}$	V_I=13V ~ 24V		-	-	1.5	mA
		I_O=1mA ~ 40mA		-	-	0.1	
Dropout Voltage	V_{DROP}		T_J=25°C	-	1.7	-	V
Ripple Rejection	RR	V_I=15V ~ 25V, f=120Hz		38	45	-	dB

Electrical Characteristics

(Electrical Characteristics at V_I=17V, I_O=40mA, C_I=0.33 ㎌, C_O=0.1 ㎌, 0°C ≤T_J≤125°C, Unless otherwise specified)

Parameter	Symbol	Test Condition*		S78L10F Min.	S78L10F Typ.	S78L10F Max.	Unit
Output Voltage**	V_O		T_J=25°C	9.6	10.0	10.4	V
		I_O=1mA ~ 40mA V_I=13V ~ 25V		9.5	-	10.5	
		I_O=1mA ~ 70mA V_I=17V		9.5	-	10.5	
Line Regulation	$\triangle V_{O(\triangle VI)}$	V_I=13V ~ 25V	T_J=25°C	-	51	175	mV
		V_I=14V ~ 25V		-	42	125	
Load Regulation	$\triangle V_{O(\triangle IL)}$	I_O=1mA ~ 100mA	T_J=25°C	-	20	90	mV
		I_O=1mA ~ 40mA		-	11	40	
Quiescent Current	I_{QC}		T_J=25°C	-	4.2	6	mA
Quiescent Current Change	$\triangle I_{QC}$	V_I=14V ~ 25V		-	-	1.5	mA
		I_O=1mA ~ 40mA		-	-	0.1	
Dropout Voltage	V_{DROP}		T_J=25°C	-	1.7	-	V
Ripple Rejection	RR	V_I=15V ~ 25V, f=120Hz		37	44	-	dB

Electrical Characteristics

(Electrical Characteristics at V_I=19V, I_O=40mA, C_I=0.33 ㎌, C_O=0.1 ㎌, 0°C ≤T_J≤125°C, Unless otherwise specified)

Parameter	Symbol	Test Condition*		S78L12F Min.	S78L12F Typ.	S78L12F Max.	Unit
Output Voltage**	V_O		T_J=25°C	11.5	12.0	12.5	V
		I_O=1mA ~ 40mA V_I=14V ~ 27V		11.4	-	12.5	
		I_O=1mA ~ 70mA V_I=19V		11.4	-	12.6	
Line Regulation	$\triangle V_{O(\triangle VI)}$	V_I=14.5V ~ 27V	T_J=25°C	-	55	250	mV
		V_I=16V ~ 27V		-	49	200	
Load Regulation	$\triangle V_{O(\triangle IL)}$	I_O=1mA ~ 100mA	T_J=25°C	-	22	100	mV
		I_O=1mA ~ 40mA		-	13	50	
Quiescent Current	I_{QC}		T_J=25°C	-	4.3	6.5	mA
Quiescent Current Change	$\triangle I_{QC}$	V_I=16V ~ 27V		-	-	1.5	mA
		I_O=1mA ~ 40mA		-	-	0.1	
Dropout Voltage	V_{DROP}		T_J=25°C	-	1.7	-	V
Ripple Rejection	RR	V_I=15V ~ 25V, f=120Hz		37	42	-	dB

Electrical Characteristics

(Electrical Characteristics at V_I=23V, I_O=40mA, C_I=0.33 µF, C_O=0.1 µF, 0°C ≤T_J≤125°C, Unless otherwise specified)

Parameter	Symbol	Test Condition*		S78L15F Min.	S78L15F Typ.	S78L15F Max.	Unit
Output Voltage**	V_O		T_J=25°C	14.40	15.0	15.60	V
		I_O=1mA ~ 40mA V_I=17.5V ~ 30V		14.25	-	15.75	
		I_O=1mA ~ 70mA V_I=23V		14.25	-	15.75	
Line Regulation	$\triangle V_{O(\triangle VI)}$	V_I=17.5V ~ 30V	T_J=25°C	-	65	300	mV
		V_I=19V ~ 30V		-	58	250	
Load Regulation	$\triangle V_{O(\triangle IL)}$	I_O=1mA ~ 100mA	T_J=25°C	-	25	150	mV
		I_O=1mA ~ 40mA		-	15	75	
Quiescent Current	I_{QC}		T_J=25°C	-	4.6	6.5	mA
Quiescent Current Change	$\triangle I_{QC}$	V_I=19V ~ 30V		-	-	1.5	mA
		I_O=1mA ~ 40mA		-	-	0.1	
Dropout Voltage	V_{DROP}		T_J=25°C	-	1.7	-	V
Ripple Rejection	RR	V_I=18.5V ~ 28.5V, f=120Hz		34	39	-	dB

Electrical Characteristics

(Electrical Characteristics at V_I=26V, I_O=40mA, C_I=0.33 µF, C_O=0.1 µF, 0°C ≤T_J≤125°C, Unless otherwise specified)

Parameter	Symbol	Test Condition*		S78L18F Min.	S78L18F Typ.	S78L18F Max.	Unit
Output Voltage**	V_O		T_J=25°C	17.3	18.0	18.7	V
		I_O=1mA ~ 40mA V_I=20.5V ~ 33V		17.1	-	18.9	
		I_O=1mA ~ 70mA V_I=26V		17.1	-	18.9	
Line Regulation	$\triangle V_{O(\triangle VI)}$	V_I=20.5V ~ 33V	T_J=25°C	-	70	360	mV
		V_I=22V ~ 33V		-	64	300	
Load Regulation	$\triangle V_{O(\triangle IL)}$	I_O=1mA ~ 100mA	T_J=25°C	-	27	180	mV
		I_O=1mA ~ 40mA		-	19	90	
Quiescent Current	I_{QC}		T_J=25°C	-	4.7	6.5	mA
Quiescent Current Change	$\triangle I_{QC}$	V_I=22V ~ 33V		-	-	1.5	mA
		I_O=1mA ~ 40mA		-	-	0.1	
Dropout Voltage	V_{DROP}		T_J=25°C	-	1.7	-	V
Ripple Rejection	RR	V_I=21.5V ~ 31.5V, f=120Hz		32	36	-	dB

Electrical Characteristics

(Electrical Characteristics at V_I=32V, I_O=40mA, C_I=0.33 ㎌, C_O=0.1 ㎌, 0°C ≤T_J≤125°C, Unless otherwise specified)

Parameter	Symbol	Test Condition*		S78L24F Min.	S78L24F Typ.	S78L24F Max.	Unit
Output Voltage**	V_O		T_J=25°C	23.0	24.0	25.0	V
		I_O=1mA ~ 40mA V_I=26.5V ~ 39V		22.8	-	25.2	
		I_O=1mA ~ 70mA V_I=32V		22.8	-	25.2	
Line Regulation	$\triangle V_{O(\triangle VI)}$	V_I=26.5V ~ 39V	T_J=25°C	-	95	480	mV
		V_I=29V ~ 39V		-	78	400	
Load Regulation	$\triangle V_{O(\triangle IL)}$	I_O=1mA ~ 100mA	T_J=25°C	-	41	240	mV
		I_O=1mA ~ 40mA		-	28	120	
Quiescent Current	I_{QC}		T_J=25°C	-	4.8	6.5	mA
Quiescent Current Change	$\triangle I_{QC}$	V_I=28V ~ 39V		-	-	1.5	mA
		I_O=1mA ~ 40mA		-	-	0.1	
Dropout Voltage	V_{DROP}		T_J=25°C	-	1.7	-	V
Ripple Rejection	RR	V_I=27.5V ~ 37.5V, f=120Hz		30	33	-	dB

* Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33 ㎌ capacitor across the input and a 0.1 ㎌ capacitor across the output.

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

Electrical Characteristics Curve

Fig.1 V_O vs. T_J

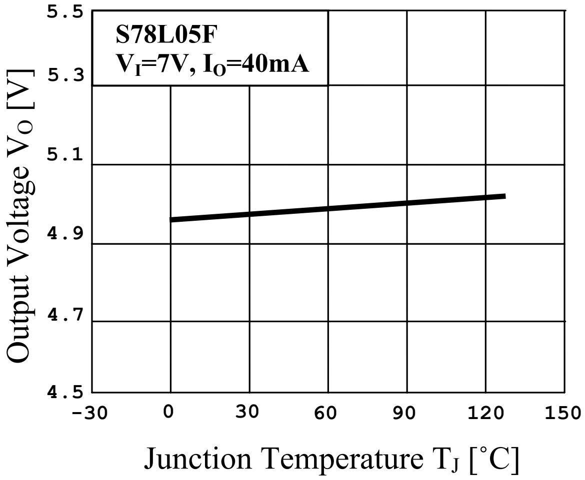


Fig.2 I_{QC} vs. T_J

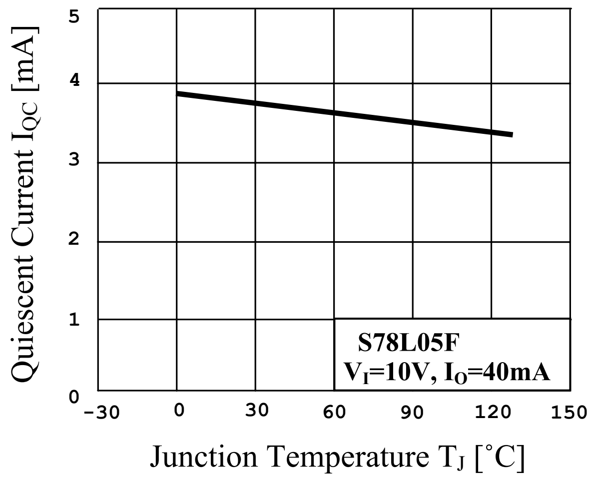


Fig.3 V_O vs. I_O

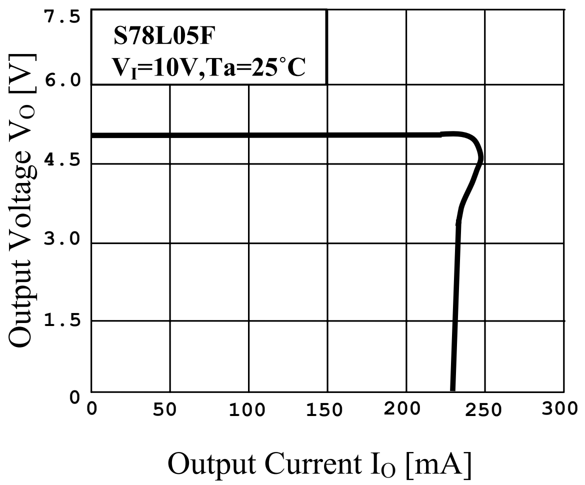


Fig.4 V_O vs. V_I

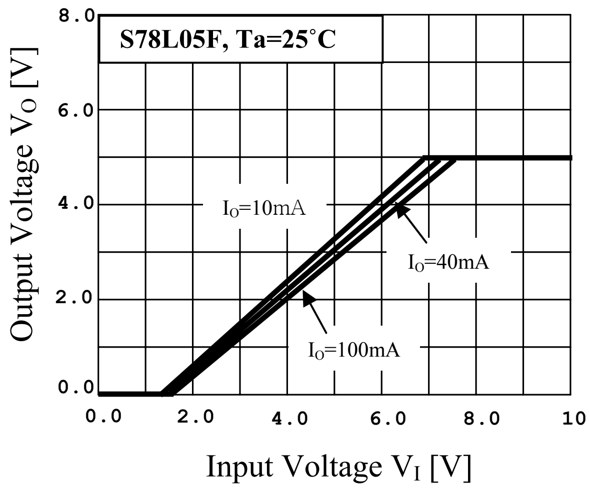


Fig.5 I_{QC} vs. V_I

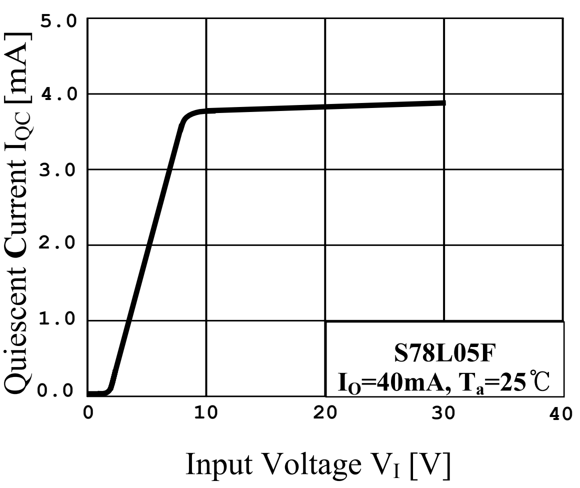
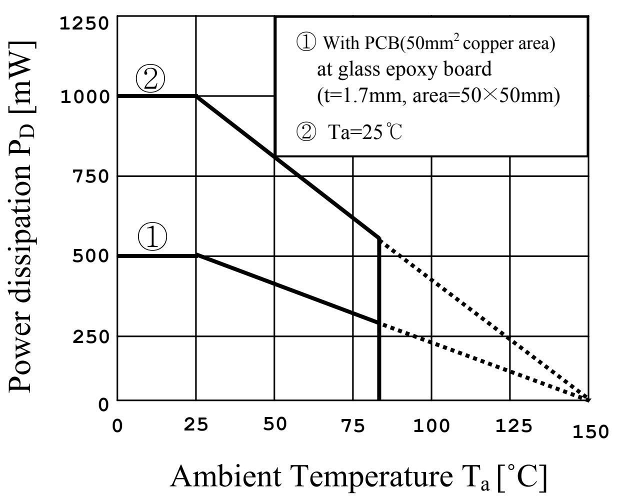


Fig.6 P_D vs T_a



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