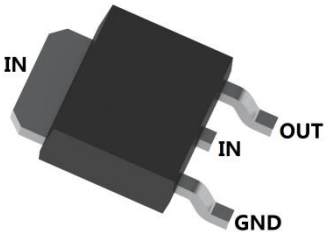
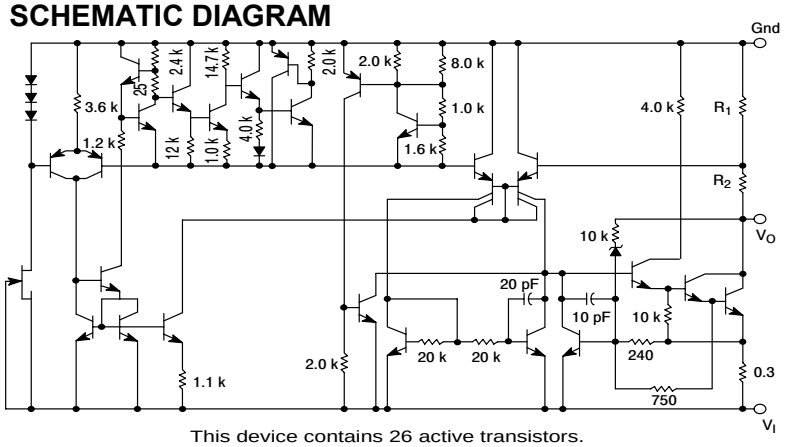
PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

FEATURES

- Maximum Output Current I_O: 0.5A
- Output Voltage V_O: -5,-6,-8,-9,-10,-12,-15,-18,-20,-24 V
- Continuous Total Dissipation
  P_D: 1.25 W (Ta= 25 ℃)
- Surface Mount device

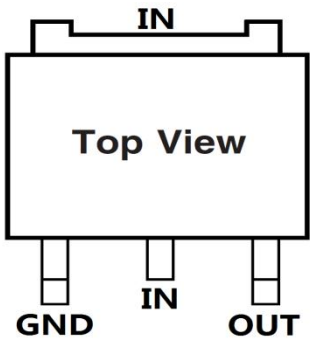


SCHEMATIC DIAGRAM



This device contains 26 active transistors.

TO-252



MECHANICAL DATA

- Case: TO-252
- Case Material: Molded Plastic. UL flammability
- Classification Rating: 94V-0
- Weight: 0.055 grams (approximate)

MAXIMUM RATINGS (Operating temperature range applies unless otherwise specified)

Parameter		Symbol	Value	Unit
Input Voltage	V_O=-5~-18V	V_i	-35	V
	V_O=-20~-24V		-40	V
Total Dissipation		P_D	Internally Limited	W
Thermal Resistance from Junction to Ambient		$R_{\theta JA}$	65	°C/W
Thermal Resistance from Junction to Case		$R_{\theta Jc}$	5.0	°C/W
Operating Temperature		T_{opr}	0~+125	°C
Storage Temperature Range		T_{STG}	-65 ~+125	°C

TEST CIRCUIT(Typical Applications)

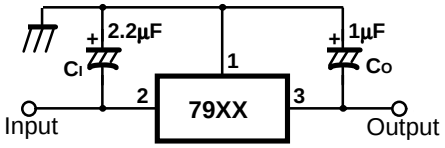
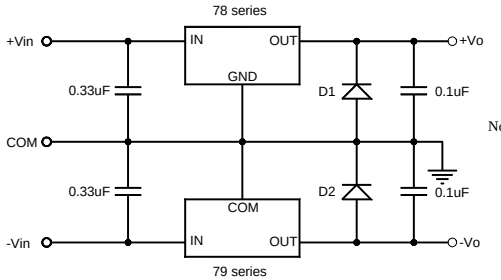


Figure 1.Negative Fixed output regulator



Note : In the above positive and negative power supply application, D1 and D2 should be connected. If D1 and D2 are not connected, either of positive or negative power supply circuit may not turns on.

Figure 2.Positive/Negative Voltage Supply

Notes:

(1) To specify an output voltage, substitute voltage value for "XX "

(2) Required for stability. For value given, capacitor must be solid tantalum. If aluminium electronics are used, at least ten times value shown should be selected. CI is required if regulator is located an appreciable distance from power supply filter.

(3) To improve transient response. If large capacitors are used, a high current diode from input to output (1N400I or similar) should be introduced to protect the device from momentary input short circuit.

PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

ELECTRICAL CHARACTERISTICS OF 7905 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE

(Vi=-10V,Io=-500mA,Ci=2.2uF,Co=1uF,0°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	-4.80	-5.0	-5.20	V	T_J=+25°C
		-4.75	-5.0	-5.25	V	-8V≤V_i≤-20V,I_O=5mA~1A,P_O≤ 15W
Line regulation(NOTE1)	ΔV_O			100	mV	-7V≤V_i≤-25V,T_J=+25°C
				50	mV	-8V≤V_i≤-12V,T_J=+25°C
Load Regulation(NOTE1)	ΔV_O			100	mV	I_O=5mA~1.5A,T_J=+25°C
				50	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			3	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1.3	mA	-8V≤V_i≤-25V
				0.5	mA	5mA≤I_O≤1A
Output Noise Voltage	V_N		100		μV	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	54	60		dB	ΔV_i=10V,f=120Hz
Dropout Voltage	V_D		1.4		V	T_J=+25°C,I_O=1A,ΔV_O=100mV
Short Circuit Current	I_{sc}		2.1		A	
Peak Current	I_{pk}		2.5		A	T_J=+25°C
Temperature Coefficient of V_D	$\Delta V_O/\Delta T$		-0.4		mV/°C	I_O=5mA

Note:1. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

ELECTRICAL CHARACTERISTICS OF 7906 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE

(Vi=-11V,Io=-500mA,Ci=2.2uF,Co=1uF,0°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	-5.75	-6.0	-6.25	V	T_J=+25°C
		-5.7	-6.0	-6.3	V	-9.5V≤V_i≤-21.5V,I_O=5mA~1A,P_O≤ 15W
Line regulation(NOTE1)	ΔV_O			120	mV	-8.5V≤V_i≤-25V
				60	mV	-9V≤V_i≤-15V,T_J=+25°C
Load Regulation(NOTE1)	ΔV_O			120	mV	I_O=5mA~1.5A,T_J=+25°C
				60	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			3	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1.3	mA	-9.5V≤V_i≤-25V
				0.5	mA	5mA≤I_O≤1A
Output Noise Voltage	V_N		144		μV	10Hz≤f≤100kHz,T_A=+25°C
Ripple Rejection	RR	54	60		dB	ΔV_i=10V,f=120Hz,
Dropout Voltage	V_d		1.4		V	T_J=+25°C,I_O=1A,ΔV_O=100mV
Short Circuit Current	I_{sc}		2		A	
Peak Current	I_{pk}		2.5		A	T_J=+25°C
Temperature Coefficient of V_D	$\Delta V_O/\Delta T$		-0.6		mV/°C	I_O=5mA

Note:1. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

ELECTRICAL CHARACTERISTICS OF 7908 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE
(Vi=-14V,Io=500mA,Ci=2.2uF,Co=1uF,0°C≤TJ≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	-7.7	-8.0	-8.3	V	T_J=+25°C
		-7.6	-8.0	-8.4	V	-11.5V≤V_i≤-23V,I_O=5mA~1A,P_O≤ 15W
Line regulation(NOTE1)	ΔV_O			160	mV	-10.5V≤V_i≤-25V,T_J=+25°C
				80	mV	-11V≤V_i≤-17V,T_J=+25°C
Load Regulation(NOTE1)	ΔV_O			160	mV	I_O=5mA~1.5A,T_J=+25°C
				80	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			3	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1.3	mA	-11.5V≤V_i≤-25V
				0.5	mA	5mA≤I_O≤1A
Output Noise Voltage	V_N		175		μV	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	54	60		dB	ΔV_i=10V,f=120Hz
Dropout Voltage	V_d		1.1		V	I_O=1A,ΔV_O=100mV,T_J=+25°C
Short Circuit Current	I_{sc}		1.5		A	
Peak Current	I_{pk}		2.5		A	T_J=+25°C
Temperature Coefficient of V_D	$\Delta V_O/\Delta T$		-0.6		mV/°C	I_O=5mA

Note:1. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

ELECTRICAL CHARACTERISTICS OF 7909 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE
(Vi=-15V,Io=500mA,Ci=2.2uF,Co=1uF,0°C≤TJ≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	-8.7	-9.0	-9.3	V	T_J=+25°C
		-8.6	-9.0	-9.4	V	-11.5V≤V_i≤-24V,I_O=5mA~1A,P_O≤ 15W
Line regulation(NOTE1)	ΔV_O			180	mV	-11.5V≤V_i≤-26V,T_J=+25°C
				90	mV	-13V≤V_i≤-19V,T_J=+25°C
Load Regulation(NOTE1)	ΔV_O			180	mV	I_O=5mA~1.5A,T_J=+25°C
				90	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			3	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1.3	mA	-11.5V≤V_i≤-26V
				0.5	mA	5mA≤I_O≤1A
Output Noise Voltage	V_N		175		μV	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	54	60		dB	ΔV_i=10V,f=120Hz
Dropout Voltage	V_D		1.1		V	I_O=1A,ΔV_O=100mV,T_J=+25°C
Short Circuit Current	I_{sc}		1.5		A	
Peak Current	I_{pk}		2.5		A	T_J=+25°C
Temperature Coefficient of V_D	$\Delta V_O/\Delta T$		-0.6		mV/°C	I_O=5mA

Note:1. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

ELECTRICAL CHARACTERISTICS OF 7910 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE
(Vi=-17V,Io=500mA,Ci=2.2uF,Co=1uF,0°C≤TJ≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	-9.6	-10	-10.4	V	T_J=+25°C
		-9.5	-10	-10.5	V	-12V≤V_i≤-28V,I_O=5mA~1A,P_O≤ 15W
Line regulation(NOTE1)	ΔV_O			200	mV	-12.5V≤V_i≤-28V,T_J=+25°C
				100	mV	-14V≤V_i≤-20V,T_J=+25°C
Load Regulation(NOTE1)	ΔV_O			200	mV	I_O=5mA~1.5A,T_J=+25°C
				100	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			3	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1	mA	-12.5V≤V_i≤-28V,T_J=+25°C
				0.5	mA	5mA≤I_O≤1A,T_J=+25°C
Output Noise Voltage	V_N		280		μV	10Hz≤f≤100kHz,T_A=+25°C
Ripple Rejection	RR	54	60		dB	ΔV_i=10V,f=120Hz
Dropout Voltage	V_D		1.1		V	I_O=1A,ΔV_O=100mV,T_J=+25°C
Short Circuit Current	I_{sc}		1.5		A	
Peak Current	I_{pk}		2.5		A	T_J=+25°C
Temperature Coefficient of V_D	$\Delta V_O/\Delta T$		-0.8		mV/°C	I_O=5mA

Note:1. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

ELECTRICAL CHARACTERISTICS OF 7912 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE
(Vi=-19V,Io=500mA,Ci=2.2uF,Co=1uF,0°C≤TJ≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	-11.5	-12	-12.5	V	T_J=+25°C
		-11.4	-12	-12.6	V	-15.5V≤V_i≤-27V,I_O=5mA~1A,P_O≤ 15W
Line regulation(NOTE1)	ΔV_O			240	mV	-14.5V≤V_i≤-30V,T_J=+25°C
				120	mV	-16V≤V_i≤-22V,T_J=+25°C
Load Regulation(NOTE1)	ΔV_O			240	mV	I_O=5mA~1.5A,T_J=+25°C
				120	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			3	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1	mA	-15V≤V_i≤-30V
				0.5	mA	5mA≤I_O≤1A
Output Noise Voltage	V_N		200		μV	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	54	60		dB	ΔV_i=10V,f=120Hz
Dropout Voltage	V_d		1.1		V	I_O=1A,ΔV_O=100mV,T_J=+25°C
Short Circuit Current	I_{sc}		1.5		A	
Peak Current	I_{pk}		2.5		A	T_J=+25°C
Temperature Coefficient of V_D	$\Delta V_O/\Delta T$		-0.8		mV/°C	I_O=5mA

Note:1. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

ELECTRICAL CHARACTERISTICS OF 7915 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE
(Vi=-23V,Io=500mA,Ci=2.2uF,Co=1uF, 0°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	-14.4	-15	-15.6	V	T_J=+25°C
		-14.3	-15	-15.7	V	-18.5V≤V_i≤-30V,I_O=5mA~1A,P_O≤ 15W
Line regulation(NOTE1)	ΔV_O			300	mV	-17.5V≤V_i≤-30V,T_J=+25°C
				150	mV	-20V≤V_i≤-26V,T_J=+25°C
Load Regulation(NOTE1)	ΔV_O			300	mV	I_O=5mA~1.5A,T_J=+25°C
				150	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			3	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1	mA	-18.5V≤V_i≤-30V
				0.5	mA	5mA≤I_O≤1A
Output Noise Voltage	V_N		250		μV	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	54	60		dB	ΔV_i=10V,f=120Hz
Dropout Voltage	V_d		1.1		V	I_O=1A,ΔV_O=100mV,T_J=+25°C
Short Circuit Current	I_{sc}		1.3		A	
Peak Current	I_{pk}		2.2		A	T_J=+25°C
Temperature Coefficient of V_D	$\Delta V_O/\Delta T$		-0.9		mV/°C	I_O=5mA

Note:1. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

ELECTRICAL CHARACTERISTICS OF 7918 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE
(Vi=-27V,Io=500mA,Ci=2.2uF,Co=1uF, 0°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	-17.3	-18	-18.7	V	T_J=+25°C
		-17.1	-18	-18.9	V	-22V≤V_i≤-33V,I_O=5mA~1A,P_O≤ 15W
Line regulation(NOTE1)	ΔV_O			360	mV	-21V≤V_i≤-33V,T_J=+25°C
				180	mV	-24V≤V_i≤-30V,T_J=+25°C
Load Regulation(NOTE1)	ΔV_O			360	mV	I_O=5mA~1.5A,T_J=+25°C
				180	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			3	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1	mA	-22V≤V_i≤-33V
				0.5	mA	5mA≤I_O≤1A
Output Noise Voltage	V_N		300		μV	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	54	60		dB	ΔV_i=10V,f=120Hz
Dropout Voltage	V_d		1.1		V	I_O=1A,ΔV_O=100mV,T_J=+25°C
Short Circuit Current	I_{sc}		1.1		A	
Peak Current	I_{pk}		2.2		A	T_J=+25°C
Temperature Coefficient of V_D	$\Delta V_O/\Delta T$		-1		mV/°C	I_O=5mA

Note:1. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

ELECTRICAL CHARACTERISTICS OF 7920 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE
(Vi=-29V,Io=500mA,Ci=2.2uF,Co=1uF,0°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	-19.2	-20	-20.8	V	T_J=+25°C
		-19.0	-20	-21.0	V	-24V≤V_i≤-35V,I_O=5mA~1A,P_O≤ 15W
Line regulation(NOTE1)	ΔV_O			400	mV	-23V≤V_i≤-35V,T_J=+25°C
				200	mV	-26V≤V_i≤-32V,T_J=+25°C
Load Regulation(NOTE1)	ΔV_O			400	mV	I_O=5mA~1.5A,T_J=+25°C
				200	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			3	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1	mA	-24V≤V_i≤-35V
				0.5	mA	5mA≤I_O≤1A
Output Noise Voltage	V_N		350		μV	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	54	60		dB	ΔV_i=10V,f=120Hz
Dropout Voltage	V_D		1.1		V	I_O=1A,ΔV_O=100mV,T_J=+25°C
Short Circuit Current	I_{sc}		0.9		A	
Peak Current	I_{pk}		2.5		A	T_J=+25°C
Temperature Coefficient of V_D	$\Delta V_O/\Delta T$		-1.1		mV/°C	I_O=5mA

Note:1. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

ELECTRICAL CHARACTERISTICS OF 7924 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE
(Vi=-33V,Io=500mA,Ci=2.2uF,Co=1uF, 0°C≤T_J≤+125°C unless otherwise specified)

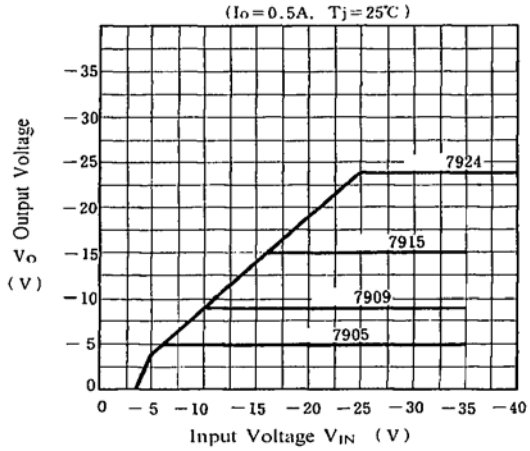
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	-23.0	-24	-25.0	V	T_J=+25°C
		-22.8	-24	-25.2	V	-27V≤V_i≤-38V,I_O=5mA~1A,P_O≤ 15W
Line regulation(NOTE1)	ΔV_O			480	mV	-27V≤V_i≤-38V,T_J=+25°C
				180	mV	-30V≤V_i≤-36V,T_J=+25°C
Load Regulation(NOTE1)	ΔV_O			480	mV	I_O=5mA~1.5A,T_J=+25°C
				240	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			3	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1	mA	-27V≤V_i≤-38V
				0.5	mA	5mA≤I_O≤1A
Output Noise Voltage	V_N		400		μV	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	54	60		dB	ΔV_i=10V,f=120Hz,
Dropout Voltage	V_D		1.1		V	I_O=1A,ΔV_O=100mV,T_J=+25°C
Short Circuit Current	I_{sc}		1.1		A	
Peak Current	I_{pk}		2.2		A	T_J=+25°C
Temperature Coefficient of V_D	$\Delta V_O/\Delta T$		-1		mV/°C	I_O=5mA

Note:1. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

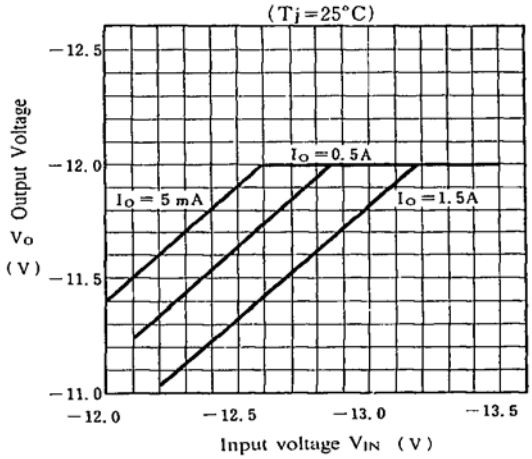
PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

Typical Characteristics

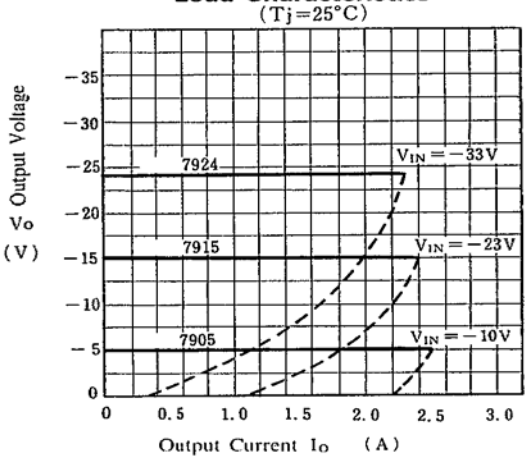
7900 Output Characteristics



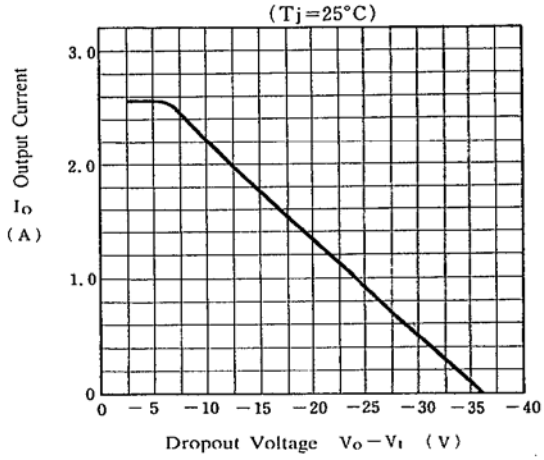
7912 Output Voltage vs. Low Input Voltage



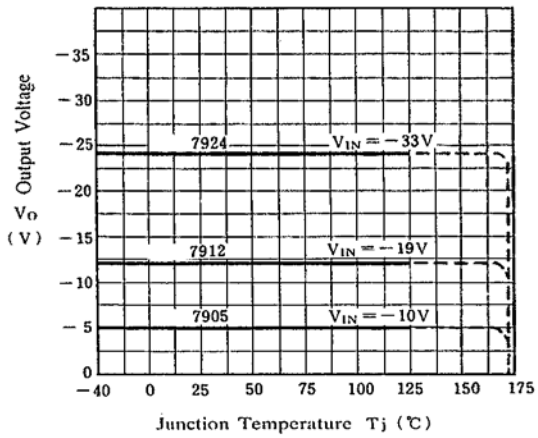
7905/15/24 Load Characteristics



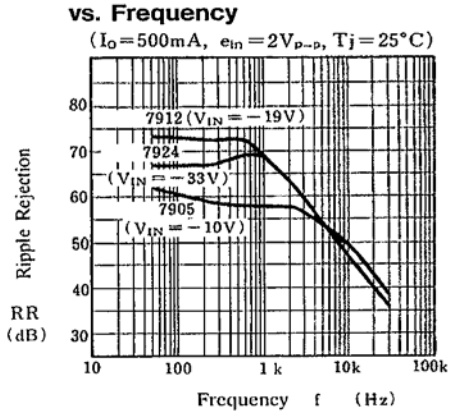
7900 Series Short Circuit Output Current



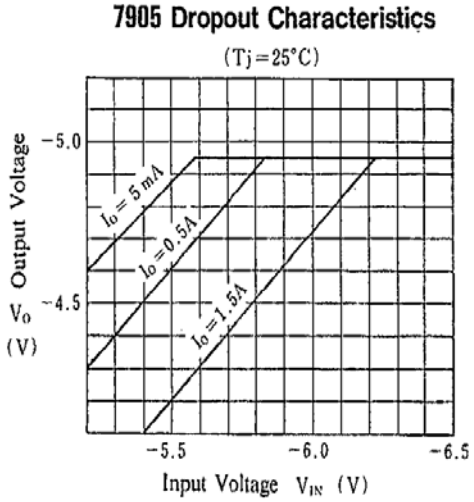
7905/12/24 Output Voltage vs. Junction Temperature

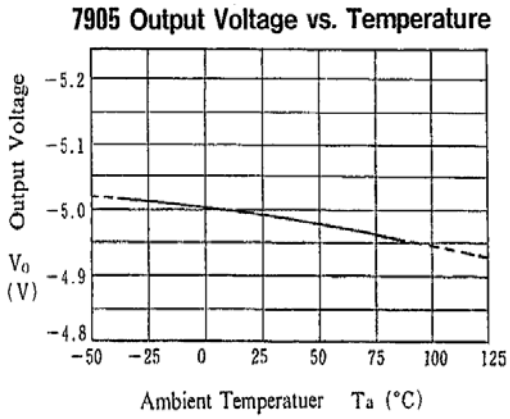


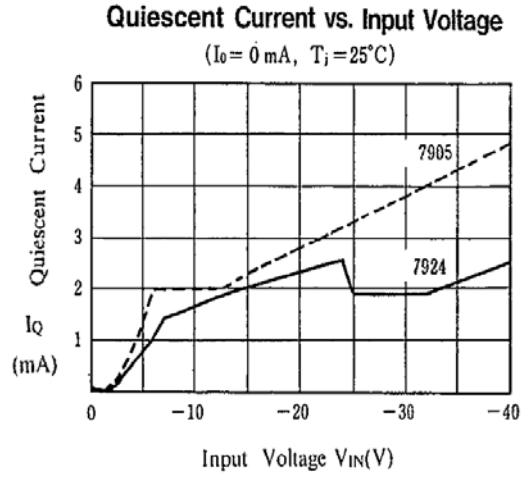
7905/15/24 Ripple Rejection vs. Frequency



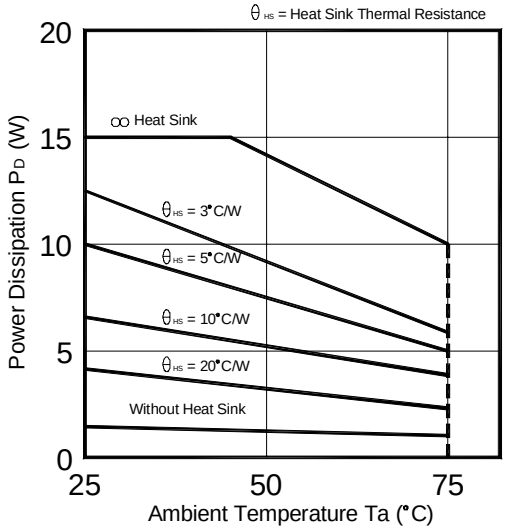
PLASTIC-ENCAPSULATE VOLTAGE REGULATORS





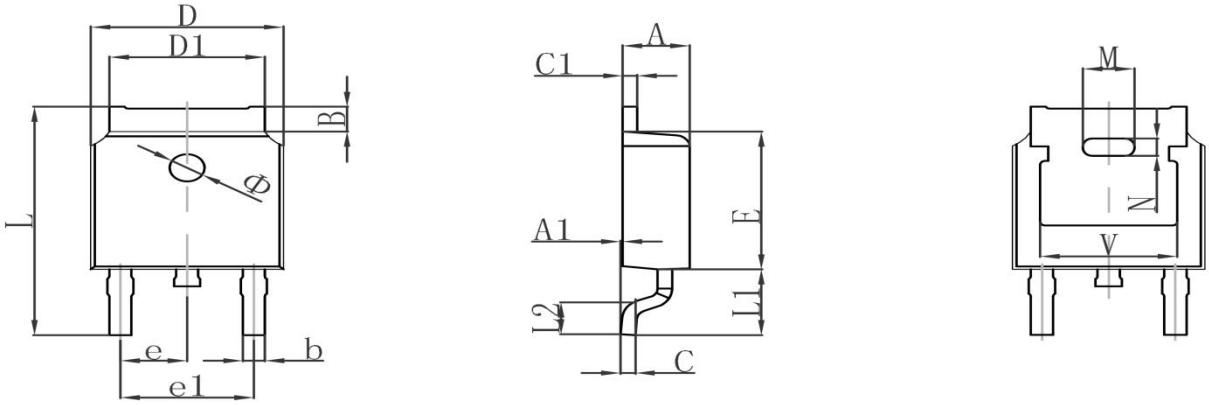


Power Dissipation vs. Ambient Temperature



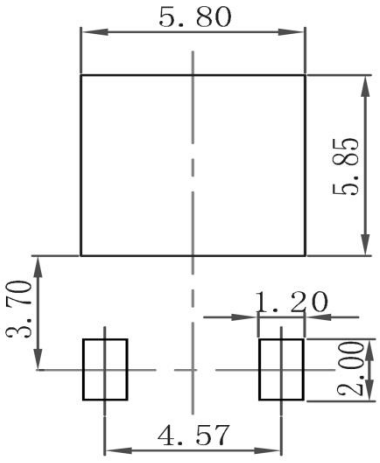
PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

TO-252 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.380	0.087	0.094
A1	0.000	0.100	0.000	0.004
B	0.800	1.400	0.031	0.055
b	0.710	0.810	0.028	0.032
c	0.460	0.560	0.018	0.022
c1	0.460	0.560	0.018	0.022
D	6.500	6.700	0.256	0.264
D1	5.130	5.460	0.202	0.215
E	6.000	6.200	0.236	0.244
e	2.286TYP		0.090TYP	
e1	4.327	4.727	0.170	0.186
M	1.778REF		0.070REF	
N	0.762REF		0.018REF	
L	9.800	10.400	0.386	0.409
L1	2.9REF		0.114REF	
L2	1.400	1.700	0.055	0.067
V	4.830REF		0.190REF	
Φ	1.100	1.300	0.043	0.051

TO-252 Suggested Pad Layout



Note:

1.Controlling dimension: in millimeters

2.General tolerance: ±0.05mm

3.The pad layout is for reference purposes only