

Dual Power Operational Amplifier

TCA 2365

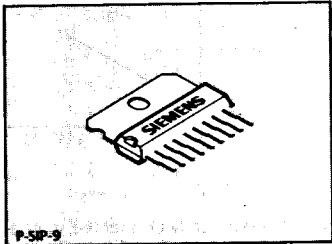
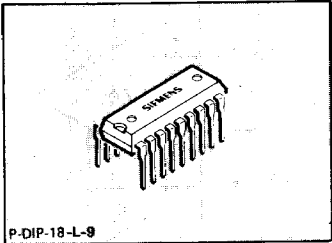
Features

- High output peak current of twice 2.5 A
- Wide supply voltage range, 8 V to 32 V
- High slew rate 4 V/ μ s
- Outputs entirely protected (DC short-circuit proof)
- Thermal overload protection
- Inhibit input enables "tristate" outputs

Applications

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

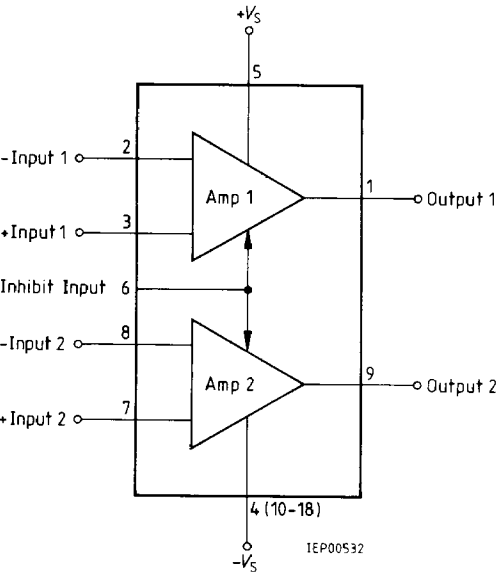
Bipolar IC



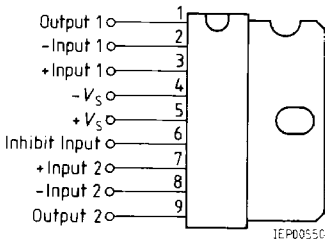
Type	Ordering Code	Package
TCA 2365	Q67000-A1876	P-SIP-9
TCA 2365 A	Q67000-A8017	P-DIP-18-L-9

The TCA 2365 is a dual power op amp in a P-SIP-9 or P-DIP-18L-9 package. The IC contains two identical op amps, each supplying a high output peak current of 2.5 A at supply voltages between ± 4 V and ± 15 V. Both amplifiers can be disconnected simultaneously (tristate; $Z_o \approx 4$ k Ω) via an inhibit input. Integrated protective circuits protect the outputs against short circuit to $+V_s$ and $-V_s$ and prevent thermal overloading of the IC.

Pin Configuration
TCA 2365 A



TCA 2365



Pin 4 is electrically connected to cooling fin.
(Establish external connection between pin 4 and pin 10-18)

Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit
		TCA 2365	TCA 2365 A	
Supply voltage	V_S	± 16	± 16	V
$t = 50 \text{ ms}$	V_S	± 18	± 18	V
Differential input voltage	V_{ID}	$\pm V_S$	$\pm V_S$	V
Output voltage range	V_O	$-V_S - 1 \text{ to } +V_S + 1$		V
Peak output current	I_O	± 2.5	± 2.5	A
Supply current	I_S	5.5	5.5	A
Junction temperature	T_J	150	150	$^{\circ}\text{C}$
Storage temperature range	T_{stg}	-55 to 125	-55 to 125	$^{\circ}\text{C}$
Thermal resistance				
junction - ambient	$R_{\text{th jA}}$	65	60	K/W
junction - case	$R_{\text{th jC}}$	6	10	K/W

Operating Range

Supply voltage	V_S	$\pm 4 \text{ to } \pm 15$	$\pm 4 \text{ to } \pm 15$	V
Case temperature	T_C	-25 to 85	-25 to 85	$^{\circ}\text{C}$
$P_{\text{tot}} = 10.0 \text{ W}$				
Voltage gain	$G_{V \text{ min}}$	10	10	dB

Characteristics $V_S = \pm 10 \text{ V}$; $T_j = 25^\circ\text{C}$

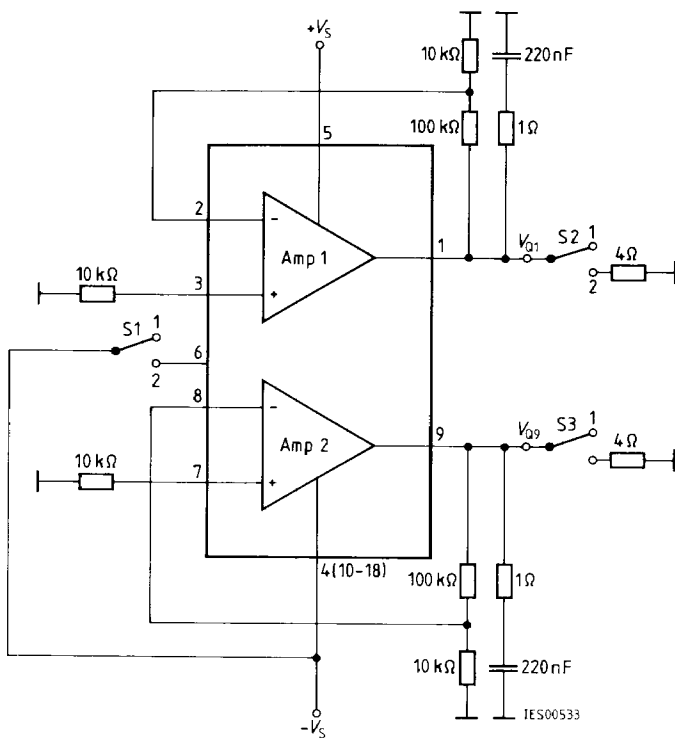
Parameter	Symbol	Limit Values			Unit	Test Circuit
		min.	typ.	max.		
Open-loop supply current consumption						
S1 in position 1	I_S		30	50	mA	1
S1 in position 2	I_{SM}		5	8	mA	1
Input offset voltage	V_{I0}	-10		10	mV	2
Input offset current	I_{I0}	-100		100	nA	3
Input current	I_I		0.25	1	μA	3
Output voltage						
($R_L = 12 \Omega$; $f = 1 \text{ kHz}$)	$V_{O \text{ pp}}$	± 8.5	± 9.0		V	4
($R_L = 4 \Omega$; $f = 1 \text{ kHz}$)	$V_{O \text{ pp}}$	± 8.0	± 8.5		V	4
($R_L = 470 \Omega$; $f = 50 \text{ kHz}$)	$V_{O \text{ pp}}$		± 6.0		V	4
Input resistance ($f = 1 \text{ kHz}$)	R_I	1	5		M Ω	4
Open-loop voltage gain ($f = 100 \text{ Hz}$)	G_{V0}	70	80		dB	5
Common-mode input voltage range	V_{IC}	+7/-10	+7.5/-10.5		V	6
Common-mode rejection	K_{CMR}	70	80		dB	6
Supply voltage rejection	K_{SVR}	70	80		dB	7
Temperature coefficient of V_{I0} $-25^\circ\text{C} \leq T_j \leq +85^\circ\text{C}$	$\alpha_{V_{I0}}$		50		$\mu\text{V/K}$	2
Temperature coefficient of I_{I0} $-25^\circ\text{C} \leq T_j \leq +85^\circ\text{C}$	$\alpha_{I_{I0}}$		0.4		nA/K	3
Slew rate of V_q for non-inverting operation ¹⁾	SR		4		V/ μs	8
Slew rate of V_q for inverting operation ¹⁾	SR		4		V/ μs	9
Noise voltage referred to input Inhibit input (referred to $-V_S$)	V_n		3		μV	1
V_6 for IC turned off	$V_{6 \text{ OFF}}$	0		1.0	V	1
V_6 for IC turned on	$V_{6 \text{ ON}}$	3.0		6	V	1
Turn-on time $ I_{1,9} > 1 \text{ A}$	$t_{D \text{ ON}}$		2	5	μs	1
Turn-off time $ I_{1,9} < 1 \text{ A}$	$t_{D \text{ OFF}}$		15	30	μs	1
S2 and S3 in position 2						

¹⁾ For the relationship between power bandwidth and slew rate refer to "General Information"

Test Circuits

Figure 1

Open-Loop Supply Current Consumption, Noise Voltage, Turn-Off Voltage



Switch as drawn unless otherwise specified.

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

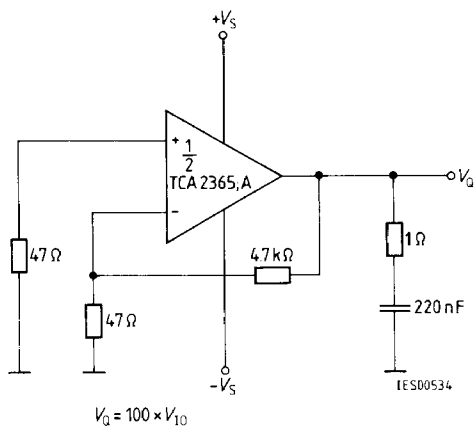
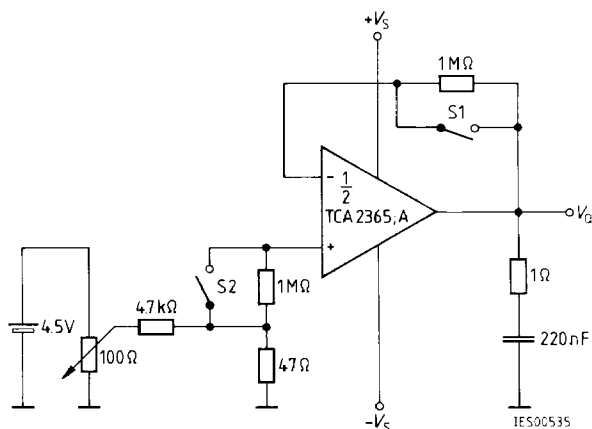


Figure 3
Input Offset Current, Input Current, Temperature Coefficient of I_{IO}



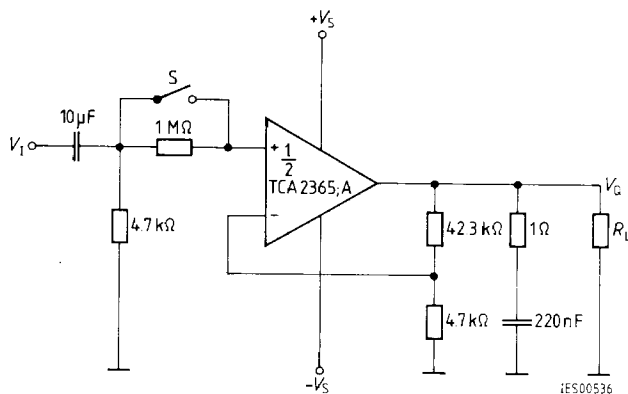
$$S1 \text{ open} - S2 \text{ closed: } I_{I-} = \frac{V_Q}{1 \text{ M}\Omega}$$

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

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

S1 closed - S2 closed: offset alignment

Figure 4
Output Voltage, Input Resistance



S closed: to measure $V_{O,pp}$

S open/closed: to measure R_I

Figure 5
Open-Loop Voltage Gain

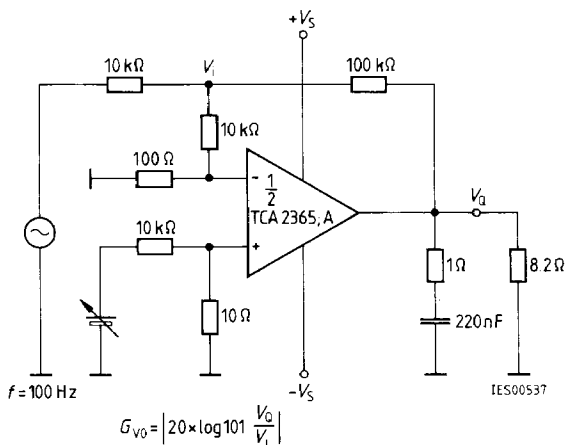
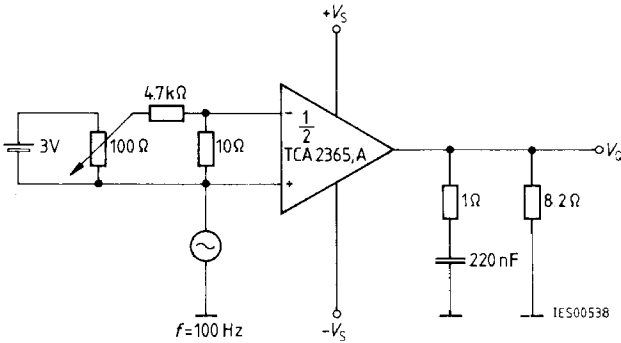
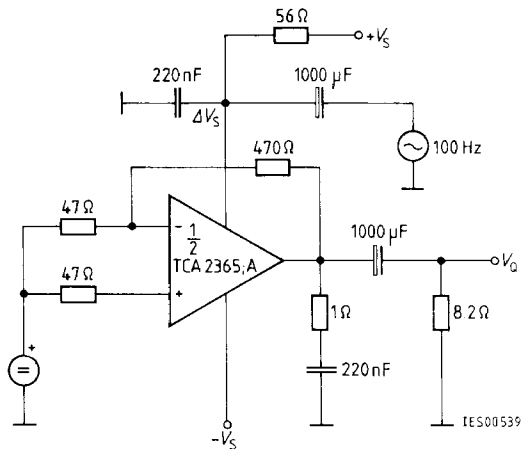


Figure 6**Common-Mode Voltage Gain G_{VC}** **Common-Mode Rejection $k_{CMR} \text{ (dB)} = G_{V0} \text{ (dB)} - G_{VC} \text{ (dB)}$** **Figure 7****Supply Voltage Rejection**

$$k_{SVR} = 20 \log \frac{\Delta V_O}{G_V \cdot \Delta V_S} \text{ [dB]}$$

Figure 8
Slew Rate for Non-Inverting Operation

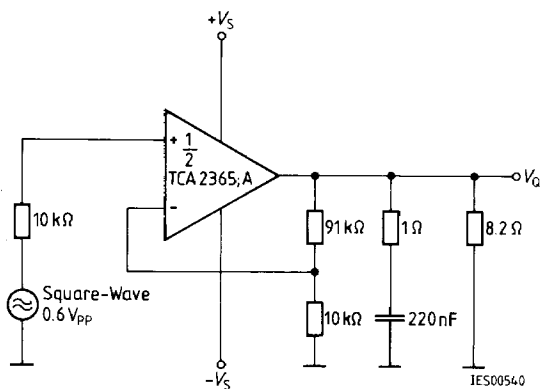
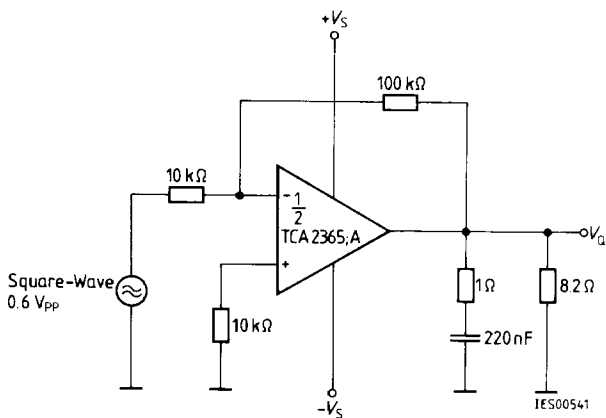
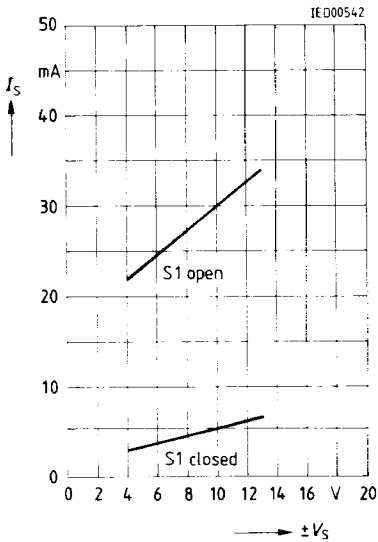


Figure 9
Slew Rate for Inverting Operation

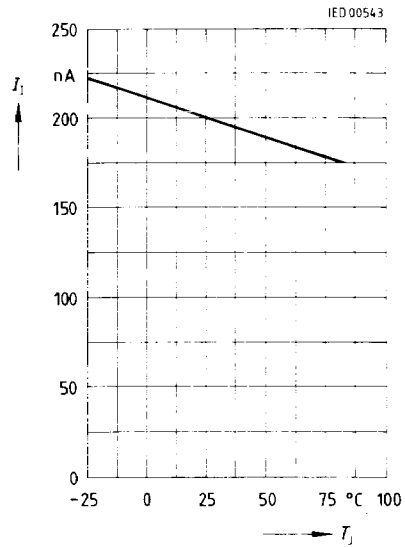


Supply Current I_S and I_{SM} versus Supply Voltage

$T_J = 25^\circ\text{C}$

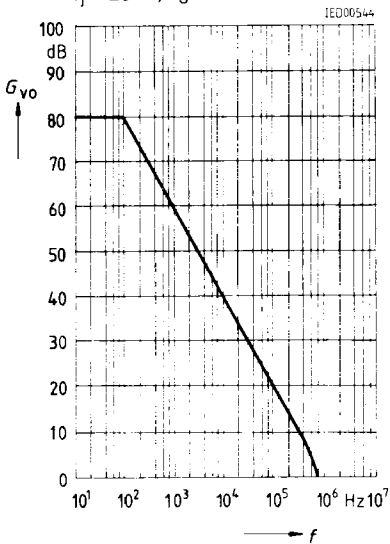


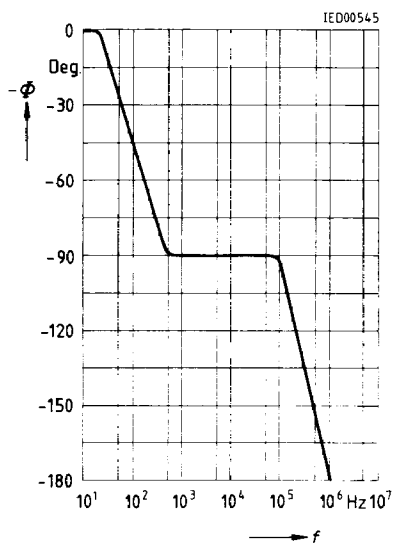
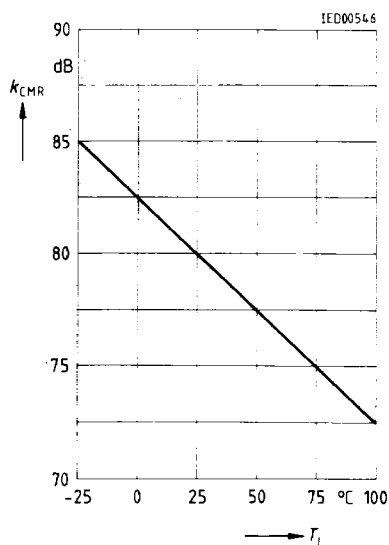
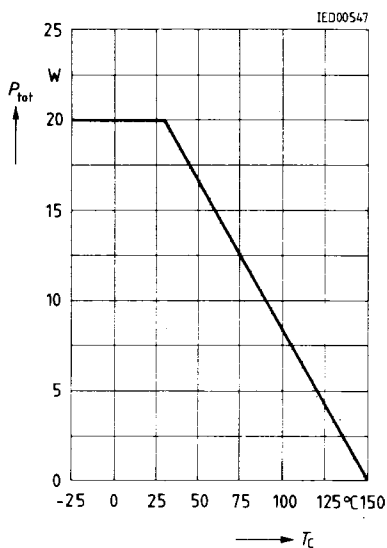
Input Current versus Junction Temperature



Open-Loop Voltage Gain versus Frequency

$T_J = 25^\circ\text{C}$; $V_S = \pm 10\text{ V}$



Phase Response versus Frequency $T_j = 25^\circ\text{C}; V_S = \pm 10\text{ V}$ **Common-Mode Rejection versus Junction Temperature** $V_S = \pm 10\text{ V}$ **Max. Permissible Power Dissipation versus Case Temperature****Max. Permissible Power Dissipation versus Case Temperature**