Funktionsbeschreibung der einzelnen Einschübe und Baugruppen

Für diesen Arbeitsauftrag benötigen Sie die folgenden Komponenten:

- Mikrocontroller-Einschub -A1
- Funktionseinschub -A2
- Prüfbaugruppe -A3

Funktionseinschub (-A2)

Auf der Leiterplatte befindet sich eine Refenzspannungserzeugung mit den Spannungen +2,5 V an -A2.MP8 und –9 V an -A2.MP10.

Die beiden äquivalent aufgebauten Schaltungen zur Sinussignalerzeugung bestehen aus einem D/A-Umsetzer -A2.T1 mit den nachgeschalteten Verstärkern -A2.T2.1 und -A2.T2.2. Der Verstärker -A2.T2.1 setzt das Stromausgangssignal des D/A-Umsetzers -A2.T1 in eine Spannung um. Mit -A2.T2.2 wird der Arbeitspunkt symmetrisch um 0 V gelegt. Ein nachgeschalteter Filter -A2.T3.1 mit der Grenzfrequenz 1 kHz glättet das Signal. Die Ausgangsamplitude wird mit -A2.R13 an -A2.MP4 eingestellt.

Prüfbaugruppe (-A3)

Das Gerät überwacht statische und dynamische Eingangssignale. Über drei Leuchtdioden werden die Betriebszustände angezeigt:

-A3.P1 leuchtet obere Toleranzgrenze überschritten
-A3.P2 leuchtet untere Toleranzgrenze unterschritten
-A3.P3 leuchtet innerhalb der Toleranzgrenze

Bei dynamischen Eingangssignalen können je nach Signaltyp die Leuchtdioden beim Über- beziehungsweise Unterschreiten der Toleranzgrenzen proportional zur Eingangsfrequenz blinken. Der Abgleich dieses Überwachungsgeräts wird statisch durchgeführt. Mit den Jumpern -A3.XJ3 und -A3.XJ4 können +2,5 V und 0 V als Eingangssignale für -A3.T1.1 aufgeschaltet werden. Am Messpunkt -A3.MP2 sind negative Spannungen eingestellt. Der Verstärker -A3.T1.2 invertiert die Spannung. Für die nachgeschalteten Komparatoren -A3.T3 und -A3.T4 werden mit -A3.R18 die obere und mit -A3.R21 die untere Schaltgrenze eingestellt.

Beschreibung der Software

Das Hauptprogramm besteht aus einer Endlosschleife und einer Tabelle. In dieser Endlosschleife werden zwei Ausgaben durchgeführt und ein Unterprogramm zweimal aufgerufen.

Die Tabelle besteht aus 256 Einzelwerten. Jeder dieser Einzelwerte steht für einen Punkt der Sinuskurve. Das Programm liest einen Einzelwert aus der Tabelle, gibt ihn aus und merkt sich die nächste Tabellenposition.

Nach einer Wartezeit startet die gleiche Prozedur für das Cosinus-Signal. Auch hier wird die gleiche Tabelle genutzt, jedoch ist der erste Einzelwert bei 45°.

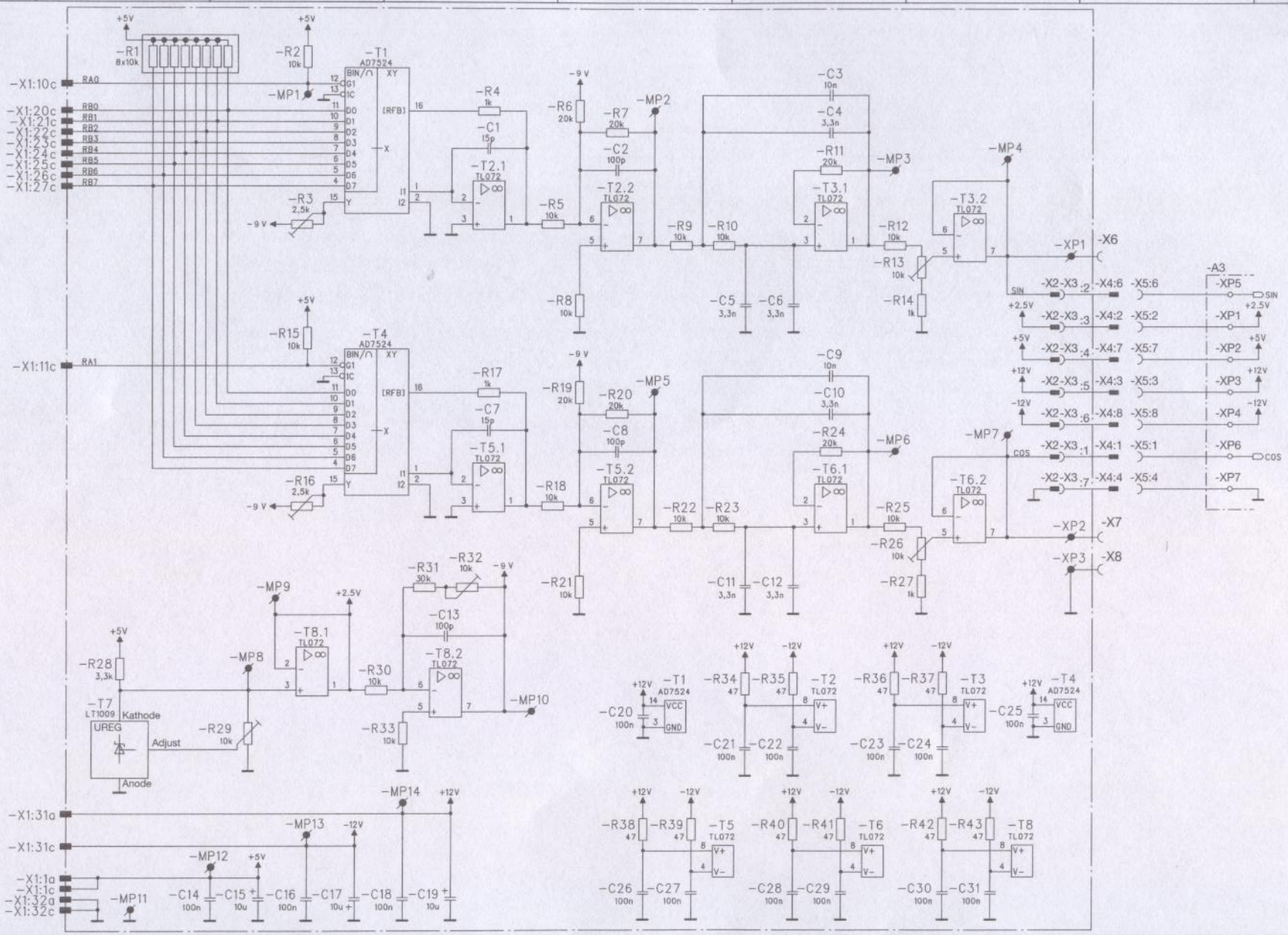
Ist das Ende der Tabelle für eine der Ausgaben erreicht, wird wieder mit dem ersten Tabellenwert gestartet.

Für die Ausgabe wird der Port B als Datenbus genutzt. Mit den Leitungen RA0 und RA1 des Port A sind zwei CS-Signale generiert.

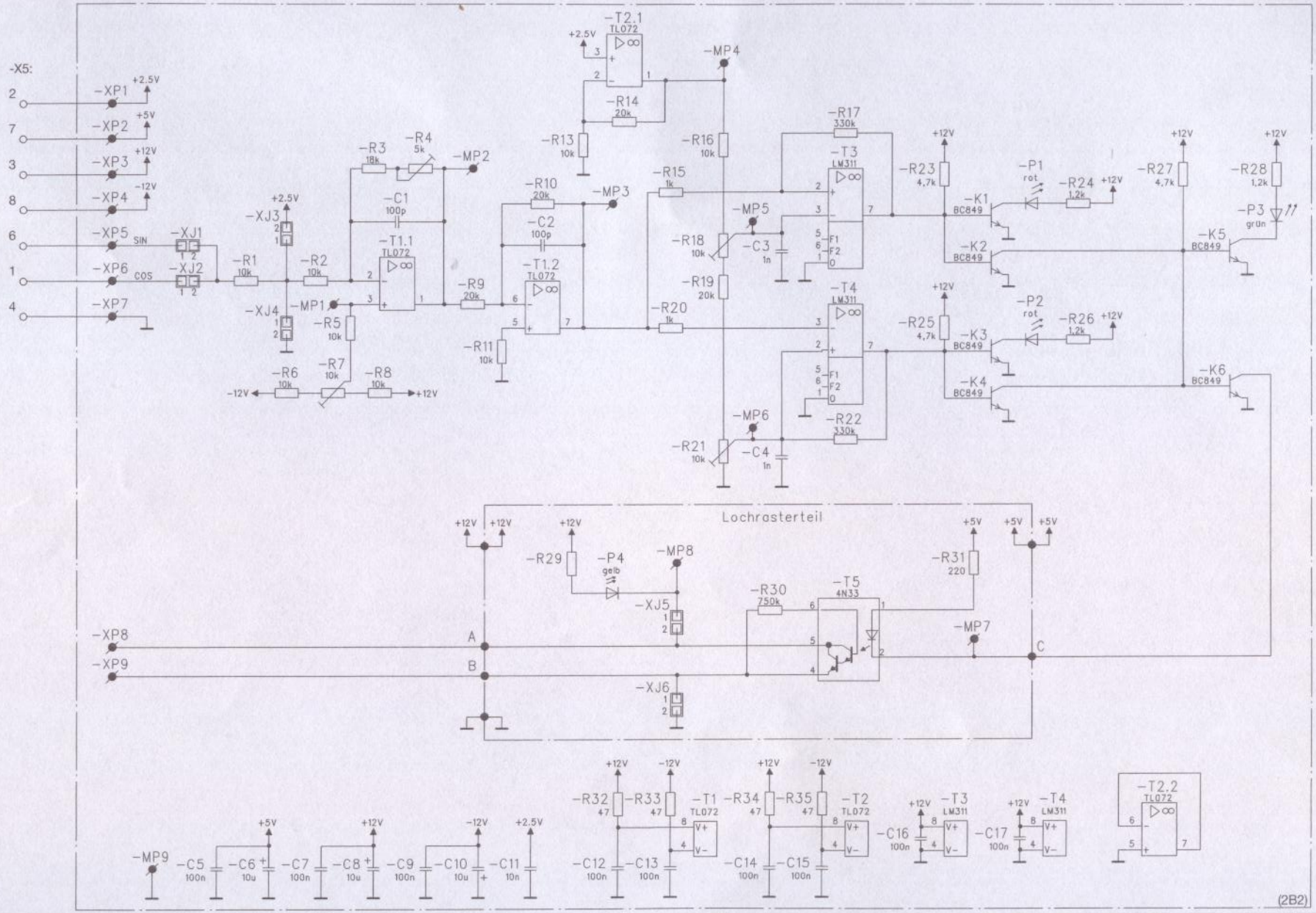
Das Unterprogramm „Warten_1“ ist eine programmierte Warteschleife mit den Variablen WARTE_A, WARTE_M und WARTE_I. Mit diesem Unterprogramm wird die Frequenz des Sinus- und Cosinus-Signals bestimmt.

Am Mikrocontroller-Einschub -A1 leuchten programmbedingt die LEDs B1, B2 und B5 für Port A und die LEDs B6 ... B13 für Port B.

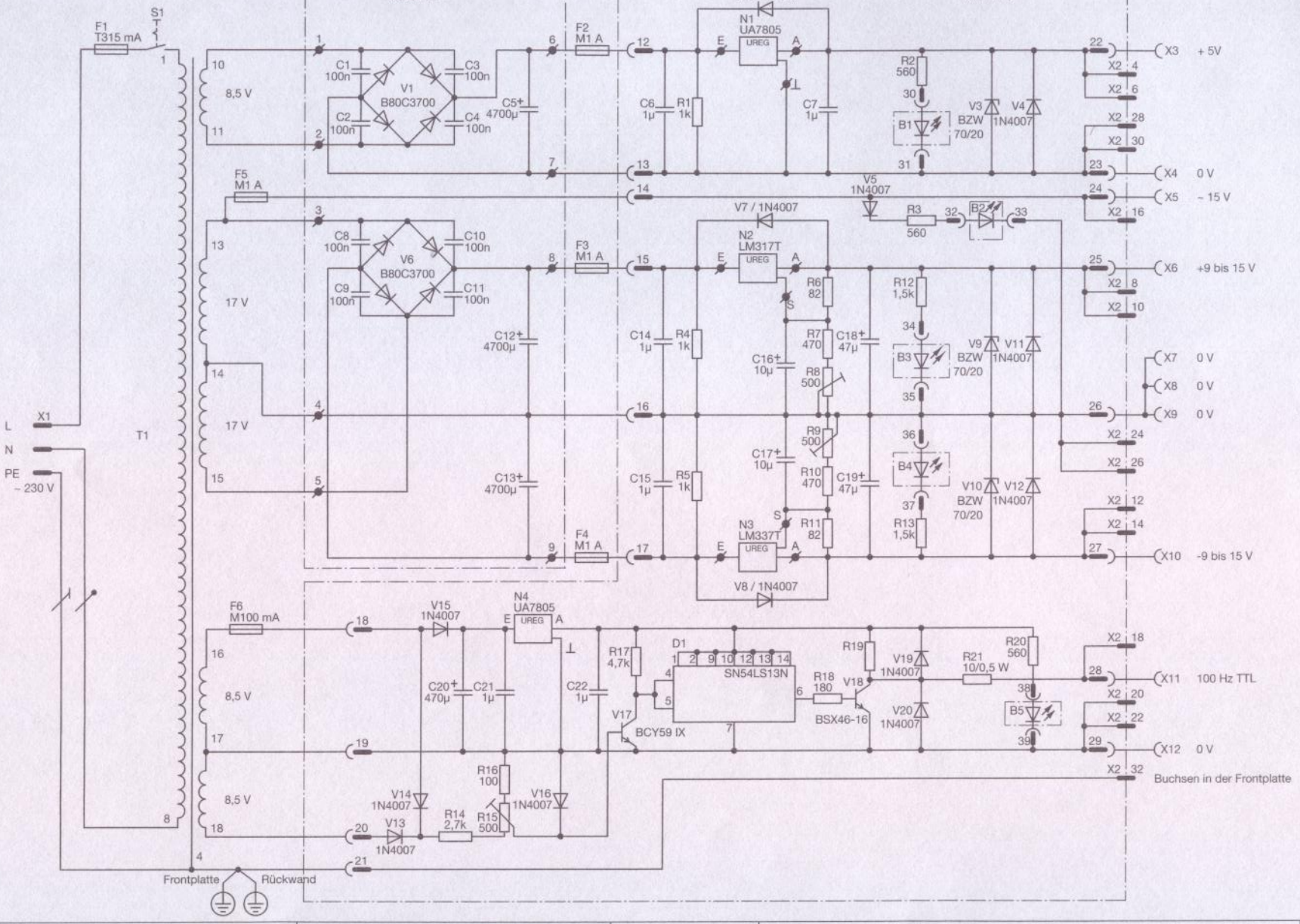
Da B11 ... B13 nicht so oft angesprochen werden, blinken diese Leuchtdioden.



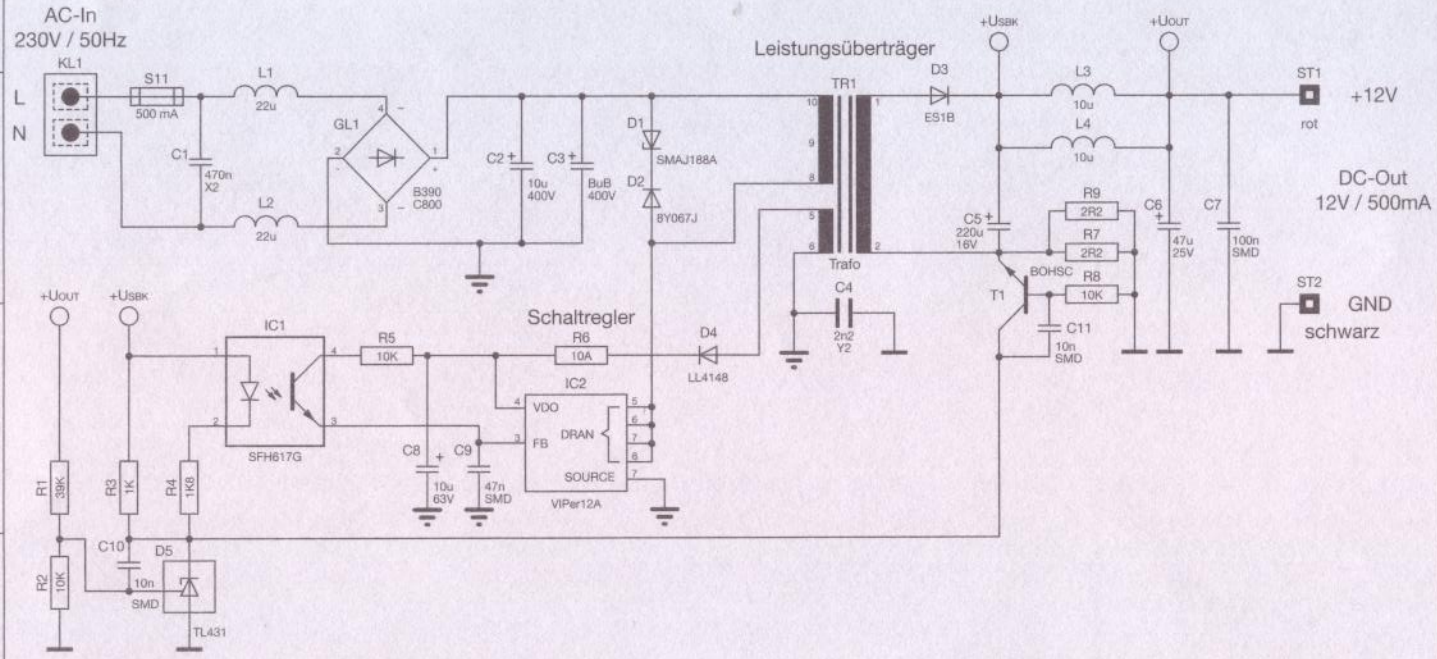
IHK	Abschlussprüfung Teil 2 - Sommer 2010 Elektroniker/-in für Geräte und Systeme Verordnung vom 3. Juli 2003/24. Juli 2007	Systementwurf Teil B Funktionseinschub -A2 Stromlaufplan		Blatt 2



IHK	Abschlussprüfung Teil 2 - Sommer 2010 Elektroniker/-in für Geräte und Systeme Verordnung vom 3. Juli 2003/24. Juli 2007	Systementwurf Teil B Prüfbaugruppe -A3 Stromlaufplan			Blatt 3



IHK	Abschlussprüfung Teil 2 - Sommer 2010 Elektroniker/-in für Geräte und Systeme Verordnung vom 3. Juli 2003/24. Juli 2007	Systementwurf Teil B Stromversorgung IK-88/1 Stromlaufplan			Blatt 4



Technische Daten:	**NT1**	
DC-Ausgang:	12 VDC/500 mA	
Wirkungsgrad:	typ. 75 %	
Eingangsspannung:	90–264 V	
Netzfrequenz:	50 Hz/60 Hz	
Stückliste:	**NT1**	
Widerstand	2,2 Ohm	2 x
Widerstand	1,0 Ohm	1 x
Widerstand	1,0 kOhm	1 x
Widerstand	1,8 kOhm	1 x
Widerstand	10 kOhm	3 x
Widerstand	39 kOhm	1 x
Kondensator	2,2 nF/250 V~	1 x
Kondensator	10 nF	2 x
Kondensator	47 nF	1 x
Kondensator	100 nF	1 x
Kondensator	470 nF/250 V~	1 x
Kondensator	6,8 µF/400 V	1 x
Kondensator	10 µF/63 V	1 x
Kondensator	10 µF/400 V	1 x
Kondensator	47 µF/25 V	1 x
Kondensator	220 µF/16 V	1 x
SFH617-2		1 x
VIPer12A		1 x
BC848C		1 x
SMAJ188A-TR		1 x
BYD57J		1 x
ES1B		1 x
LL4148		1 x
TL431		1 x
B380C800		1 x
SMD-Induktivität, 22µH, 250mA		2 x
SMD-Induktivität, 10µH		2 x
Übertrager CVP11-021, print		1 x
Rundsicherung, 0,5A, träge		1 x
Rund-Sicherungshalter		1 x

IHK	Abschlussprüfung Teil 2 - Sommer 2010 Elektroniker/-in für Geräte und Systeme Verordnung vom 3. Juli 2003/24. Juli 2007	Systementwurf Teil B Stromversorgung NT1 Stromlaufplan		Blatt 5

0.05 µV/ °C max, SINGLE-SUPPLY CMOS OPERATIONAL AMPLIFIERS
Zerø-Drift Series

OPA334, OPA2334
OPA335, OPA2335

FEATURES
LOW OFFSET VOLTAGE: 5 µV (max)
ZERO DRIFT: 0.05 µV/ °C (max)
QUIESCENT CURRENT: 285 µA
SINGLE-SUPPLY OPERATION
SINGLE AND DUAL VERSIONS
SHUTDOWN
MicroSIZE PACKAGES

APPLICATIONS
TRANSDUCER APPLICATIONS
TEMPERATURE MEASUREMENT
ELECTRONIC SCALES
MEDICAL INSTRUMENTATION
BATTERY-POWERED INSTRUMENTS
HANDHELD TEST EQUIPMENT

DESCRIPTION
The OPA334 and OPA335 series of CMOS operational amplifiers use auto-zeroing techniques to simultaneously provide very low offset voltage (5 µV max), and near zero drift over time and temperature. These miniature, high-precision, low quiescent current amplifiers offer high input impedance and rail-to-rail output swing. Single or dual supplies as low as +2.7 V (±1.35 V) and up to +5.5 V (±2.75 V) may be used. These op amps are optimized for low-voltage, single-supply operation.The OPA334 family includes a shutdown mode. Under logic control, the amplifiers can be switched from normal operationto a standby current of 2 µA. When the Enable pin is connected high, the amplifier is active. Connecting Enable low disables the amplifier, and places the output in a high-impedance state.The OPA334 (single version with shutdown) comes in MicroSIZE SOT23-6. The OPA335 (single version without shutdown) is available in SOT23-5, and SO-8. The OPA2334 (dual version with shutdown) comes in MicroSIZE MSOP-10.The OPA2335 (dual version without shutdown) is offered inthe MSOP-8 and SO-8 packages. All versions are specified for operation from –40 °C to +125 °C.

ABSOLUTE MAXIMUM RATINGS (1)

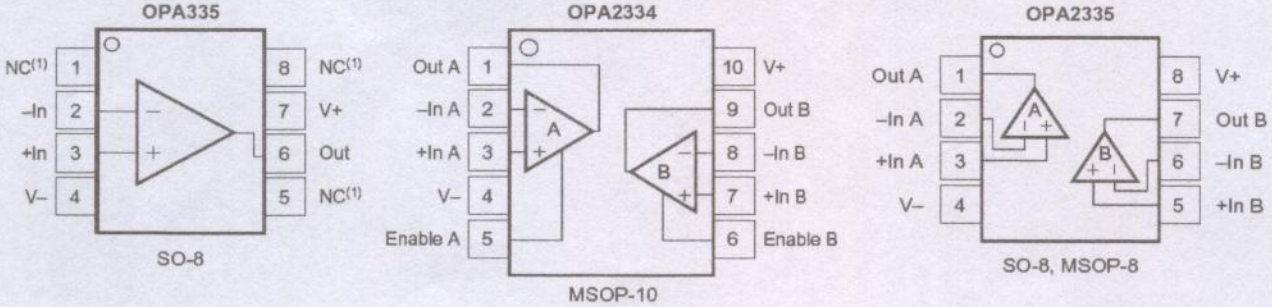
Supply Voltage	+7 V
Signal Input Terminals, Voltage (2)	–0.5 V to (V+) +0.5 V
Current (2)	±10 mA
Output Short Circuit (3)	Continuous
Operating Temperature	–40 °C to +150 °C
Storage Temperature	–65 °C to +150 °C
Junction Temperature	+150 °C
Lead Temperature (soldering, 10 s)	+300 °C

NOTES:
(1) Stres ses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these, or any other conditions beyond those specified, is not implied.
(2) Input terminals are diode-clamped to the power-supplyrails. Input signals that can swing more than 0.5 V beyond the supply railsshould be current-limited to 10 mA or less.
(3) Short-circuit to ground, one amplifier per package.

ELECTROSTATIC DISCHARGE SENSITIVITY
This integrated circuit can be damaged by ESD. We recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of semiconductor products and disclaimers there to appears at the end of this data sheet.

PIN CONFIGURATION



NOTES: (1) NC indicates no internal connection. (2) Pin 1 of the SOT23-6 is determined by orienting the package marking as indicated in the diagram.

 S10 1680/3190 K2-wk-weiß-090210

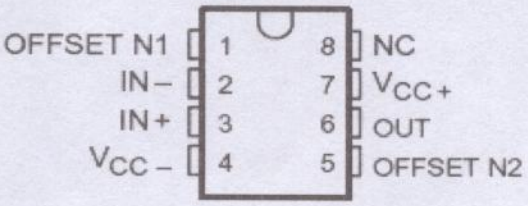
TL071, TL071A, TL071B, TL072, TL072A, TL072B, TL074, TL074A, TL074B
LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

- Low Power Consumption
- Wide Common-Mode and Differential Voltage Ranges
- Low Input Bias and Offset Currents
- Output Short-Circuit Protection
- Low Total Harmonic Distortion 0.003% Typ
- Low Noise Vn = 18 nV/SQR (Hz); Typ at f = 1 kHz
- High Input Impedance . . . JFET Input Stage
- Internal Frequency Compensation
- Latch-Up-Free Operation
- High Slew Rate . . . 13 V/us Typ
- Common-Mode Input Voltage Range Includes VCC+

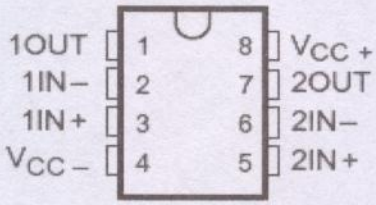
Absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†	
Supply voltage, VCC+ (see Note 1)	18 V
Supply voltage, VCC– (see Note 1)	–18 V
Differential input voltage, VID (see Note 2)	±30 V
Input voltage, VI (see Notes 1 and 3)	±15 V
Duration of output short circuit (see Note 4)	unlimited
Continuous total power dissipation	See Dissip.Rat.Tab.
Operating free-air temperature range, TA:	0 °C to 70 °C
C suffix	–40 °C to 85 °C
I suffix	–55 °C to 125 °C
M suffix	–65 °C to 150 °C
Storage temperature range	260 °C
Case temperature for 60 seconds: FK package	300 °C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: J, JG, or W package	260 °C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D, N, P, or PW package	

Description
The JFET-input operational amplifiers in the TL07_ series are designed as low-noise versions of the TL08_ series amplifiers with low input bias and offset currents and fast slew rate. The low harmonic distortion and low noise make the TL07_ series ideally suited for high-fidelity and audio preamplifier applications. Each amplifier features JFET inputs (for high input impedance) coupled with bipolar output stages integrated on a single monolithic chip. The C-suffix devices are characterized for operation from 0 °C to 70 °C. The I-suffix devices are characterized for operation from –40 °C to 85 °C. The M-suffix devices are characterized for operation over the full military temperature range of –55 °C to 125 °C.

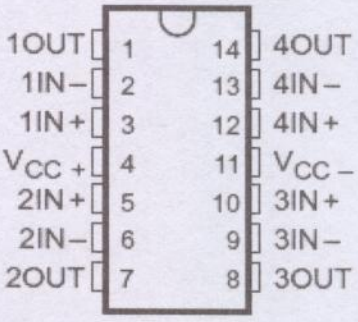
TL071, TL071A, TL071B
D, JG, P, OR PW PACKAGE
(TOP VIEW)



TL072, TL072A, TL072B
D, JG, P, OR PW PACKAGE
(TOP VIEW)



TL074, TL074A, TL074B
D, J, N, OR PW PACKAGE
TL074 . . . W PACKAGE
(TOP VIEW)



† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
NOTES: 1. All voltage values, except differential voltages, are with respect to the midpoint between VCC+ and VCC–.
2. Differential voltages are at IN+ with respect to IN –.
3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 V, whichever is less.
4. The output may be shorted to ground or to either supply. Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded.

electrical characteristics, $V_{CC\pm}$ = ±15 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS†	T_A‡	TL071C TL072C TL074C			TL071AC TL072AC TL074AC			TL071BC TL072BC TL074BC			TL071I TL072I TL074I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_O = 0, R_S = 50 Ω	25°C		3	10		3	6		2	3		3	6	mV
			Full range			13			7.5			5			8	
α_{VIO}	Temperature coefficient of input offset voltage	V_O = 0, R_S = 50 Ω	Full range		18			18			18			18		μV/°C
I_{IO}	Input offset current	V_O = 0	25°C		5	100		5	100		5	100		5	100	pA
			Full range			10			2			2			2	nA
I_{IB}	Input bias current§	V_O = 0	25°C		65	200		65	200		65	200		65	200	pA
			Full range			7			7			7			20	nA
V_{ICR}	Common-mode input voltage range		25°C	±11	−12 to 15		±11	−12 to 15		±11	−12 to 15		±11	−12 to 15		V
V_{OM}	Maximum peak output voltage swing	R_L = 10 kΩ	25°C	±12	±13.5		±12	±13.5		±12	±13.5		±12	±13.5		V
		R_L ≥ 10 kΩ	Full range	±12			±12			±12			±12			
		R_L ≥ 2 kΩ		±10			±10			±10			±10			
A_{VD}	Large-signal differential voltage amplification	V_O = ±10 V, R_L ≥ 2 kΩ	25°C	25	200		50	200		50	200		50	200		V/mV
			Full range	15			25			25			25			
B_1	Unity-gain bandwidth		25°C		3			3			3			3		MHz
r_i	Input resistance		25°C		10^{12}			10^{12}			10^{12}			10^{12}		Ω
CMRR	Common-mode rejection ratio	V_{IC} = V_{ICR}min, V_O = 0, R_S = 50 Ω	25°C	70	100		75	100		75	100		75	100		dB
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	V_{CC} = ±9 V to ±15 V, V_O = 0, R_S = 50 Ω	25°C	70	100		80	100		80	100		80	100		
I_{CC}	Supply current (each amplifier)	V_O = 0, No load	25°C		1.4	2.5		1.4	2.5		1.4	2.5		1.4	2.5	mA
V_{O1}/V_{O2}	Crosstalk attenuation	A_{VD} = 100	25°C		120			120			120			120		dB

† All characteristics are measured under open-loop conditions with zero common-mode voltage unless otherwise specified.
‡ Full range is T_A = 0°C to 70°C for TL07_C,TL07_AC, TL07_BC and is T_A = −40°C to 85°C for TL07_I.
§ Input bias currents of a FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive as shown in Figure 4. Pulse techniques must be used that maintain the junction temperature as close to the ambient temperature as possible.

TL081, TL081A, TL081B, TL082, TL082A, TL082B, TL082Y, TL084, TL084A, TL084B, TL084Y
JFET-INPUT OPERATIONAL AMPLIFIERS

- Low Power Consumption
- Wide Common-Mode and Differential Voltage Ranges
- Low Input Bias and Offset Currents
- Output Short-Circuit Protection
- Low Total Harmonic
- Distortion . . . 0.003% Typ
- High Input Impedance . . . JFET-Input Stage
- Latch-Up-Free Operation
- High Slew Rate . . . 13 V/us Typ
- Common-Mode Input Voltage Range Includes VCC+

Description

The TL08x JFET-input operational amplifier family is designed to offer a wider selection than any previously developed operational amplifier family. Each of these JFET-input operational amplifiers incorporates well-matched, high-voltage JFET and bipolar transistors in a monolithic integrated circuit. The devices feature high slew rates, low input bias and offset currents, and low offset voltage temperature coefficient. Offset adjustment and external compensation options are available within the TL08x family. The C-suffix devices are characterized for operation from 0°C to 70°C. The I-suffix devices are characterized for operation from –40°C to 85°C. The Q-suffix devices are characterized for operation from –40°C to 125°C. The M-suffix devices are characterized for operation over the full military temperature range of –55°C to 125°C.

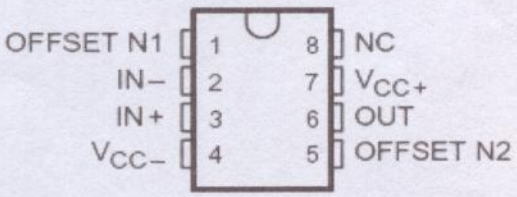
absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

		TL08_C TL08_AC TL08_BC	TL08_I	TL084Q	TL08_M	UNIT
Supply voltage, V_{CC+} (see Note 1)		18	18	18	18	V
Supply voltage V_{CC-} (see Note 1)		–18	–18	–18	–18	V
Differential input voltage, V_{ID} (see Note 2)		±30	±30	±30	±30	V
Input voltage, V_I (see Notes 1 and 3)		±15	±15	±15	±15	V
Duration of output short circuit (see Note 4)		unlimited	unlimited	unlimited	unlimited	
Continuous total power dissipation		See Dissipation Rating Table				
Operating free-air temperature range, T_A		0 to 70	–40 to 85	–40 to 125	–55 to 125	°C
Storage temperature range, T_{stg}		–65 to 150	–65 to 150	–65 to 150	–65 to 150	°C
Case temperature for 60 seconds, T_C	FK package				260	°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	J or JG package				300	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	D, N, P, or PW package	260	260	260		°C

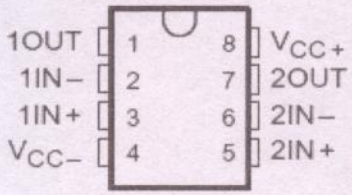
† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES:
1. All voltage values, except differential voltages, are with respect to the midpoint between V_{CC+} and V_{CC-}.
2. Differential voltages are at IN+ with respect to IN–.
3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 V, whichever is less.
4. The output may be shorted to ground or to either supply. Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded.

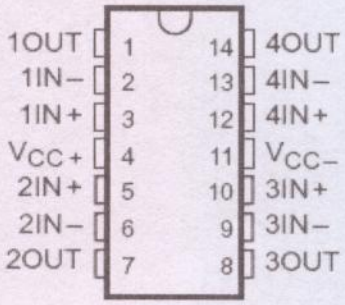
TL081, TL081A, TL081B
D, JG, P, OR PW PACKAGE
(TOP VIEW)



TL082, TL082A, TL082B
D, JG, P, OR PW PACKAGE
(TOP VIEW)



TL084, TL084A, TL084B
D, J, N, PW, OR W PACKAGE
(TOP VIEW)



NC – No internal connection

Electrical Characteristics

T_{amb} = 25 °C, unless otherwise specified
Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

Input

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I_F = 50 mA	V_F		1.25	1.5	V
Reverse current	V_R = 3.0 V	I_R		0.1	100	µ
Capacitance	V_R = 0 V	C_O		25		pF

Output

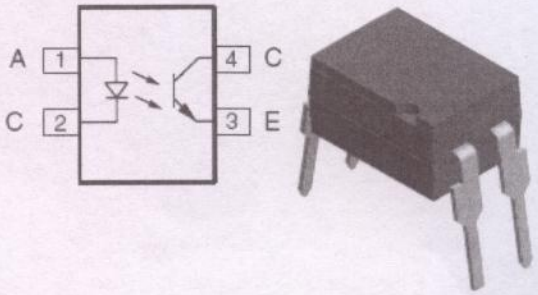
Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector-emitter breakdown voltage[1)]	I_C = 100 µA, I_F = 0	BV_{CEO}	30			V
Collector-base breakdown voltage[1)]	I_C = 100 µA, I_F = 0	BV_{CBO}	50			V
Emitter-base breakdown voltage[1)]	I_C = 100 µA, I_F = 0	BV_{EBO}	8.0			V
Emitter-collector breakdown voltage[1)]	I_C = 100 µA, I_F = 0	BV_{ECO}	5.0	10		V
Collector-emitter leakage current	V_{CE} = 10 V, I_F = 0	I_{CEO}		1.0	100	nA
	I_C = 0.5 mA, V_{CE} = 5.0 V	h_{FE}	13			

[1)] Indicates JEDEC registered values

SFH617A, Optocoupler, High Reliability, 5300 VRMS

Features

- Good CTR Linearity Depending on Forward Current
- Isolation Test Voltage, 5300 VRMS
- High Collector-Emitter Voltage, VCEO = 70 V
- Low Saturation Voltage
- Fast Switching Times
- Low CTR Degradation
- Temperature Stable
- Low Coupling Capacitance
- End-Stackable, .100 " (2.54 mm) Spacing
- High Common-Mode Interference Immunity
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



Absolute Maximum Ratings

Tamb = 25 °C, unless otherwise specified

Stresses in excess of the absolute Maximum Ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute Maximum Rating for extended periods of the time can adversely affect reliability.

Description

The SFH617A (DIP) feature a high current transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 package. The coupling devices are designed for signal transmission between two electrically separated circuits.

The couplers are end-stackable with 2.54 mm spacing. Creepage and clearance distances of > 8.0 mm are achieved with option 6. This version complies with IEC 60950 (DIN VDE 0805) for reinforced insulation up to an operation voltage of 400 VRMS or DC. Specifications subject to change.

Input

Parameter	Test condition	Symbol	Value	Unit
Reverse voltage		V_R	6.0	V
DC Forward current		I_F	60	mA
Surge forward current	t ≤ 10 µs	I_{FSM}	2.5	A
Power dissipation		P_{diss}	100	mW

Output

Parameter	Test condition	Symbol	Value	Unit
Collector-emitter voltage		V_{CE}	70	V
Emitter-collector voltage		V_{EC}	7.0	V
Collector current		I_C	50	mA
	t ≤ 1.0 ms	I_C	100	mA
Power dissipation		P_{diss}	150	mW

Coupler

Parameter	Test condition	Symbol	Value	Unit
Isolation test voltage between emitter and detector, refer to climate DIN 40046, part 2, Nov. 74		V_{ISO}	5300	V_{RMS}
Creepage			≥ 7.0	mm
Clearance			≥ 7.0	mm
Insulation thickness between emitter and detector			≥ 0.4	mm
Comparative Tracking index per DIN IEC 112/VDEO 303, part 1			≥ 175	
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	≥ 10^{12}	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	≥ 10^{11}	Ω
Storage temperature range		T_{stg}	- 55 to + 150	°C
Ambient temperature range		T_{amb}	- 55 to + 100	°C
Junction temperature		T_j	100	°C
Soldering temperature	max. 10 s. dip soldering distance to seating plane ≥ 1.5 mm	T_{sld}	260	°C

Electrical Characteristics

T_{amb} = 25 °C, unless otherwise specified
Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

Input

(IR GaAs)

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I_F = 60 mA	V_F		1.25	1.65	V
Reverse current	V_R = 6.0 V	I_R		0.01	10	µA
Capacitance	V_R = 0 V, f = 1.0 MHz	C_O		13		pF
Thermal resistance		R_{thja}		750		K/W

Output

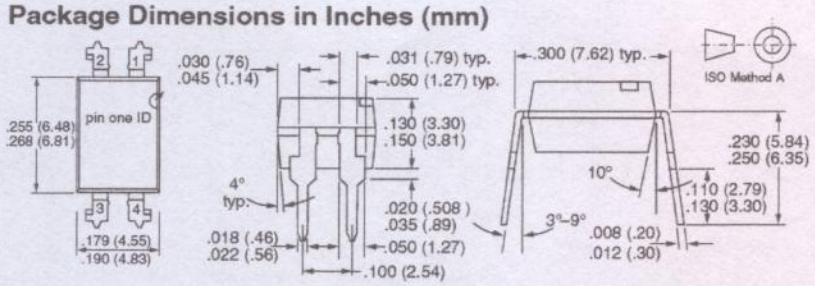
(Si Phototransistor)

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Collector-emitter capacitance	V_{CE} = 5 V, f = 1.0 MHz		C_{CE}		5.2		pF
Thermal resistance			R_{thja}		500		K/W
Collector-emitter leakage current	V_{CE} = 10 V	SFH617A-1	I_{CEO}		2.0	50	nA
		SFH617A-2	I_{CEO}		2.0	50	nA
		SFH617A-3	I_{CEO}		5.0	100	nA
		SFH617A-4	I_{CEO}		5.0	100	nA

Coupler

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector-emitter saturation voltage	I_F = 10 mA, f = 1.0 MHz	V_{CEsat}	0.4	0.25		V
Coupling capacitance		C_C		0.4		pF

Package Dimensions in Inches (mm)



CNY70, Reflective Optical Sensor with Transistor Output

Description

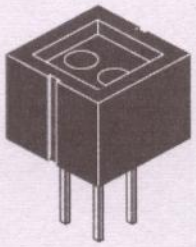
The CNY70 has a compact construction where the emitting light source and the detector are arranged in the same direction to sense the presence of an object by using the reflective IR beam from the object.
The operating wavelength is 950 nm. The detector consists of a phototransistor.

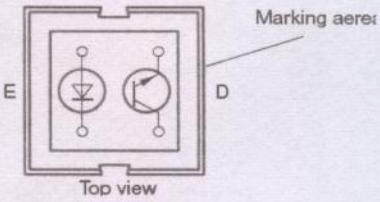
Applications

- Optoelectronic scanning and switching devices i.e., index sensing, coded disk scanning etc., (optoelectronic encoder assemblies for transmission sensing).

Features

- Compact construction in center-to-center spacing of 0.1'
- No setting required
- High signal output
- Low temperature coefficient
- Detector provided with optical filter
- Current Transfer Ratio (CTR) of typical 5%





Absolute Maximum Ratings

Input (Emitter)

Parameter	Test Conditions	Symbol	Value	Unit
Reverse voltage		V_R	5	V
Forward current		I_F	50	mA
Forward surge current	$t_p \leq 10\ \mu s$	I_{FSM}	3	A
Power dissipation	$T_{amb} \leq 25°C$	P_V	100	mW
Junction temperature		T_j	100	°C

Output (Detector)

Parameter	Test Conditions	Symbol	Value	Unit
Collector emitter voltage		V_{CEO}	32	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
Power dissipation	$T_{amb} \leq 25°C$	P_V	100	mW
Junction temperature		T_j	100	°C

Coupler

Parameter	Test Conditions	Symbol	Value	Unit
Total power dissipation	$T_{amb} \leq 25°C$	P_{tot}	200	mW
Ambient temperature range		T_{amb}	–55 to +85	°C
Storage temperature range		T_{stg}	–55 to +100	°C
Soldering temperature	2 mm from case, $t \leq 5$ s	T_{sd}	260	°C

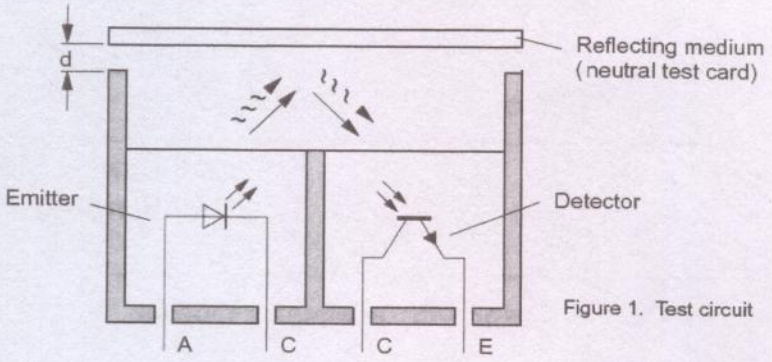


Figure 1. Test circuit

Electrical Characteristics (T_{amb} = 25°C)

Input (Emitter)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Forward voltage	I_F = 50 mA	V_F		1.25	1.6	V

Output (Detector)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector emitter voltage	I_C = 1 mA	V_{CEO}	32			V
Emitter collector voltage	I_E = 100 µA	V_{ECO}	5			V
Collector dark current	V_{CE} = 20 V, I_f = 0, E = 0	I_{CEO}			200	nA

Coupler

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector current	V_{CE} = 5 V, I_F = 20 mA, d = 0.3 mm (figure 1)	I_C [1]	0.3	1.0		mA
Cross talk current	V_{CE} = 5 V, I_F = 20 mA (figure 1)	I_{CX} [2]			600	nA
Collector emitter saturation voltage	I_F = 20 mA, I_C = 0.1 mA, d = 0.3 mm (figure 1)	V_{CEsat} [1]			0.3	V

[1] Measured with the 'neutral test card', white side with 90% diffuse reflectance

[2] Measured without reflecting medium

L7800 SERIES — POSITIVE VOLTAGE REGULATORS

- OUTPUT CURRENT UP TO 1.5 A
- OUTPUT VOLTAGES OF 5; 5.2; 6; 8; 8.5; 9; 12; 15; 18; 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSITION SOA PROTECTION

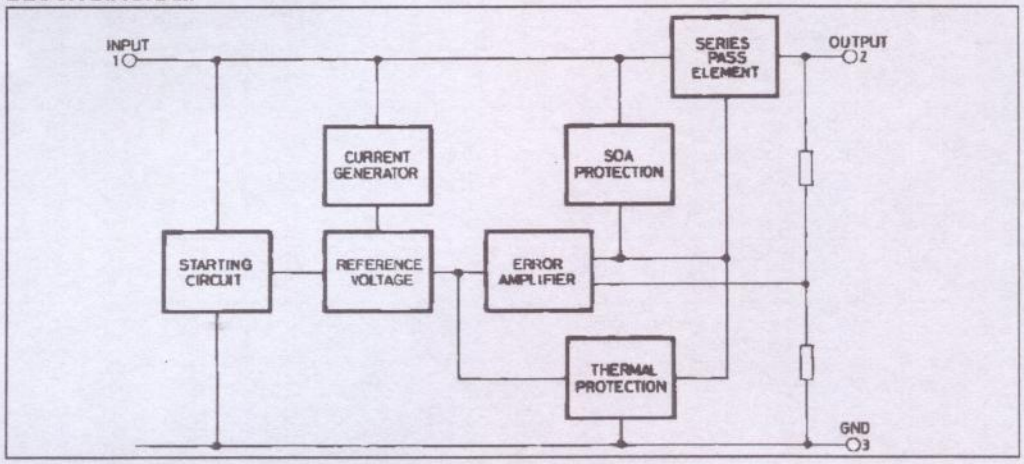
Type	TO-220	Output Voltage
L7805		5V
L7805C	L7805CV	5V
L7852C	L7852CV	5.2V
L7806		6V
L7806C	L7806CV	6V
L7808		8V
L7808C	L7808CV	8V
L7885C	L7885CV	8.5V
L7809C	L7809CV	9V
L7812		12V
L7812C	L7812CV	12V
L7815		15V
L7815C	L7815CV	15V
L7818		18V
L7818C	L7818CV	18V
L7820		20V
L7820C	L7820CV	20V
L7824		24V
L7824C	L7824CV	24V

(*) AVAILABLE IN TAPE AND REEL WITH "-TR" SUFFIX

DESCRIPTION

The L7800 series of three-terminal positive regulators is available in TO-220 ISOWATT220 TO-3 and D^2PAK packages and several fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

BLOCK DIAGRAM



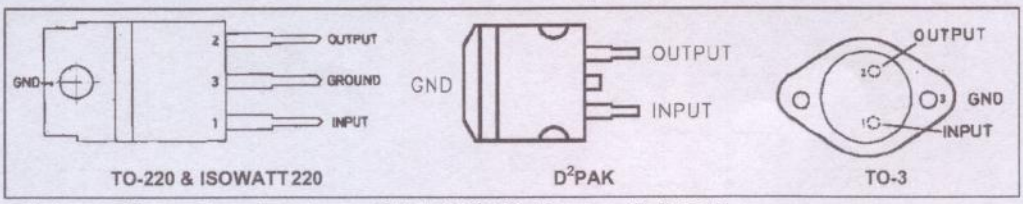
ABSOLUTE MAXIMUM RATINGS

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}	Power Dissipation	Internally limited	
T_{op}	Operating Junction Temperature Range (for **L7800**) (for **L7800C**)	-55 to 150 0 to 150	°C °C
T_{stg}	Storage Temperature Range	-65 to 150	°C

THERMAL DATA

Symbol	Parameter		D^2PAK	TO-220	ISOWATT220	TO-3	Unit
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	3	3	4	4	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5	50	60	35	°C/W

CONNECTION DIAGRAM AND ORDERING NUMBERS (top view)



 S10 1680/3190 K2-wk-weiß-090210

ELECTRICAL CHARACTERISTICS FOR L7805 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 10V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

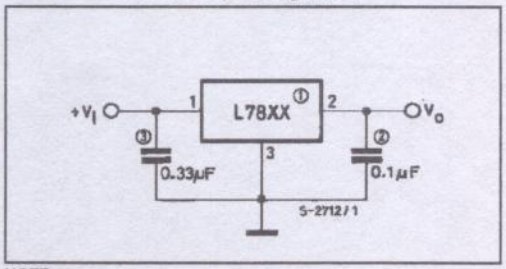
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	4.8	5	5.2	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 8 to 20 V	4.65	5	5.35	V
ΔV_o*	Line Regulation	V_i = 7 to 25 V T_j = 25 °C V_i = 8 to 12 V T_j = 25 °C		3 1	50 25	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			100 25	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 8 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		0.6		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_o
SVR	Supply Voltage Rejection	V_i = 8 to 18 V f = 120 Hz	68			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	A

ELECTRICAL CHARACTERISTICS FOR L7812 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 19V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

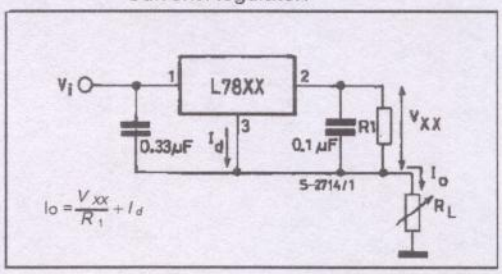
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	11.5	12	12.5	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 15.5 to 27 V	11.4	12	12.6	V
ΔV_o*	Line Regulation	V_i = 14.5 to 30 V T_j = 25 °C V_i = 16 to 22 V T_j = 25 °C			120 60	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			100 60	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 15 to 30 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		1.5		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_o
SVR	Supply Voltage Rejection	V_i = 15 to 25 V f = 120 Hz	61			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		18		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	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.

Fixed Output Regulator.

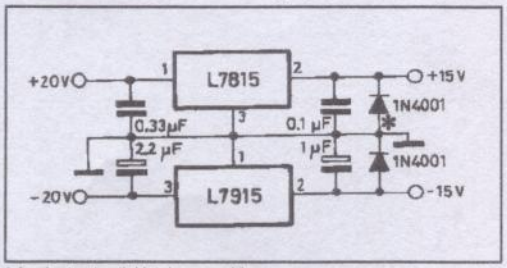


Current Regulator.

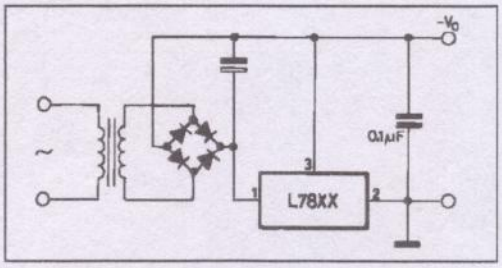


NOTE:
1. To specify an output voltage, substitute voltage value for "XX".
2. Although no output capacitor is need for stability, it does improve transient response.
3. Required if cregulator is locate an appreciable distance from power supply filter.

Split Power Supply (± 15V – 1A).



Negative Output Voltage Circuit.



* Against potential latch-up problems.

L7900 SERIES — NEGATIVE VOLTAGE REGULATORS

- OUTPUT CURRENT UP TO 1.5 A
- OUTPUT VOLTAGES OF -5; -5.2; -6; -8; -9; -12; -15; -18; -20; -22; -24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSITION SOA PROTECTION

Type	TO-220	Output Voltage
L7905C	L7905CV	-5V
L7952C	L7952CV	-5.2V
L7906C	L7906CV	-6V
L7908C	L7908CV	-8V
L7912C	L7912CV	-12V
L7915C	L7915CV	-15V
L7918C	L7918CV	-18V
L7920C	L7920CV	-20V
L7922C	L7922CV	-22V
L7924C	L7924CV	-24V

(*) AVAILABLE IN TAPE AND REEL WITH "-TR" SUFFIX

DESCRIPTION

The L7900 series of three-terminal negative regulators is available in TO-220, ISOWATT220 TO-3 and D^2PAK packages and several fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation; furthermore, having the same voltage option 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 adequate heat sinking is provided, they can deliver over 1.5A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

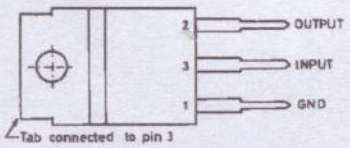
ABSOLUTE MAXIMUM RATINGS

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}	Power Dissipation	Internally limited	
T_{op}	Operating Junction Temperature Range	0 to 150	°C
T_{stg}	Storage Temperature Range	- 65 to 150	°C

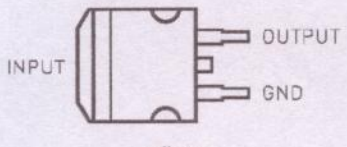
THERMAL DATA

Symbol	Parameter	D^2PAK	TO-220	ISOWATT220	TO-3	Unit
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	3	3	4	4	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	62.5	50	60	35	°C/W

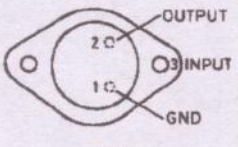
CONNECTION DIAGRAM AND ORDERING NUMBERS (top view)



TO-220 & ISOWATT220



D^2PAK



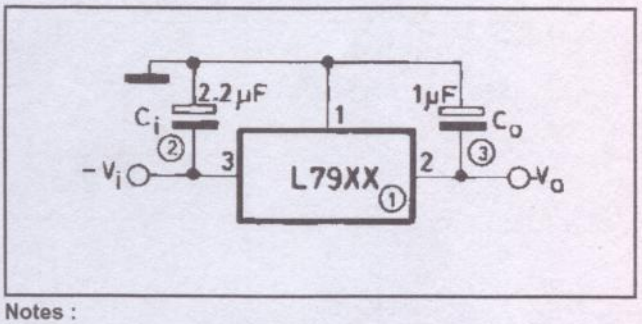
TO-3

ELECTRICAL CHARACTERISTICS FOR L7912C (refer to the test circuits, T_j = 0 to 150 °C, V_i = -19V, I_o = 500 mA, C_i = 2.2 µF, C_o = 1 µF 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 = -5 mA to -1 A $P_o \leq$ 15 W V_i = -15.5 to -27 V	-11.4	-12	-12.6	V
ΔV_o*	Line Regulation	V_i = -14.5 to -30 V T_j = 25 °C V_i = -16 to -22 V T_j = 25 °C			240 120	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA 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 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = -15 to -30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.8		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		200		µV
SVR	Supply Voltage Rejection	ΔV_i = 10 V f = 120 Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.5		A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.5		A

APPLICATION INFORMATION

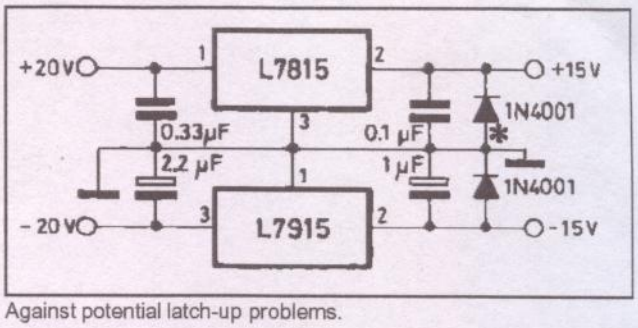
Fixed Output Regulator.



Notes :

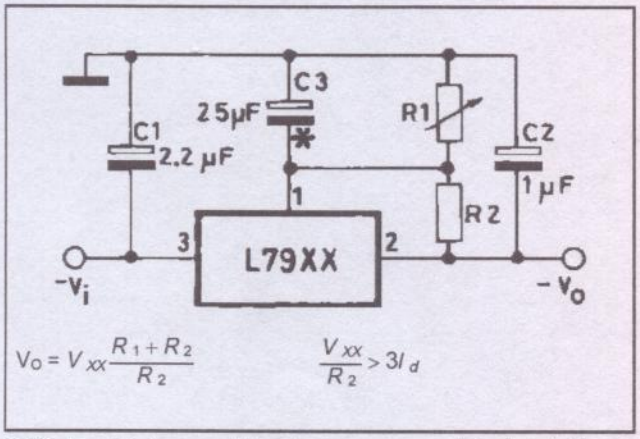
1. To specify an output voltage, substitute voltage value for "XX".
2. Required for stability. For value given, capacitor must be solid tantalum. If aluminium electrolitics are used, at least ten times value should be selected. C_1 is required if regulator is located an appreciable distance from power 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.

Split Power Supply (± 15V/1A).



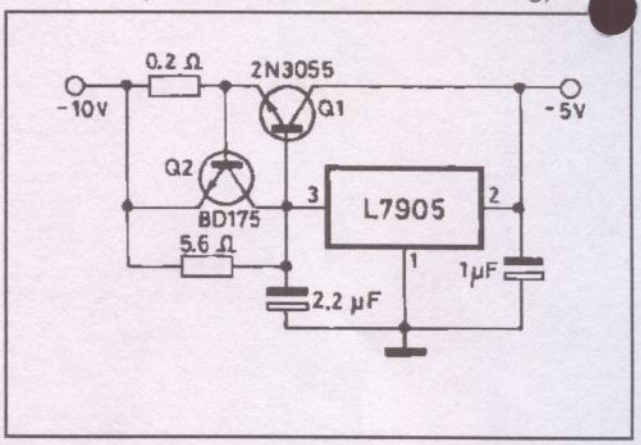
Against potential latch-up problems.

Circuit for Increasing Output Voltage.

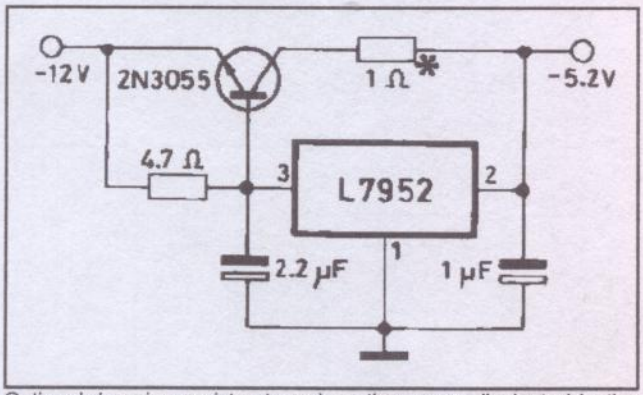


C3 Optional for improved transient response and ripple rejection.

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



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



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