

May 1990

## General-Purpose High-Current N-P-N Transistor Arrays

CA3081 - Common-Emitter Array

CA3082 - Common-Collector Array

Directly Drive 7-Segment Incandescent Displays and Light-Emitting-Diode (LED) Displays

### Features:

- 7 transistors permit a wide range of applications in either a common-emitter (CA3081) or common-collector (CA3082) configuration
- High  $I_C$ : 100 mA max.
- Low  $V_{CE\ sat}$  (at 50 mA): 0.4 V typ.

### Applications:

- Drivers for:
  - Incandescent display devices
  - LED displays
  - Relay control
  - Thyristor firing

CA3081 and CA3082 consist of seven high-current (to 100 mA) silicon n-p-n transistors on a common monolithic substrate. The CA3081 is connected in a common-emitter configuration and the CA3082 is connected in a common-collector configuration.

The CA3081 and CA3082 are capable of directly driving seven-segment displays, and light-emitting diode (LED)

displays. These types are also well-suited for a variety of other drive applications, including relay control and thyristor firing.

The CA3081 and CA3082 are supplied in a 16-lead Small Outline package (M suffix), in a 16-lead dual-in-line plastic package (E suffix), and in a 16-lead dual-in-line frit-seal ceramic package (F suffix), which include a separate substrate connection for maximum flexibility in circuit design. Both types are also available in chip form.

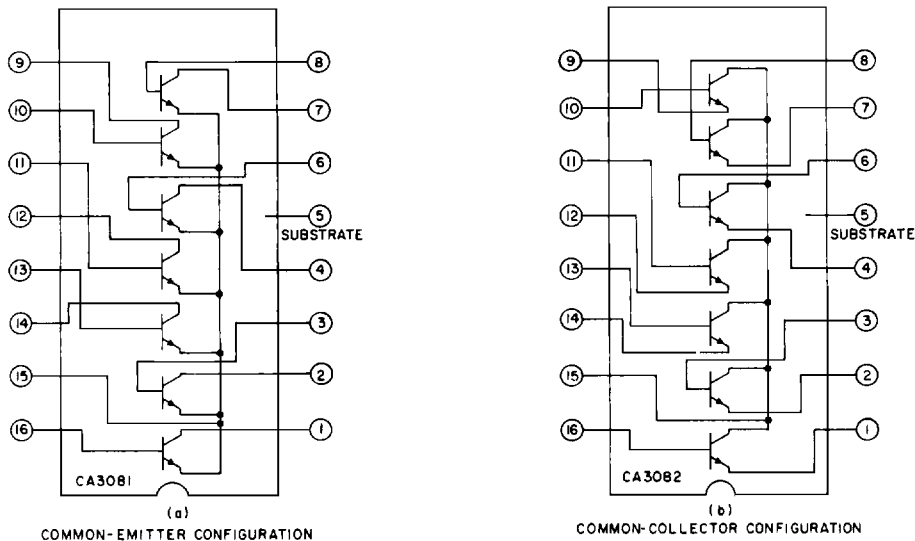


Figure 1 - Functional diagrams of types CA3081 and CA3082.

## CA3081, CA3082

### MAXIMUM RATINGS, Absolute-Maximum Values at $T_A = 25^\circ\text{C}$

**Power Dissipation:**

Any one transistor .....	500	mW
Total package .....	750	mW
Above $55^\circ\text{C}$ .....	Derate linearly 6.67	$\text{mW}/^\circ\text{C}$

**Ambient Temperature Range:**

Operating .....	$-55$ to $+125$	$^\circ\text{C}$
Storage .....	$-65$ to $+150$	$^\circ\text{C}$

**Lead Temperature (During Soldering):**

At distance  $1/16'' \pm 1/32''$  ( $1.59 \text{ mm} \pm 0.79 \text{ mm}$ )

from case for 10 seconds max. ....	265	$^\circ\text{C}$
------------------------------------	-----	------------------

The following ratings apply for each transistor in the device:

Collector-to-Emitter Voltage ( $V_{\text{CEO}}$ ) .....	16	V
Collector-to-Base Voltage ( $V_{\text{CBO}}$ ) .....	20	V
Collector-to-Substrate Voltage ( $V_{\text{CIO}}$ ) <sup>■</sup> .....	20	V
Emitter-to-Base Voltage ( $V_{\text{EBO}}$ ) .....	5	V
Collector Current ( $I_C$ ) .....	100	mA
Base Current ( $I_B$ ) .....	20	mA

\* The collector of each transistor of the CA3081 and CA3082 is isolated from the substrate by an integral diode. The substrate must be connected to a voltage which is more negative than any collector voltage in order to maintain isolation between transistors and

provide normal transistor action. To avoid undesired coupling between transistors, the substrate terminal (5) should be maintained at either DC or signal (AC) ground. A suitable bypass capacitor can be used to establish a signal ground.

### ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$

**For Equipment Design**

CHARACTERISTIC	SYMBOL	TEST CONDITIONS		LIMITS			UNITS
			Typ. Char. Curve	Min.	Typ.	Max.	
Collector-to-Base Breakdown Voltage	$V_{(\text{BR})\text{CES}}$	$I_C = 500 \mu\text{A}, I_E = 0$	-	20	60	-	V
Collector-to-Substrate Breakdown Voltage	$V_{(\text{BR})\text{CIO}}$	$ I_C  = 500 \mu\text{A}, I_E = 0, I_B = 0$	-	20	60	-	V
Collector-to-Emitter Breakdown Voltage	$V_{(\text{BR})\text{CEO}}$	$I_C = 1 \text{ mA}, I_B = 0$	-	16	24	-	V
Emitter-to-Base Breakdown Voltage	$V_{(\text{BR})\text{EBO}}$	$I_C = 500 \mu\text{A}$	-	5	6.9	-	V
DC Forward Current Transfer Ratio	$h_{\text{FE}}$	$V_{\text{CE}} = 0.5 \text{ V}, I_C = 30 \text{ mA}$	-	30	68	-	
		$V_{\text{CE}} = 0.8 \text{ V}, I_C = 50 \text{ mA}$	-	40	70	-	
Base-to-Emitter Saturation Voltage	$V_{\text{BE sat}}$	$I_C = 30 \text{ mA}, I_B = 1 \text{ mA}$	3	-	0.87	1.0	V
Collector-to-Emitter Saturation Voltage: CA3081, CA3082	$V_{\text{CE sat}}$	$I_C = 30 \text{ mA}, I_B = 1 \text{ mA}$	-	-	0.27	0.5	V
		$I_C = 50 \text{ mA}, I_B = 5 \text{ mA}$	4	-	0.4	0.7	
		$I_C = 50 \text{ mA}, I_B = 5 \text{ mA}$	4	-	0.4	0.8	
Collector-Cutoff Current	$I_{\text{CEO}}$	$V_{\text{CE}} = 10 \text{ V}, I_B = 0$	-	-	-	10	$\mu\text{A}$
Collector-Cutoff Current	$I_{\text{CBO}}$	$V_{\text{CB}} = 10 \text{ V}, I_E = 0$	-	-	-	1	$\mu\text{A}$

TYPICAL STATIC CHARACTERISTICS FOR EACH TRANSISTOR OF TYPES CA3081 AND CA3082

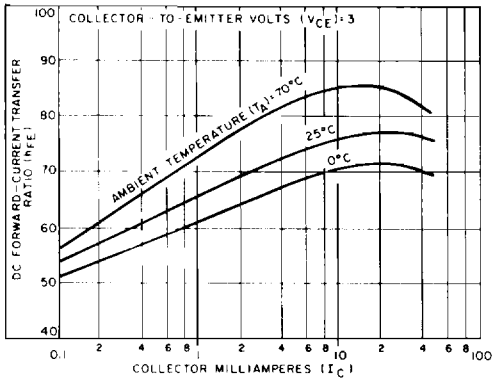


Fig. 2-hFE vs. IC

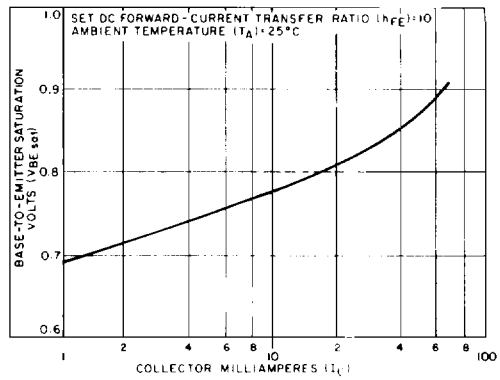


Fig. 3-VBEsat vs. IC

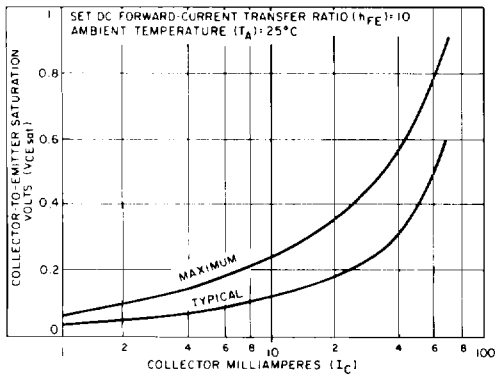


Fig. 4-VCEsat vs. IC at TA = 25°C

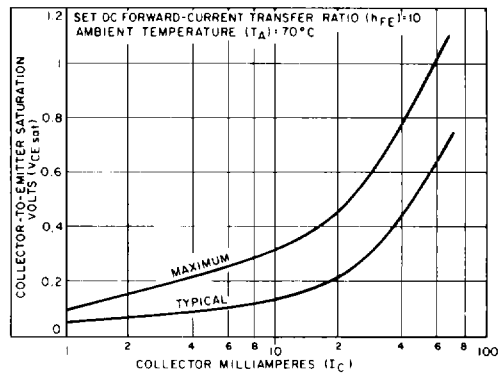


Fig. 5-VCEsat vs. IC at TA = 70°C

TYPICAL READ-OUT DRIVER APPLICATIONS

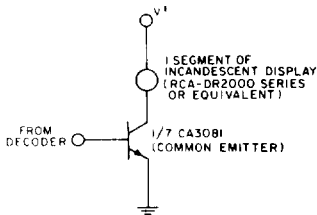
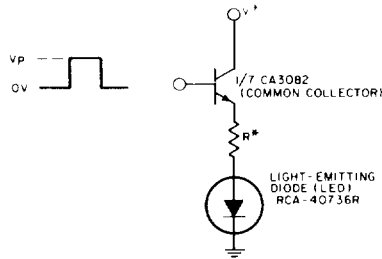


Fig. 6-Schematic diagram showing one transistor of the CA3081 driving one segment of an incandescent display.



\*THE RESISTANCE FOR R IS DETERMINED BY THE RELATIONSHIP

$$R = \frac{V_p - V_{BE} - V_f(LED)}{I(LED)}$$

WHERE:  $V_p$  = INPUT PULSE VOLTAGE

$$R = 0 \text{ FOR } V_p \geq V_{BE} + V_f(LED)$$

$V_f$  = FORWARD VOLTAGE DROP ACROSS THE DIODE

Fig. 7-Schematic diagram showing one transistor of the CA3082 driving a light-emitting diode (LED).