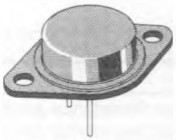
SGS-THOMSON MICROELECTRONICS

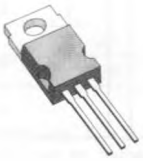
L7900 SERIES

NEGATIVE VOLTAGE REGULATORS

- OUTPUT CURRENT UP TO 1.5A
- OUTPUT VOLTAGES OF – 5 ; – 5.2 ; – 8 ; – 12 ; – 15 ; –18 ; – 20 ; – 22 ; – 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SOA PROTECTION



TO-3



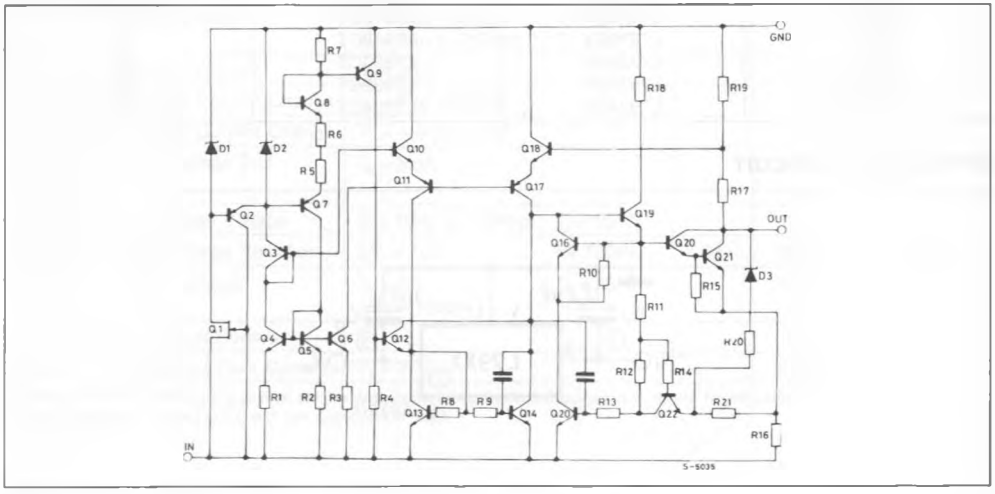
TO-220

DESCRIPTION

The L7900 series of three-terminal negative regulators is available in TO-220 and TO-3 packages and with several output voltages. They can provide local on-card regulation, eliminating the distribution problems associated with single point regulation ; furthermore, having the same voltage options as the L7800 positive standard series, they are particularly suited for split power supplies. In addition, the –5.2V is also available for ECL system.

If adeguate heatsinking is provided, the L7900 series can deliver an output current in excess of 1.5A. Although designed primarly as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

SCHEMATIC DIAGRAM



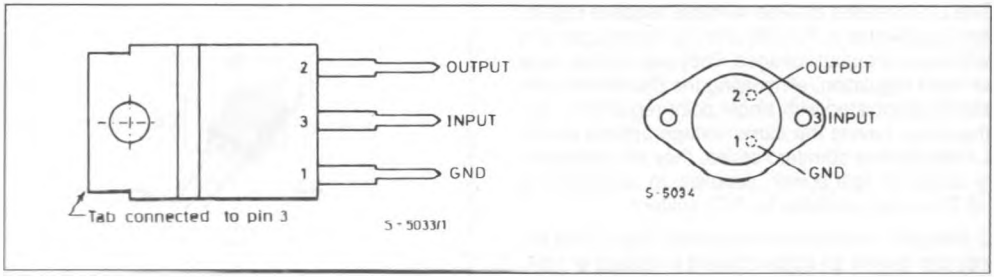
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_i	DC Input Voltage (for V_o = – 5 to – 18V) (for V_o = – 20, – 24V)	– 35 – 40	V V
I_o	Output Current	Internally limited	
P_{tot}	Total Power Dissipation	Internally limited	
T_{op}	Operating Junction Temperature	0 to + 150	°C
T_{stg}	Storage Temperature	– 65 to + 150	°C

THERMAL DATA

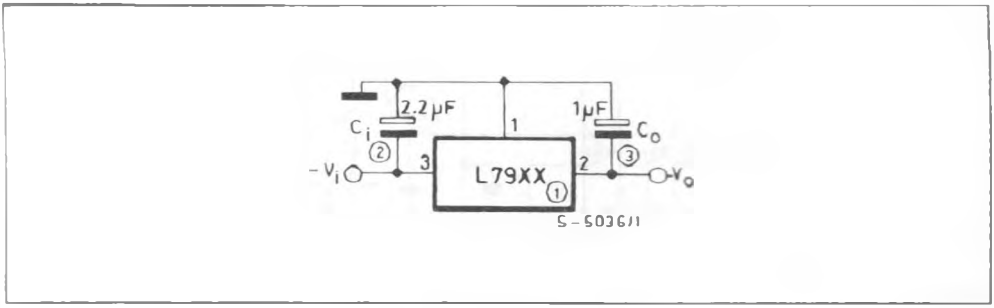
			TO-220	TO-3	
$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case	Max	3	4	°C/W
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max	50	35	°C/W

CONNECTION DIAGRAM AND ORDERING NUMBERS (top views)



Type	TO-220	TO-3	Output Voltage
L7905C	L7905CV	L7905CT	– 5V
L7952C	L7952CV	L7952CT	– 5.2V
L7908C	L7908CV	L7908CT	– 8V
L7912C	L7912CV	L7912CT	– 12V
L7915C	L7915CV	L7915CT	– 15V
L7918C	L7918CV	L7918CT	– 18V
L7920C	L7920CV	L7920CT	– 20V
L7922C	L7922CV	L7922CT	– 22V
L7924C	L7924CV	L7924CT	– 24V

APPLICATION CIRCUIT



ELECTRICAL CHARACTERISTICS FOR L7905C (refer to the test circuits, T_j = 0 to 150°C V_i = – 10V, I_o = 500mA, C_i = 2.2µF, C_o = 1µF unless otherwise specified)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25°C		– 4.8	– 5	– 5.2	V
V_o	Output Voltage	I_o = – 5mA to – 1A V_i = – 8 to – 20V	$P_o \leq$ 15W	– 4.75	– 5	– 5.25	V
ΔV_o*	Line Regulation	V_i = – 7 to – 25V V_i = – 8 to – 12V	T_j = 25°C T_j = 25°C			100 50	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500mA I_o = 250 to 750mA	T_j = 25°C T_j = 25°C			100 50	mV mV
I_d	Quiescent Current	T_j = 25°C				2	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000mA				0.5	mA
ΔI_d	Quiescent Current Change	V_i = – 8 to – 25V				1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5mA			– 0.4		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz	T_j = 25°C		100		µV/V_o
SVR	Supply Voltage Rejection	ΔV_i = 10V	f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1A ΔV_o = 100mV	T_j = 25°C		2		V
I_{sc}	Short Circuit Current				2.1		A
I_{scp}	Short Circuit Peak Current	T_j = 25°C			2.5		A

ELECTRICAL CHARACTERISTICS FOR L7952C (refer to the test circuits, T_j = 0 to 150°C V_i = – 10V, I_o = 500mA, C_i = 2.2µF, C_o = 1µF unless otherwise specified)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25°C		– 5	– 5.2	– 5.4	V
V_o	Output Voltage	I_o = – 5mA to – 1A V_i = – 8 to – 21V	$P_o \leq$ 15W	– 4.95	– 5.2	– 5.45	V
ΔV_o*	Line Regulation	V_i = – 8 to – 25V V_i = – 9 to – 19V	T_j = 25°C T_j = 25°C			105 52	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500mA I_o = 250 to 750mA	T_j = 25°C T_j = 25°C			105 52	mV mV
I_d	Quiescent Current	T_j = 25°C				2	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000mA				0.5	mA
ΔI_d	Quiescent Current Change	V_i = – 9 to – 25V				1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5mA			– 0.5		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz	T_j = 25°C		125		µV/V_o
SVR	Supply Voltage Rejection	ΔV_i = 10V	f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1A ΔV_o = 100mV	T_j = 25°C		1.8		V
I_{sc}	Short Circuit Current				2		A
I_{scp}	Short Circuit Peak Current	T_j = 25°C			2.5		A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7908C (refer to the test circuits, T_j = 0 to 150°C V_i = – 14V, I_o = 500mA, C_i = 2.2µF, C_o = 1µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25°C	– 7.7	– 8	– 8.3	V
V_o	Output Voltage	I_o = – 5mA to – 1A $P_o \leq$ 15W V_i = – 11.5 to – 23V	– 7.6	– 8	– 8.4	V
ΔV_o*	Line Regulation	V_i = – 10.5 to – 25V T_j = 25°C V_i = – 11 to – 17V T_j = 25°C			160 80	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500mA T_j = 25°C I_o = 250 to 750mA T_j = 25°C			160 80	mV mV
I_d	Quiescent Current	T_j = 25°C			2	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = – 11.5 to – 25V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5mA		– 0.6		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25°C		175		µV/V_o
SVR	Supply Voltage Rejection	ΔV_i = 10V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1A T_j = 25°C ΔV_o = 100mV		1.1		V
I_{sc}	Short Circuit Current			1.5		A
I_{scp}	Short Circuit Peak Current	T_j = 25°C		2.5		A

ELECTRICAL CHARACTERISTICS FOR L7912C (refer to the test circuits, T_j = 0 to 150°C V_i = – 19V, I_o = 500mA, C_i = 2.2µF, C_o = 1µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25°C	– 11.5	– 12	– 12.5	V
V_o	Output Voltage	I_o = – 5mA to – 1A $P_o \leq$ 15W V_i = – 5.5 to – 27V	– 11.4	– 12	– 12.6	V
ΔV_o*	Line Regulation	V_i = – 14.5 to – 30V T_j = 25°C V_i = – 16 to – 22V T_j = 25°C			240 120	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500mA T_j = 25°C I_o = 250 to 750mA T_j = 25°C			240 120	mV mV
I_d	Quiescent Current	T_j = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = – 15 to – 30V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5mA		– 0.8		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25°C		200		µV/V_o
SVR	Supply Voltage Rejection	ΔV_i = 10V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1A T_j = 25°C ΔV_o = 100mV		1.1		V
I_{sc}	Short Circuit Current			1.5		A
I_{scp}	Short Circuit Peak Current	T_j = 25°C		2.5		A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7915C (refer to the test circuits, T_j = 0 to 150°C V_i = – 23V, I_o = 500mA, C_i = 2.2µF, C_o = 1µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25°C	– 14.4	– 15	– 15.6	V
V_o	Output Voltage	I_o = – 5mA to – 1A $P_o \leq$ 15W V_i = – 18.5 to – 30V	– 14.3	– 15	– 15.7	V
ΔV_o*	Line Regulation	V_i = – 17.5 to – 30V T_j = 25°C V_i = – 20 to – 26V T_j = 25°C			300 150	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500mA T_j = 25°C I_o = 250 to 750mA T_j = 25°C			300 150	mV mV
I_d	Quiescent Current	T_j = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = – 18.5 to – 30V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5mA		– 0.9		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25°C		250		µV/V_o
SVR	Supply Voltage Rejection	ΔV_i = 10V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1A T_j = 25°C ΔV_o = 100mV		1.1		V
I_{sc}	Short Circuit Current			1.3		A
I_{scp}	Short Circuit Peak Current	T_j = 25°C		2.2		A

ELECTRICAL CHARACTERISTICS FOR L7918C (refer to the test circuits, T_j = 0 to 150°C V_i = – 27V, I_o = 500mA, C_i = 2.2µF, C_o = 1µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25°C	– 17.3	– 18	– 18.7	V
V_o	Output Voltage	I_o = – 5mA to – 1A $P_o \leq$ 15W V_i = – 22 to – 33V	– 17.1	– 18	– 18.9	V
ΔV_o*	Line Regulation	V_i = – 21 to – 33V T_j = 25°C V_i = – 24 to – 30V T_j = 25°C			360 180	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500mA T_j = 25°C I_o = 250 to 750mA T_j = 25°C			360 180	mV mV
I_d	Quiescent Current	T_j = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = – 22 to – 33V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5mA		– 1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25°C		300		µV/V_o
SVR	Supply Voltage Rejection	ΔV_i = 10V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1A T_j = 25°C ΔV_o = 100mV		1.1		V
I_{sc}	Short Circuit Current			1.1		A
I_{scp}	Short Circuit Peak Current	T_j = 25°C		2.2		A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7920C (refer to the test circuits, T_j = 0 to 150°C V_i = – 29V, I_o = 500mA, C_i = 2.2µF, C_o = 1µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25°C	– 19.2	– 20	– 20.8	V
V_o	Output Voltage	I_o = – 5mA to – 1A $P_o \leq$ 15W V_i = – 24 to – 35V	– 19	– 20	– 21	V
ΔV_o*	Line Regulation	V_i = – 23 to – 35V T_j = 25°C V_i = – 26 to – 32V T_j = 25°C			400 200	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500mA T_j = 25°C I_o = 250 to 750mA T_j = 25°C			400 200	mV mV
I_d	Quiescent Current	T_j = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = – 24 to – 35V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5mA		– 1.1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25°C		350		µV/V_o
SVR	Supply Voltage Rejection	ΔV_i = 10V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1A T_j = 25°C ΔV_o = 100mV		1.1		V
I_{sc}	Short Circuit Current			0.9		A
I_{scp}	Short Circuit Peak Current	T_j = 25°C		2.2		A

ELECTRICAL CHARACTERISTICS FOR L7922C (refer to the test circuits, T_j = 0 to 150°C V_i = – 31V, I_o = 500mA, C_i = 2.2µF, C_o = 1µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25°C	– 21.1	– 22	– 22.9	V
V_o	Output Voltage	I_o = – 5mA to – 1A $P_o \leq$ 15W V_i = – 26 to – 37V	– 20.9	– 22	– 23.1	V
ΔV_o*	Line Regulation	V_i = – 25 to – 37V T_j = 25°C V_i = – 28 to – 34V T_j = 25°C			440 220	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500mA T_j = 25°C I_o = 250 to 750mA T_j = 25°C			440 220	mV mV
I_d	Quiescent Current	T_j = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = – 26 to – 37V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5mA		– 1.1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25°C		375		µV/V_o
SVR	Supply Voltage Rejection	ΔV_i = 10V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1A T_j = 25°C ΔV_o = 100mV		1.1		V
I_{sc}	Short Circuit Current			1.1		A
I_{SCD}	Short Circuit Peak Current	T_j = 25°C		2.2		A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

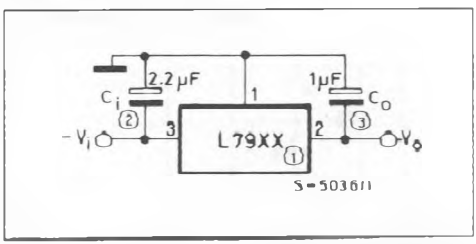
ELECTRICAL CHARACTERISTICS FOR L7924C (refer to the test circuits, T_j = 0 to 150°C V_i = – 33V, I_o = 500mA, C_i = 2.2µF, C_o = 1µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25°C	– 23	– 24	– 25	V
V_o	Output Voltage	I_o = – 5mA to – 1A $P_o \leq$ 15W V_i = – 27 to – 38V	– 22.8	– 24	– 25.2	V
ΔV_o*	Line Regulation	V_i = – 27 to – 38V T_j = 25°C V_i = – 30 to – 36V T_j = 25°C			480 240	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500mA T_j = 25°C I_o = 250 to 750mA T_j = 25°C			480 240	mV mV
I_d	Quiescent Current	T_j = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = – 27 to – 38V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5mA		– 1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25°C		400		µV/V_o
SVR	Supply Voltage Rejection	ΔV_i = 10V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1A T_j = 25°C ΔV_o = 100mV		1.1		V
I_{sc}	Short Circuit Current			1.1		A
I_{scp}	Short Circuit Peak Current	T_j = 25°C		2.2		A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

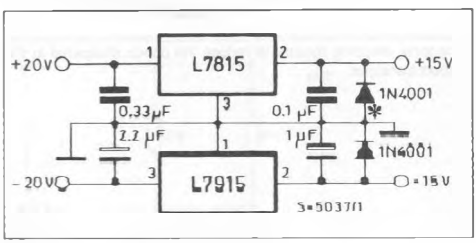
APPLICATION INFORMATION

Figure 1 : Fixed Output Regulator.



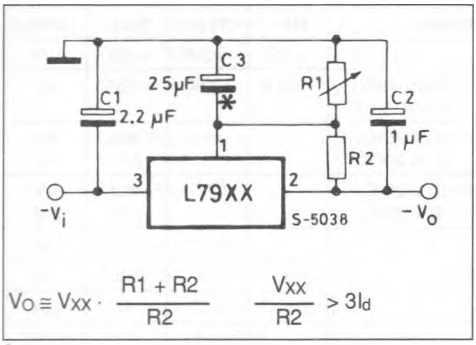
Notes : 1. To specify an output voltage, substitute voltage value for "XX".
2. Required for stability. For value given, capacitor must be solid tantalum. If aluminium electrolities are used, at least ten times value should be selected. C_i is required if regulator is located an appreciable distance from power supply filter.
3. To improve transient response. If large capacitors are used, a high current diode from input to output (1N4001 or similar) should be introduced to protect the device from momentary input short circuit.

Figure 2 : Split Power Supply (± 15V/1A).



* Against potential latch-up problems.

Figure 3 : Circuit for Increasing Output Voltage.



* C3 Optional for improved transient response and ripple rejection.

Figure 4 : High Current Negative Regulator (– 5V/4A with 5A current limiting).

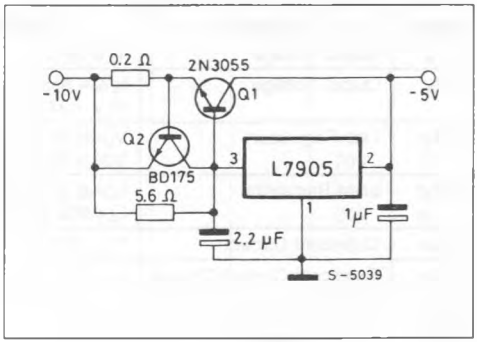
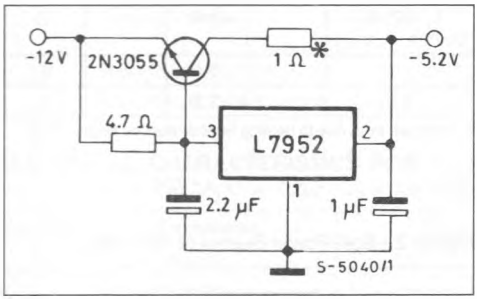


Figure 5 : Typical ECL System Power Supply (– 5.2V/4A).



* Optional dropping resistor to reduce the power dissipated in the boost transistor.