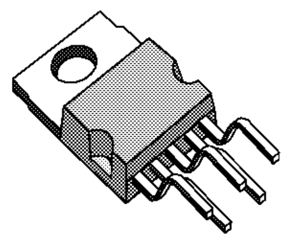
SGS-THOMSON MICROELECTRONICS

L165

3A POWER OPERATIONAL AMPLIFIER

- OUTPUT CURRENT UP TO 3A
- LARGE COMMON-MODE AND DIFFERENTIAL MODE RANGES
- SOA PROTECTION
- THERMAL PROTECTION
- ± 18V SUPPLY



Pentawatt®

ORDERING NUMBER : L165V

DESCRIPTION

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 superiore performance wherever an operational amplifier/power booster combination is required.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_s	Supply voltage	± 18	V
V_5 V_4	Upper power transistor V_{CE}	36	V
V_4 V_3	Lower power transistor V_{CE}	36	V
V_i	Input voltage	V_s	
V_j	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

APPLICATION CIRCUITS

Figure 1. Gain > 10.

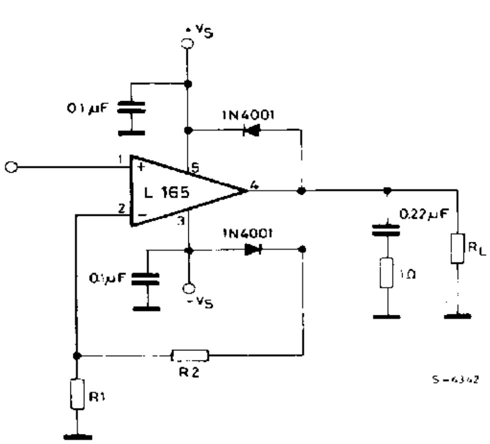
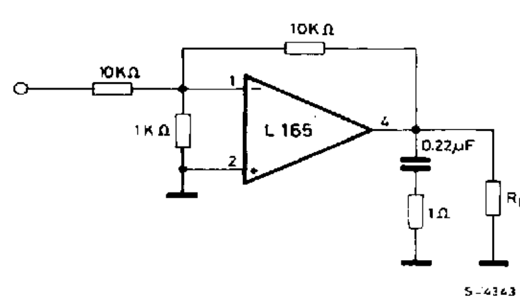
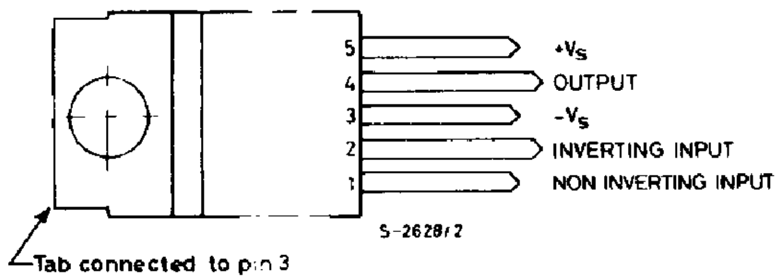


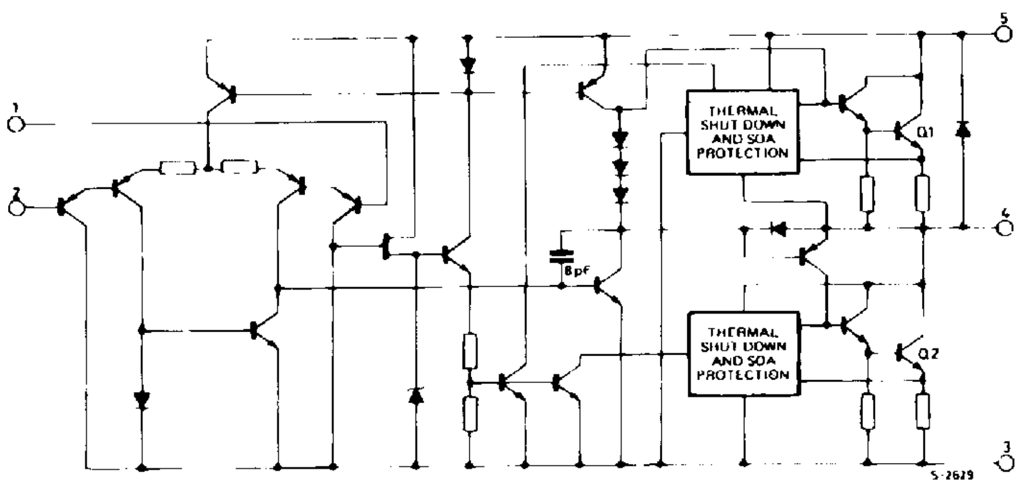
Figure 2. Unity gain configuration.



PIN CONNECTION (top view)



SCHEMATIC DIAGRAM



THERMAL DATA

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

ELECTRICAL CHARACTERISTICS (V_S = ± 15 V, T_j = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_s	Supply Voltage		± 6		± 18	V
I_d	Quiescent Drain Current	V_s = ± 18 V		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 = 0.3 A I_p = 3 A		27 24		V_{pp}
		f = 10 kHz I_p = 0.3 A I_p = 3 A		27 23		V_{PP}
R	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 ≤ 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	dB
		dB G_v = 100		40		dB
	Efficiency	f = 1 kHz R_L = 4 Ω — I_p = 1.6 A; P_o = 5W		70		%
		I_p = 3 A; P_o = 18 W		60		%
T_{sd}	Thermal Shut-down Case Temperature	P_{tot} = 12 W		110		°C
		P_{tot} = 6 W		130		

Figure 3. Open loop frequency response.

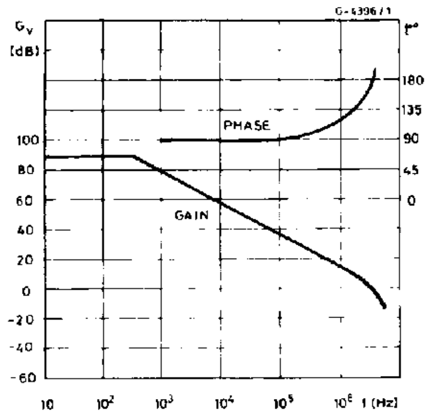


Figure 4. Closed loop frequency response (circuit of figure 2).

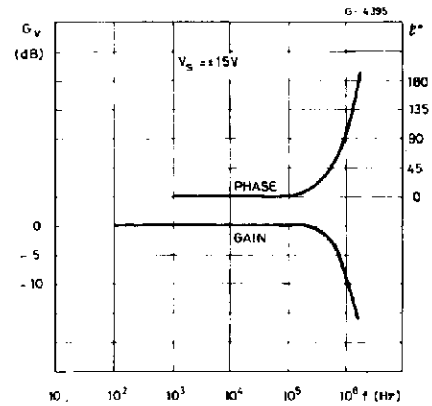


Figure 5. Large signal frequency response.

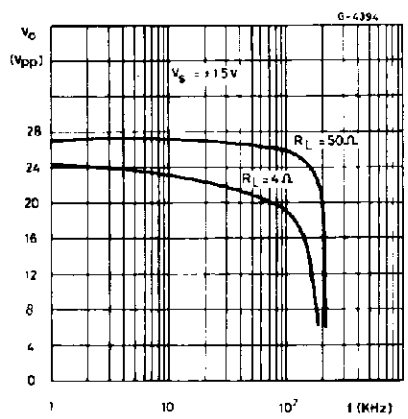


Figure 6. Maximum output current vs. voltage [VCE] across each output transistor.

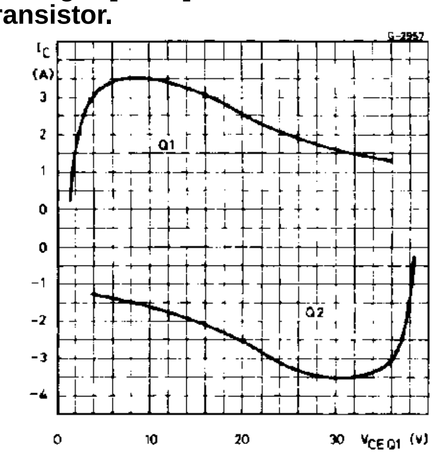


Figure 7. Safe operating area and collector characteristics of the protected power transistor.

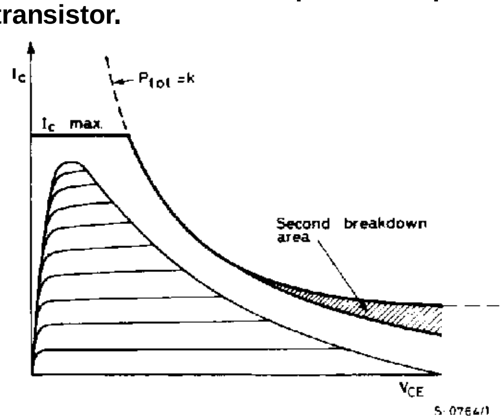


Figure 8. Maximum allowable power dissipation vs. ambient temperature.

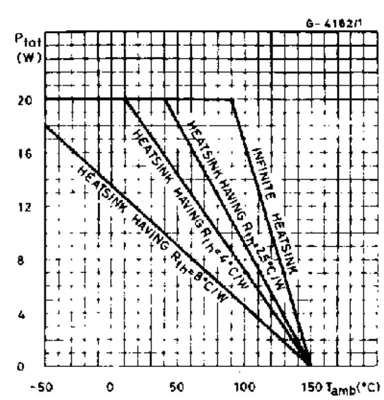
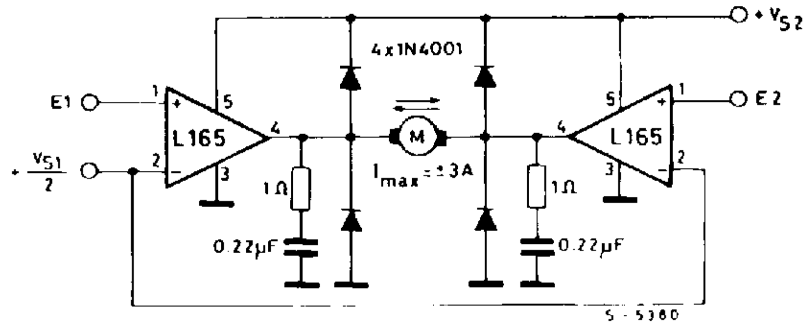
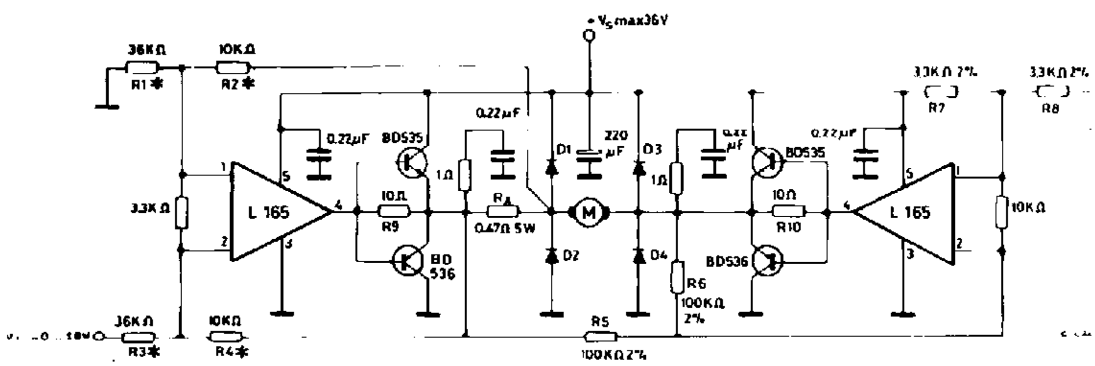


Figure 9. Bidirectional DC motor control with TTL/CMOS/µP compatible inputs.



Must be $V_{S2} \geq V_{S1}$ E1, E2 = logic inputs
V_{S1} = logic supply voltage

Figure 10. Motor current control circuit with external power transistors (I_{motor} > 3.5A).

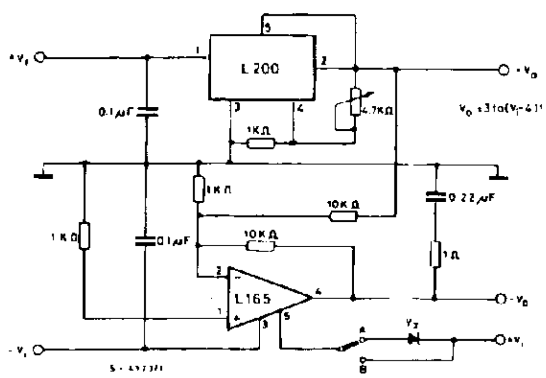


D1 to D4 : | $V_F \leq 1.2$ @ I = 4A
| $t_{rr} \leq 500$ ns

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

The transfer function is : $\frac{I_M}{V_i} = \frac{R4}{Rx \ R3}$

Figure 11. High current tracking regulator.



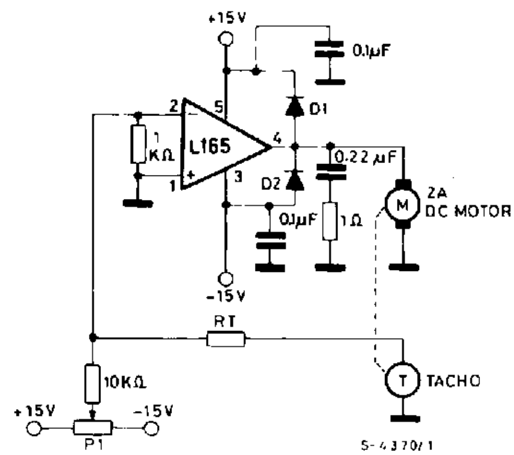
A : for ± 18 ≤ Vi ± 32

Note : V_z must be chosen in order to verify

2 V_i-V_z ≤ 36V

B : for V_i ≤ ± 18V

Figure 12. Bidirectional speed control of DC motor (Compensation networks not shown).



D1, D2 : VF ≤ 1.2V @ I = 2A

t_{rr} ≤ 500 ns

Figure 13. Split power supply.

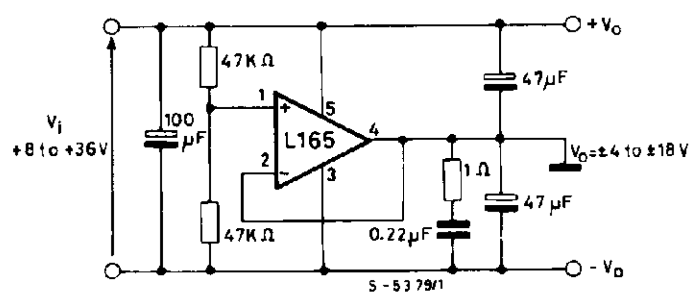
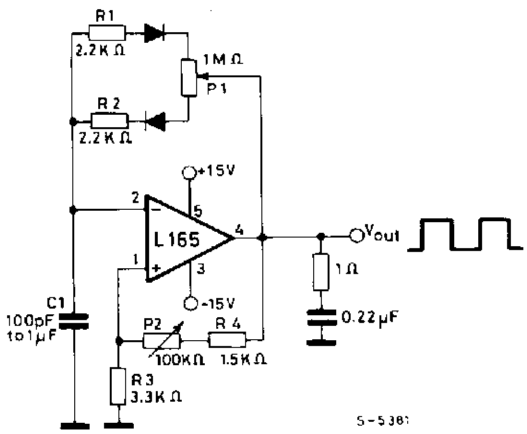


Figure 14. Power squarewave oscillator with independent adjustments for frequency and duty-cycle.



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)

PENTAWATT PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			4.8			0.189
C			1.37			0.054
D	2.4		2.8	0.094		0.110
D1	1.2		1.35	0.047		0.053
E	0.35		0.55	0.014		0.022
F	0.8		1.05	0.031		0.041
F1	1		1.4	0.039		0.055
G		3.4		0.126	0.134	0.142
G1		6.8		0.260	0.268	0.276
H2			10.4			0.409
H3	10.05		10.4	0.396		0.409
L		17.85			0.703	
L1		15.75			0.620	
L2		21.4			0.843	
L3		22.5			0.886	
L5	2.6		3	0.102		0.118
L6	15.1		15.8	0.594		0.622
L7	6		6.6	0.236		0.260
M		4.5			0.177	
M1		4			0.157	
Dia	3.65		3.85	0.144		0.152