LINEAR INTEGRATED CIRCUIT

L165

3A POWER OPERATIONAL AMPLIFIER

The L165 is a monolithic integrated circuit in Pentawatt® package, intended for use as power operational amplifier in a wide range of applications, including servo amplifiers and power supplies. The high gain and high output power capability provide superior performance wherever an operational amplifier/power booster combination is required,

- Output current up to 3A.
- Large common-mode and differential mode ranges.
- SOA protection.
- Thermal protection.

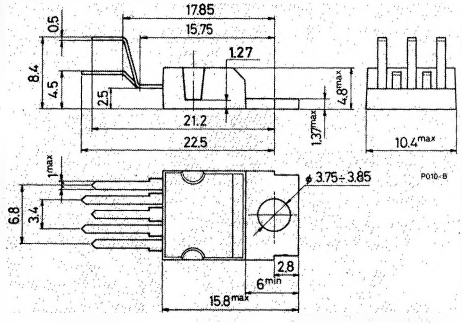
ABSOLUTE MAXIMUM RATINGS

V_s	Supply voltage	± 18	V
V_i	Input voltage	V_s	
V_i	Differential input voltage	± 15	V
I_o	Peak output current (internally limited)	3.5	A
P_{tot}	Power dissipation at T_{case} = 90°C	20	W
T_{stg}, T_j	Storage and junction temperature	-40 to 150	°C

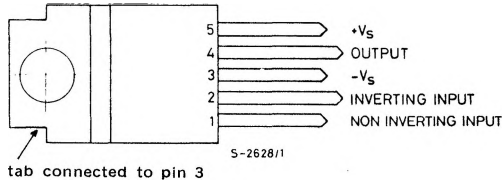
ORDERING NUMBER: L165V

MECHANICAL DATA

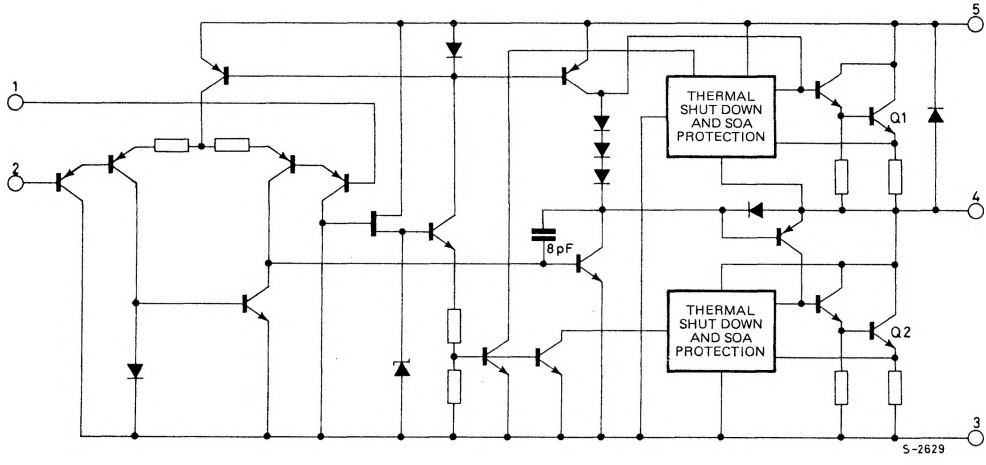
Dimensions in mm



CONNECTION DIAGRAM
(top view)



SCHEMATIC DIAGRAM



THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max 3	°C/W

ELECTRICAL CHARACTERISTICS (V_s = ± 15V, T_{amb}= 25°C unless otherwise specified)

Parameter		Test conditions		Min.	Typ.	Max.	Unit
V_s	Supply voltage			± 6		±18	V
I_d	Quiescent drain current	V_s = ± 18V			40	60	mA
I_b	Input bias current				0.2	1	μA
V_{os}	Input offset voltage				± 2	±10	mV
I_{os}	Input offset current				±20	±200	nA
SR	Slew-Rate	G_V= 10			8		V/μs
		G_V= 1 (°)			6		
V_o	Output voltage swing	f = 1 kHz	I_p = 0.3A		27		V_{pp}
			I_p = 3A		24		
		f = 10 kHz	I_p = 0.3A		27		V_{pp}
			I_p = 3A		23		
R_i	Input resistance (pin 1)	f = 1 KHz		100	500		KΩ
G_v	Voltage gain (open loop)				80		dB
e_N	Input noise voltage	B = 10 to 10 000 Hz			2		μV
i_N	Input noise current				100		pA
CMR	Common mode rejection	$R_g \leqslant$ 10 KΩ G_V= 30 dB			70		dB
SVR	Supply voltage rejection	R_g= 22 kΩ V_{ripple}= 0.5 V_{rms} f_{ripple}= 100 Hz	G_v = 10		60		dB
			G_v = 100		40		dB
η	Efficiency	f = 1 kHz R_L= 4Ω	I_p = 1.6A; P_o = 5W		70		%
			I_p = 3A; P_o = 18W		60		%
T_{sd}	Thermal shut-down case temperature	P_{tot}= 12W			110		°C
		P_{tot}= 6W			130		

(°) Circuit of fig. 8.

Fig. 1 - Open loop frequency response

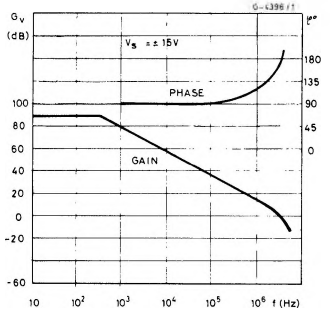


Fig. 2 - Closed-loop frequency response (circuit of fig. 8)

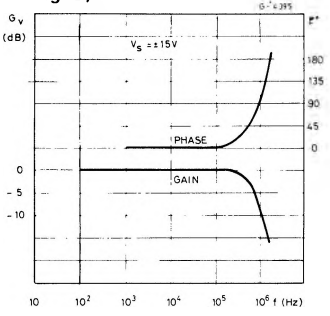


Fig. 3 - Large signal frequency response

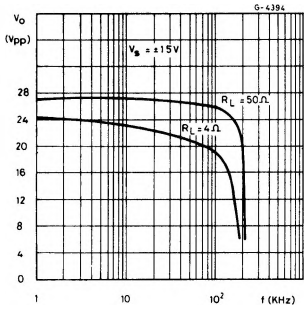


Fig. 4 - Maximum output current vs. voltage [V_{CE}] across each output transistor

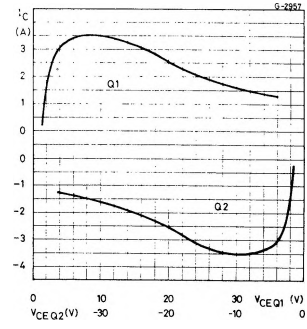


Fig. 5 - Safe operating area and collector characteristics of the protected power transistor

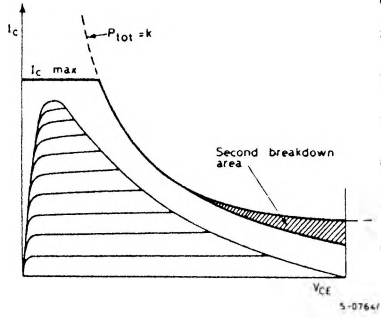


Fig. 6 - Maximum allowable power dissipation vs. ambient temperature

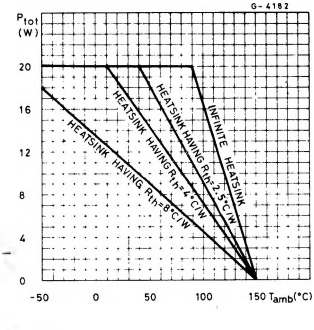


Fig. 7 - Application circuit ($G_V > 10$)

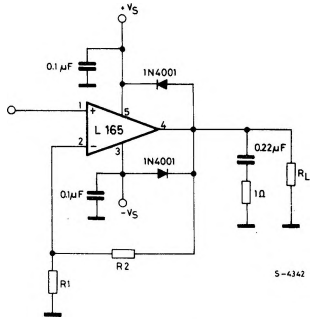


Fig. 8 - Unity gain configuration

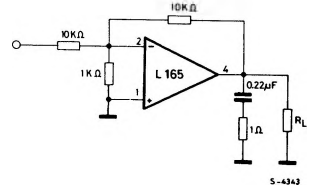
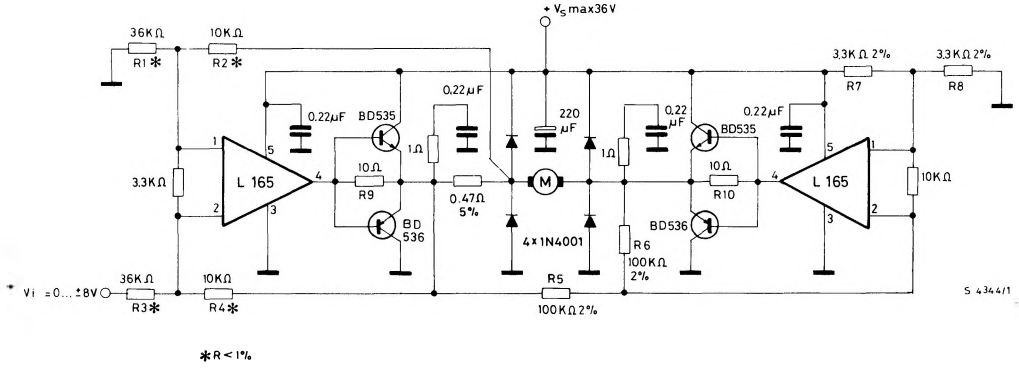


Fig. 9 - Motor current control circuit with external power transistors ($I_{motor} > 3.5A$)



Note: The input voltage level is compatible with L291 (5-BIT D/A converter)

Fig. 10 - High current tracking regulator

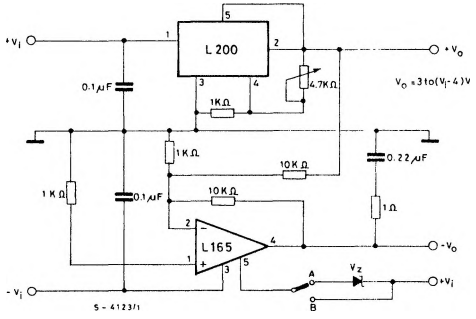
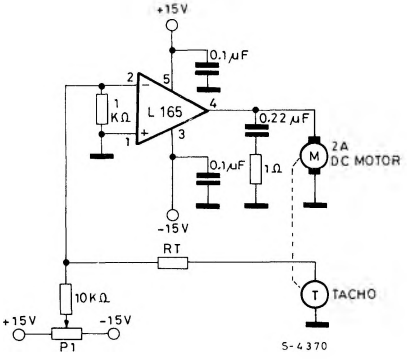


Fig. 11 - Bidirectional speed control of DC motor



A: for $\pm 18 \leqslant V_i \leqslant \pm 32$

Note – V_z must be chosen in order to verify
$2 V_i - V_z \leqslant 36V$

B: for $V_i \leqslant \pm 18V$

Fig. 12 - Split power supply

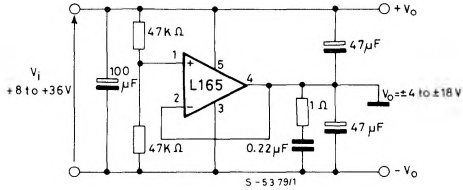
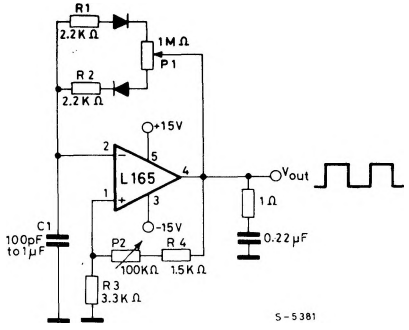
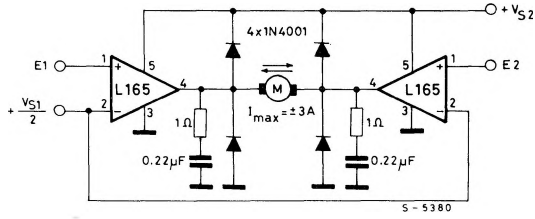


Fig. 13 - Power squarewave oscillator with independent adjustments for frequency and duty-cycle.



P1 : duty-cycle adjust
P2 : frequency adjust (f = 700 Hz with C1= 10 nF, P2= 100 KΩ, f=25 Hz with C1= 10 nF, P2= 0)

Fig. 14 - Bidirectional DC motor control with TTL/C-MOS/μP compatible inputs



V_{S1} = logic supply voltage

Must be $V_{S2} \geq V_{S1}$

E1, E2 = logic inputs

NOTE - For a more detailed description of the L165 and its applications, refer to SGS-TECHNICAL NOTE TN.150.