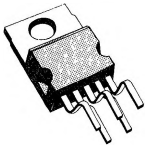
SGS-THOMSON MICROELECTRONICS

L165

3A POWER OPERATIONAL AMPLIFIER

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

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.



Pentawatt®

ORDER CODE : L165V

ABSOLUTE MAXIMUM RATINGS

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_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

APPLICATION CIRCUITS

Figure 1 : Gain > 10.

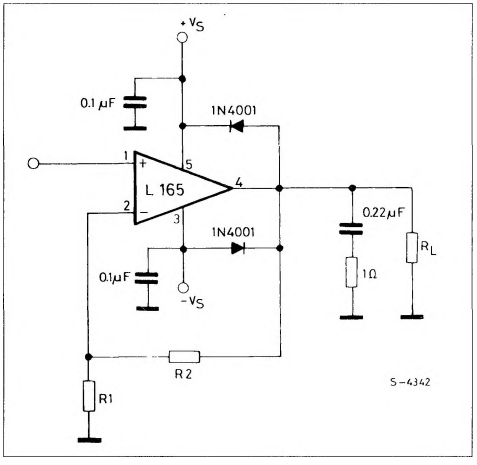
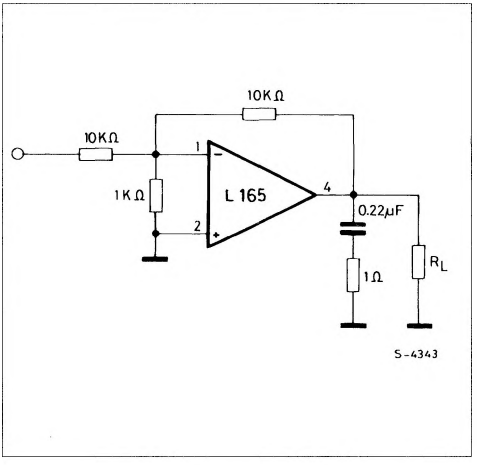
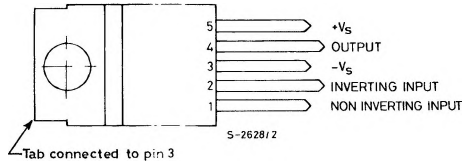


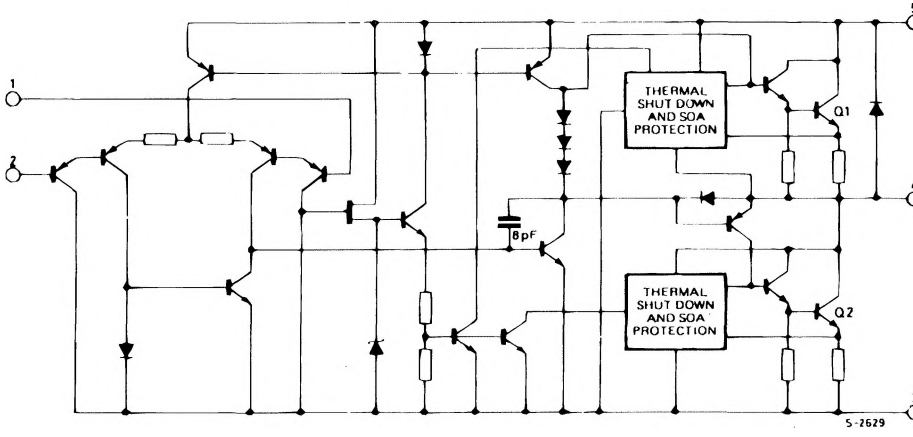
Figure 2 : Unity gain configuration.



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 = ± 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		27		V_{pp}
		f = 1 kHz I_p = 3 A		24		V_{pp}
		f = 10 kHz I_P = 0.3 A		27		V_{PP}
		f = 10 kHz I_P = 3 A		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 G_v = 10		60	dB	dB
		V_{ripple} = 0.5 V_{rms} f_{ripple} = 100 Hz dBG_v = 100		40		dB
	Efficiency	f = 1 kHz I_p = 1.6 A ; P_o = 5 W		70		%
		R_L = 4 Ω 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		°C

Figure 3 : Open loop frequency response.

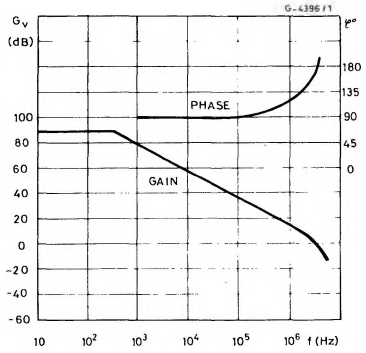


Figure 4 : Closed loop frequency response (circuit of figure 2).

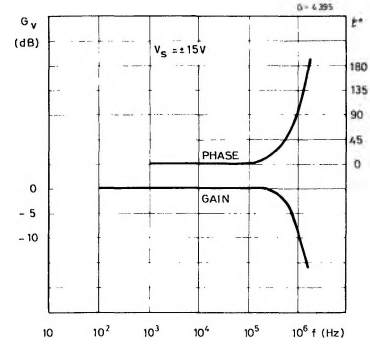


Figure 5 : Large signal frequency response.

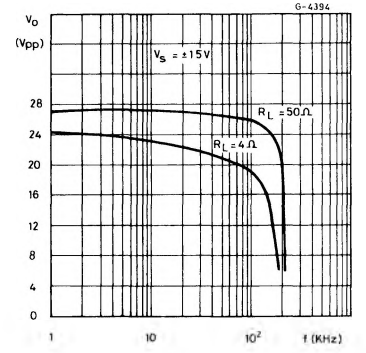


Figure 6 : Maximum output current vs. voltage [VCE] across each output transistor.

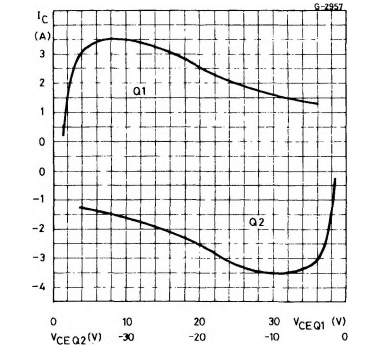


Figure 7 : Safe operating area and collector characteristics of the protected power transistor.

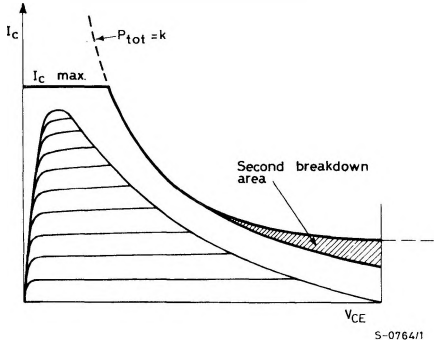


Figure 8 : Maximum allowable power dissipation vs. ambient temperature.

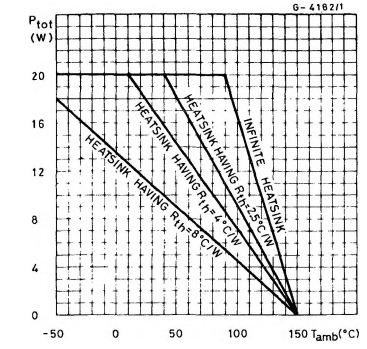
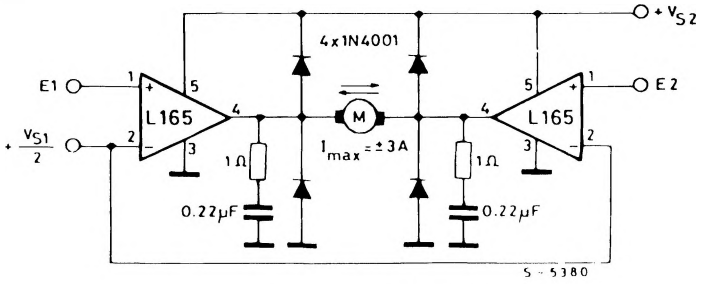
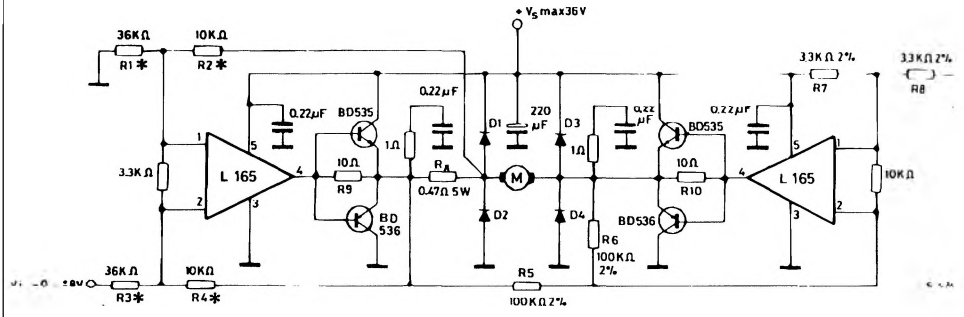


Figure 9 : Bidirectional DC motor control with TTL/CMOS/µP compatible inputs.



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).

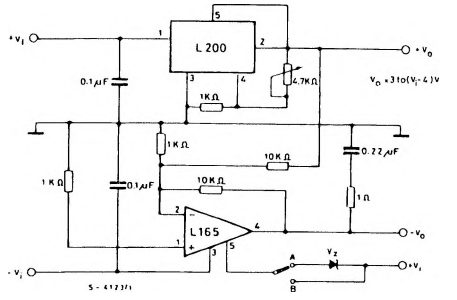


D1 to D4 : $V_F \leq 1.2$ @ I = 4A
trr ≤ 500 ns

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

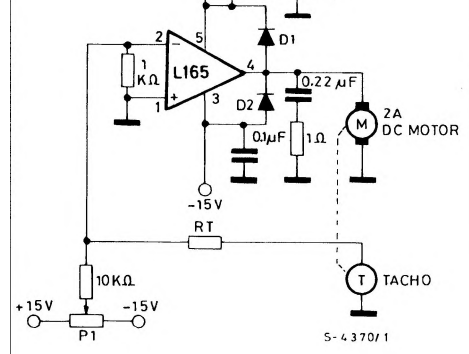
The transfer function is : $\frac{I_M}{V_i} = \frac{R4}{Rx\ R3}$

Figure 11 : High current tracking regulator.



A : for $\pm 18 \leq V_i \leq \pm 32$
Note : V_z must be chosen in order to verify
$2V_i - V_z \leq 36V$
B : for $V_i \leq \pm 18V$

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



D1, D2 : VF ≤ 1.2V @ I = 2A
trr ≤ 500 ns

Figure 13 : Split power supply.

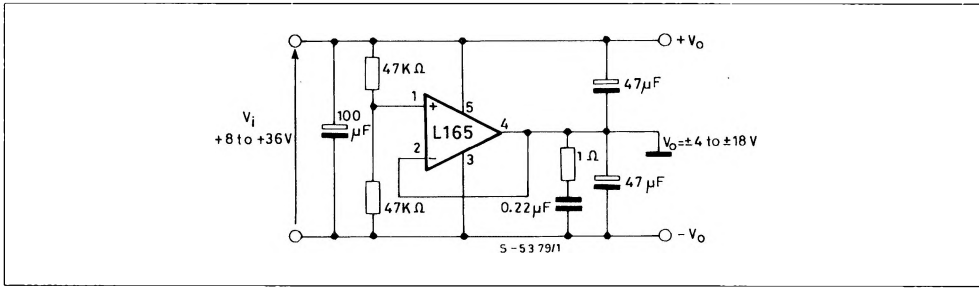
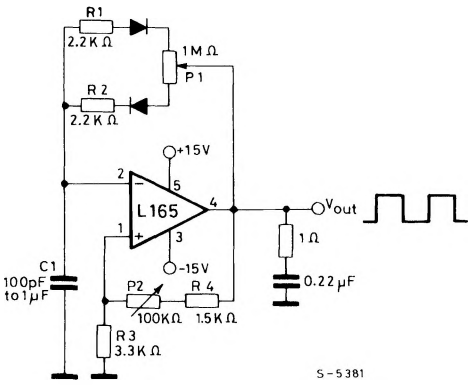


Figure 14 : Power squarewave oscillator with independent adjustments for frequency and duty-cycle.



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)