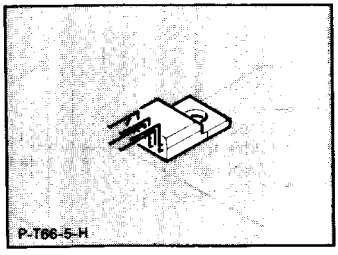
SIEMENS

Power Operational Amplifier

TCA 365 B

Preliminary Data

Bipolar IC



Features

- High peak output current, up to 4 A
- High supply voltage, up to 42 V
- Thermal overload protection
- Internal power limitation
- DC voltage short-circuit proof to $+V_S$ and $-V_S$
- Integrated clamp diodes

Applications

- Power comparator
- Power Schmitt trigger
- Speed control of DC motors

Type	Ordering Code	Package
TCA 365 B	Q67000-A8189	Plastic power package P-T66-5-H (similar to TO-220)

The TCA 365 B is a power op amp in a plastic package P-T66-5-H. At a maximum supply voltage of ±21 V, the IC produces a high output current of 4 A. The op amp is protected against thermal overload and short circuits.

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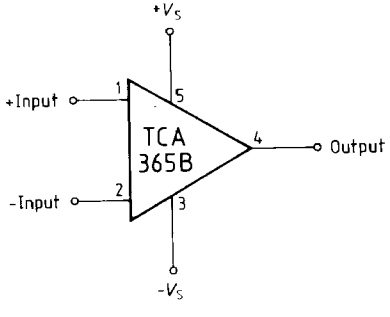
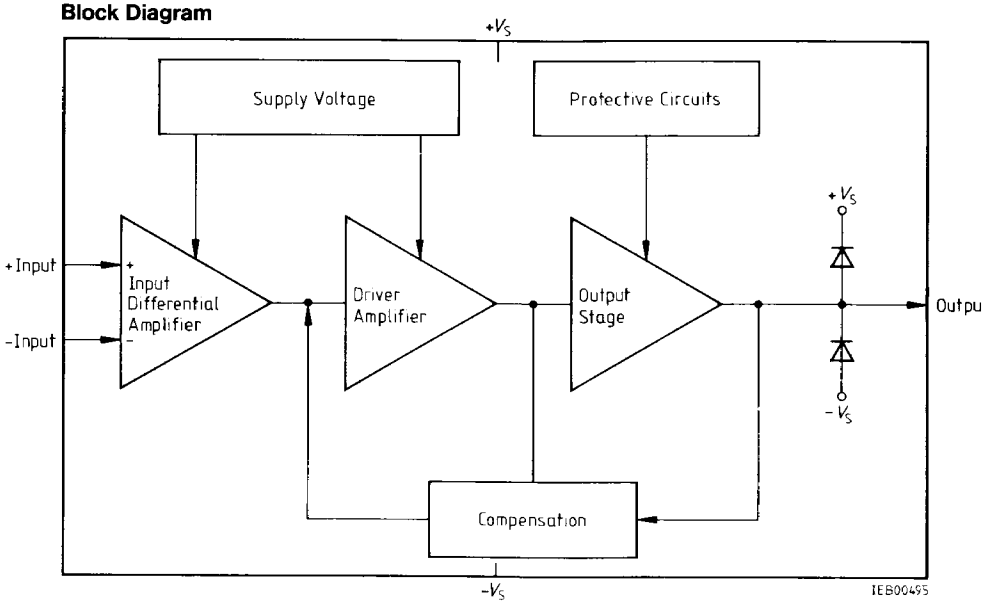
Pin Configuration



Pin 3 is electrically connected to cooling fin.

Block Diagram



Absolute Maximum Ratings

$T_C = -25\,°C$ to $85\,°C$

Parameter	Symbol	Limit Values min.	Limit Values max.	Unit	Notes
Supply voltage	V_S	0	±21	V	
Differential input voltage	V_{ID}	$-V_S$	$+V_S$	V	
Supply current	I_S	−3.5	4.0	A	
Output current	I_Q	−4.0	4.0	A	
Output current	I_Q	−2.0		A	$V_S \geq \pm 15$ V, $V_Q < -V_S$
Output current	I_Q	−3.0		A	$V_S \geq \pm 10$ V, $V_Q < -V_S$
Ground current	I_{GND}	−4.0	3.5	A	
Power dissipation at $T_C = 85\,°C$	P_D		20	W	
Junction temperature	T_j		150	°C	
Storage temperature range	T_{stg}	−50	125	°C	

Operating Range

Supply voltage	V_S	±3	±20	V	
Case temperature	T_C	−25	85	°C	$P_D = 13$ W
Voltage gain	$G_{V\,min}$	20		dB	
Forward current of clamp diode	I_F		3	A	$T_{j\,max} = 125\,°C$
Thermal resistance					
junction – ambient	$R_{th\,jA}$		65	K/W	
junction – case	$R_{th\,jC}$		3	K/W	

Characteristics

$V_S = \pm 15$ V, $T_j = 25$ °C

Parameter	Symbol	Limit Values min.	typ.	max.	Unit	Test Circuit
Open-loop supply current consumption	I_S		20	40	mA	1
Input offset voltage	V_{IO}	−10		10	mV	2
Input offset current	I_{IO}	−100		100	nA	3
Input current	I_I		0.2	1	µA	3
Output voltage						
$R_L = 12\ \Omega$; $f = 1$ kHz	$V_{Q\,pp}$	± 13.0	± 13.5		V	4
$R_L = 4\ \Omega$; $f = 1$ kHz	$V_{Q\,pp}$	± 12.5	± 13.0		V	
Input resistance $f = 1$ kHz	R_I	1	5		MΩ	4
Open-loop voltage gain $f = 100$ Hz	G_{VO}	70	80		dB	5
Common-mode input voltage range	V_{IC}	+13/−15	+13.5/−15.1		V	6
Common-mode rejection	k_{CMR}	70	80		dB	6
Supply voltage rejection	k_{SVR}	−70	−80		dB	7
Temperature coefficient of V_{IO} $-25\,°C \le T_j \le +85\,°C$	α_{VIO}		50		µV/K	2
Temperature coefficient of I_{IO} $-25\,°C \le T_j \le +85\,°C$	α_{IIO}		0.4		nA/K	3
Slew rate of V_Q for non-inverting operation	SR		2		V/µs	8
Slew rate of V_Q for inverting operation	SR		2		V/µs	9
Noise voltage referred to input (DIN 45405)	V_n		2	5	µV	1
Short-circuit current						
(S1 closed)	I_{SC}		0.75		A	1
(S2 closed)	I_{SC}		−0.75		A	1

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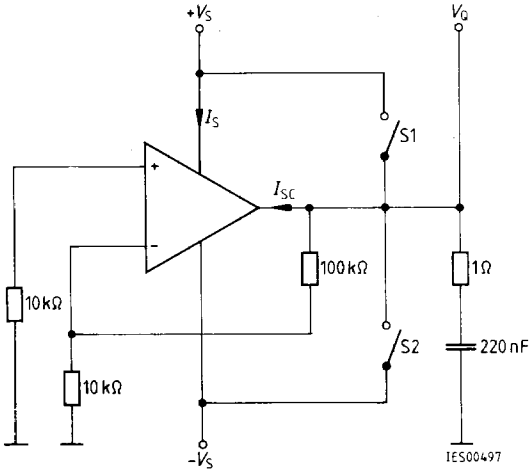
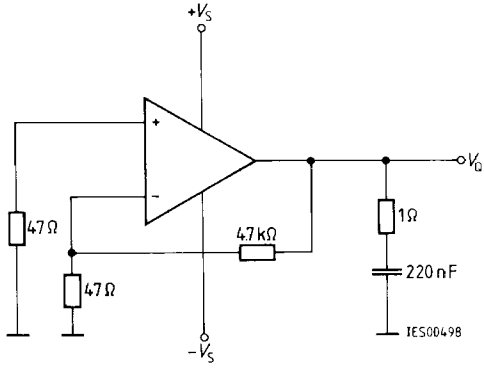
Test and Measurement Circuits

Figure 1
Open-Loop Supply Current Consumption, Noise Voltage



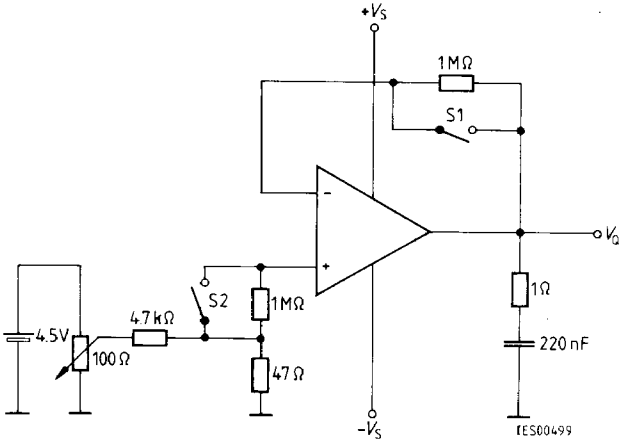
S1 and S2 as shown unless otherwise specified

Figure 2
Input Offset Voltage, Temperature Coefficient of V_{IO}



$V_Q = 100\ V_{IO}$

Figure 3
Input Offset Current; Input Current, Temperature Coefficient of I_{IO}



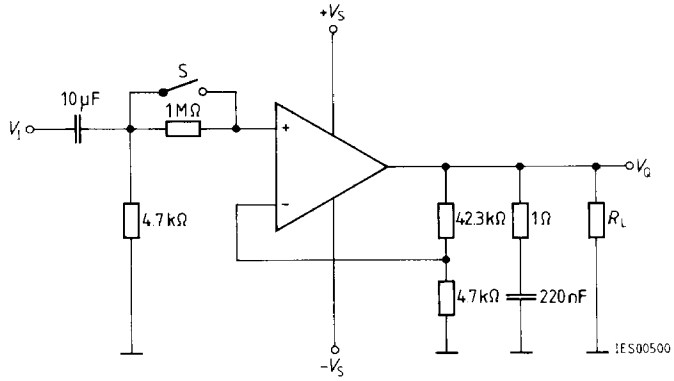
S1 open – S2 closed: $I_{I-} = \frac{V_Q}{1\,M\Omega}$

S2 open – S1 closed: $I_{I+} = \frac{V_Q}{1\,M\Omega}$

S1 open – S2 open: $I_{IO} = \frac{V_Q}{1\,M\Omega}$

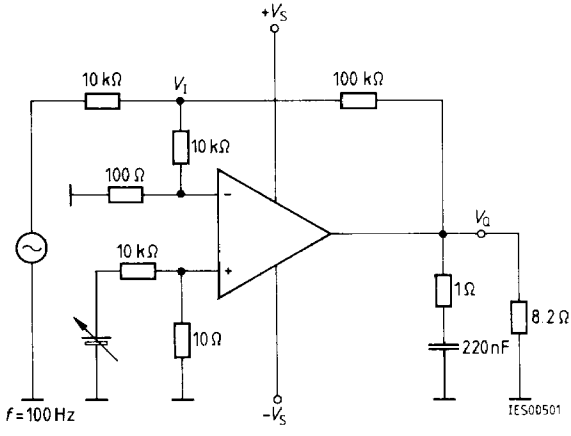
S1 closed – S2 closed: offset alignment

Figure 4
Output Voltage, Input Resistance



S closed: to measure V_{Qpp}
S open/closed: to measure R_I

Figure 5
Open-Loop Voltage Gain



$$G_{V0} = \left| 20 \log 101 \frac{V_Q}{V_I} \right| \text{(dB)}$$

Figure 6
Common-Mode Voltage Gain G_{VC}
Common-Mode Rejection k_{CMR} (dB) = G_{V0} (dB) − G_{VC} (dB)

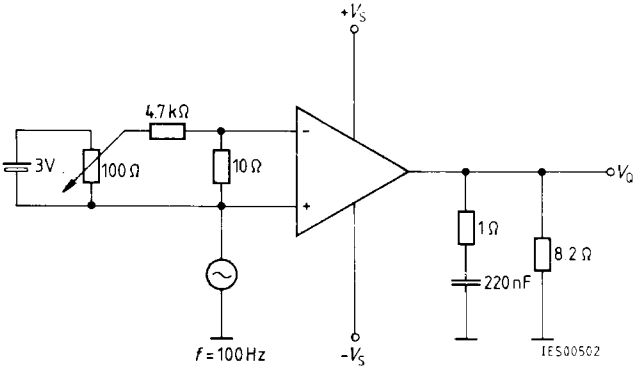
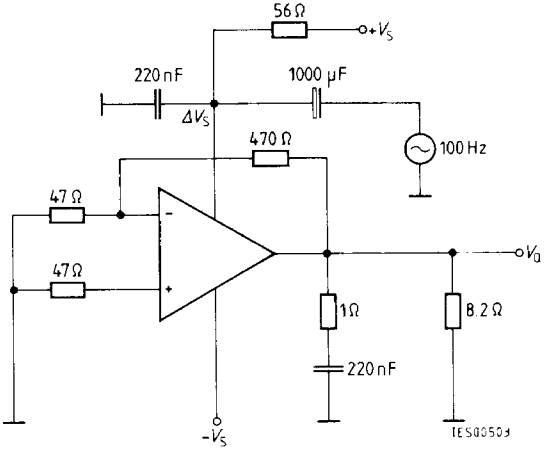


Figure 7
Supply Voltage Rejection



$$k_{SVR} = 20 \log \frac{\Delta V_Q}{G_V \times \Delta V_S} \text{ (dB)}$$

Figure 8
Slew Rate for Non-Inverting Operation

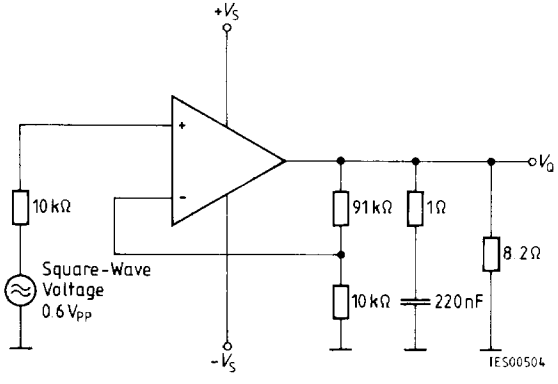


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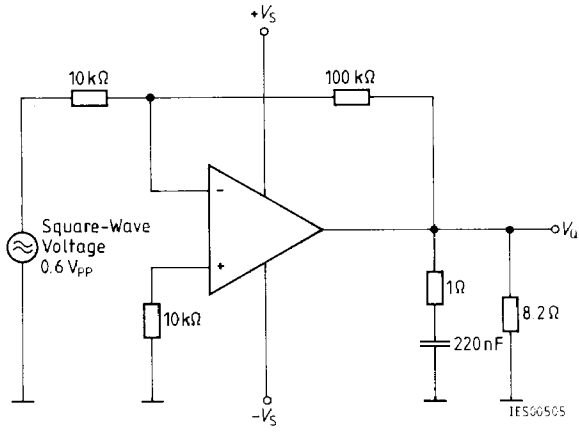
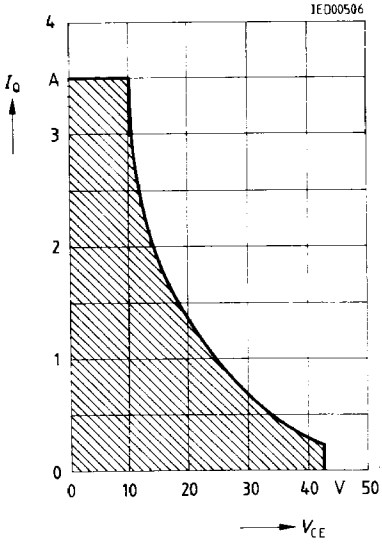
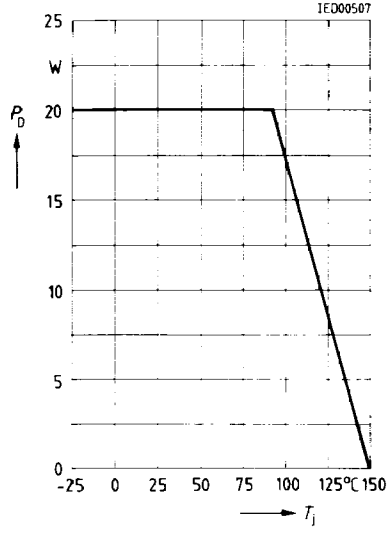
Figure 9
Slew Rate for Inverting Operation



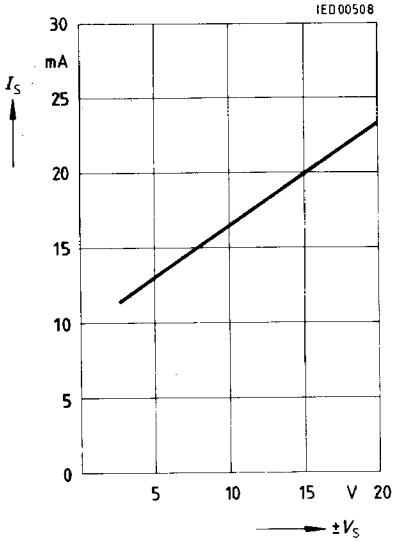
Safe Operating Area of Output Stage
Output Current versus Collector Emitter Voltage $T_j = 25\,°C$
$V_{CE} = +V_S - V_Q$ or $V_{CE} = -V_S - V_Q$



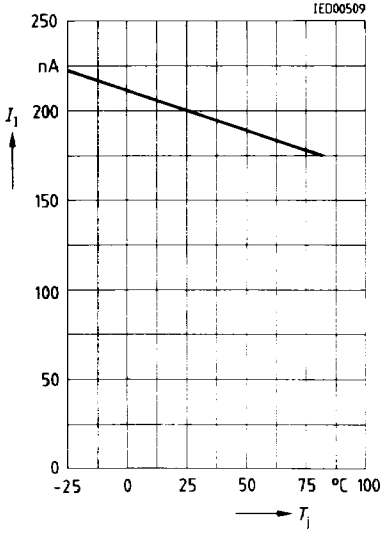
Maximum Permissible Power Dissipation versus Case Temperature



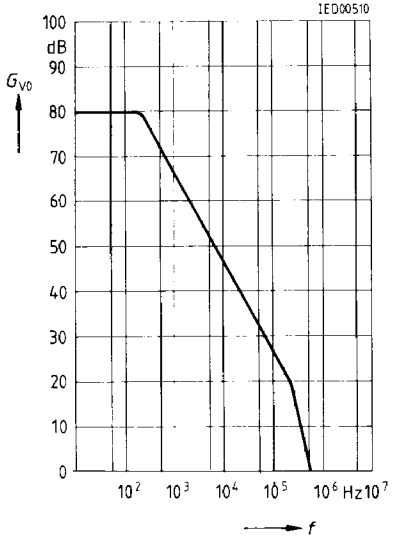
Supply Current versus Supply Voltage
$T_j = 25\,°C$



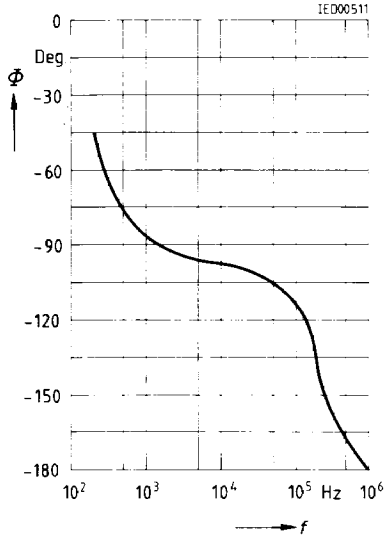
Input Current versus Junction Temperature
$V_S = \pm 15\,V$



Open-Loop Voltage Gain versus Frequency
$V_S = \pm 15\,V$, $T_j = 25\,°C$



Phase Response versus Frequency
$V_S = \pm 15\,V$, $T_j = 25\,°C$



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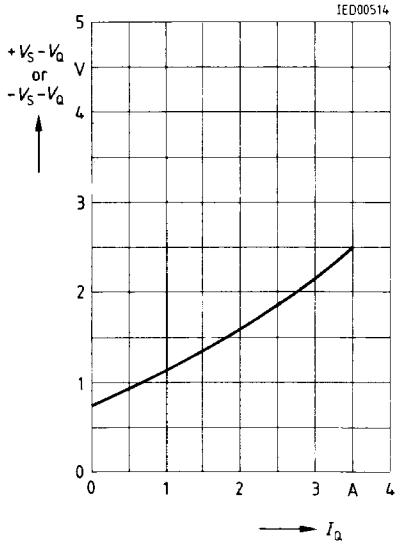
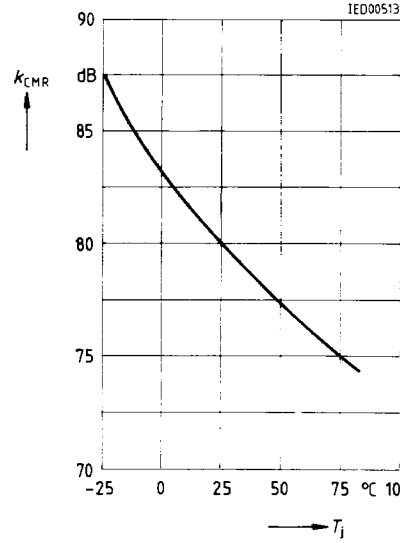
Saturation Voltage versus Output Current
$T_j = 25\,°C$



Common-Mode Rejection versus Junction Temperature
$V = \pm 15\,V$



Forward Current versus Forward Voltage
$T_j = 25\,°C$