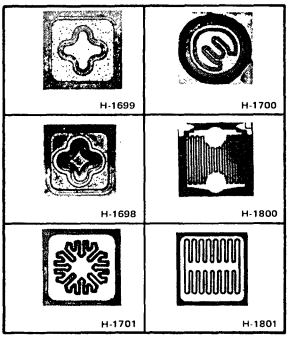
RCA
Solid State
Division

Power Transistors

CH2102 CH3439
CH2270 CH3440 CH5262 CH5322
CH2405 CH4036 CH5320 CH5323
CH3053 CH4037 CH5321 CH6479



Unmounted and Unencapsulated N-P-N and P-N-P Silicon Power Transistor Chips

Features:

- Prepared and tested for use in hybrid circuits
- h_{FE} ratings from 30 to 50 (min.)
- I_{CBO} leakage ratings in the 10 μA to 1 mA range
- V_{CEO} ratings up to 90 V on planar transistor chips; up to 325 V on passivated mesa types
- I_C up to 12 A (CH6479)

The transistor chip families described in this bulletin are selected from the broad line of RCA discrete power transistors. Known also as pellets or dies, these chips represent the essential electronic portion of the transistor. They are especially suited for direct mounting on a heat sink in hybrid circuits. The n-p-n and p-n-p types can be used either singly or in complementary-pair configurations for large-signal medium-power applications.

All of the chip families shown are double-diffused epitaxial types. Six of the families are of planar construction; the other is of a passivated mesa construction. The oxide layer that results from conventional planar processing protects the planar types. The junctions and surfaces of the mesa transistor chips are protected by deposited glass-passivated coverings.

Aluminum has been deposited at the base and emitter electrodes of all the transistor chips for ease of bonding. The base and emitter bonding areas on each chip will accommodate up to a 0.003-inch (0.076-mm)-diameter bond wire except for the CH6479 which will accommodate a 0.010-inch (0.254-mm) wire. Either thermo-compression or ultrasonic bonding can be used to attach gold wires to these electrodes; aluminum wires can also be bonded by conventional ultrasonic techniques.

The collector contact, which is on the underside of the chip, has been metallized with gold for all of the chips except CH6479. For all of the chips, the collector can be attached directly to a heat sink by adhesive or by gold-silicon or gold-germanium eutectic bonding methods.

The CH6479, because of its large size, must be mounted on a heat sink made of material with thermal expansion coefficient close to that of silicon; suitable materials are molybdenum or beryllium oxide. A special cleaning step is required in mounting the CH6479, as noted on page 5.

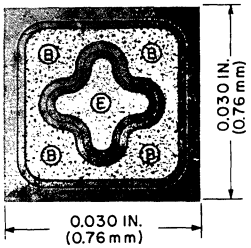
All of the chips must be mounted in an inert or reduced atmosphere. The chips must not be subjected to more than 400°C for a maximum of 1 minute. Because of the specially prepared surfaces of the chips (except as noted for the CH6479), etching of the pellets or the use of flux is not recommended.

The chips are supplied in plastic containers. Each chip is securely held in a recessed partition of the container by a clear plastic cover that also protects the surface from dust and abrasion. For additional protection, the container is sealed in a clear plastic bag. If the sealed shipping container is opened or broken, ruptured, punctured, or damaged in any way, the chips must be stored at a temperature of not more than 40°C and a relative humidity of not more than 50% in a clean, dust-free environment. If the sealed shipping container is damaged on receipt as described above, the product should be immediately returned to RCA.

These unmounted and unencapsulated chips are tested electrically and visually inspected to meet the specifications shown on the following pages. Written notification of non-conformance to such specifications must be made to RCA within 90 days of the date of the shipment by RCA. RCA assumes no responsibility for chips which have been subjected to further processing, such as, but not limited to, lead-bonding or pellet-mounting operations.

RCA has the right to change the chip design and processing without notification.

Assistance in determining proper mounting and bonding procedures is available from RCA.



2N2102 Family (n-p-n)

CH2102 CH2405
CH2270 CH3053

RCA-CH2102, CH2270, CH2405, and CH3053 are double-diffused n-p-n epitaxial planar transistor chips similar to RCA-2N2102, 2N2270, 2N2405, and 2N3053 transistors, respectively. They can be used either singly or in complementary-pair configurations with RCA p-n-p chips CH4036 and CH4037 for large-signal medium-power applications.

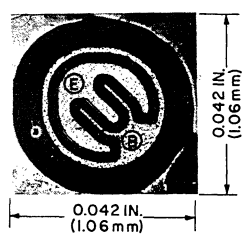
(B) 4 Base Bonding Areas 0.008 in. (0.20 mm) diameter

(E) Emitter Bonding Area 0.008 in. (0.20 mm) diameter

ELECTRICAL CHARACTERISTICS, at Chip Temperature = 25°C

Characteristic	Symbol	Test Conditions				Limits								Units
		Voltage V dc		Current mA dc		CH2102		CH2270		CH2405		CH3053		
		V_{CB}	V_{CE}	I_C	I_E	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Collector Cutoff Current	I_{CBO}	60					10		10		10		10	μA
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$				0.01	5		5		5		5		V
Collector-to-Emitter Sustaining Voltage: Base open[a]	$V_{CEO(sus)}$			20		60		45		90		30		V
DC Forward-Current Transfer Ratio[b]	h_{FE}		10	150		50		50		50		50		

[a]CAUTION: This voltage MUST NOT be measured on a curve tracer. [b]Pulse tested; 2% duty factor, less than or equal to 300 μs duration.



2N3439 Family (n-p-n)

CH3439
CH3440

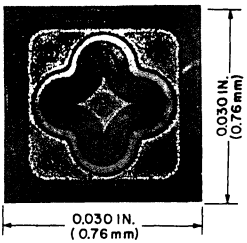
RCA-CH3439 and CH3440 are passivated mesa n-p-n transistor chips similar to those used in RCA-2N3439 and 2N3440 high-voltage transistors. Because of their high breakdown voltages, good high-frequency response, and fast switching speeds, these transistor chips can be used in high-voltage differential and operational amplifiers, high-voltage inverters and high-voltage, low-current switching regulators.

(B) Base Bonding Area 0.005 in. (0.13 mm) diameter

(E) Emitter Bonding Area 0.005 in. (0.13 mm) diameter

ELECTRICAL CHARACTERISTICS, at Chip Temperature = 25°C

Characteristic	Symbol	Test Conditions				Limits				Units
		Voltage V dc		Current mA dc		CH3439		CH3440		
		V_{CB}	V_{CE}	I_C	I_E	Min.	Max.	Min.	Max.	
Collector Cutoff Current	I_{CBO}	200					20		50	μA
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$				0.02	5		5		V
Collector-to-Emitter Sustaining Voltage: Base open [a]	$V_{CEO(sus)}$			20		325		250		V
DC Forward-Current Transfer Ratio [b]	h_{FE}		10	20		30		30		



2N4036 Family (p-n-p)

CH4036
CH4037

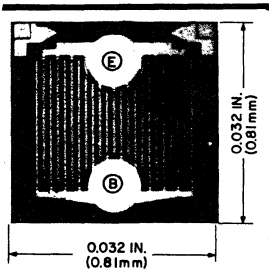
RCA-CH4036 and CH4037 are double-diffused p-n-p epitaxial planar transistor chips similar to RCA-2N4036 and 2N4037 transistors. Their high-voltage ratings and heat-dissipating ability make them ideal for amplifying large signals at a medium power level. They can be used singly or as complements of RCA n-p-n chips CH2102, CH2270, CH2405, and CH3053.

Ⓑ 4 Base Bonding Areas 0.008 in. (0.13 mm) diameter

Ⓔ Emitter Bonding Area 0.008 in. (0.13 mm) diameter

ELECTRICAL CHARACTERISTICS, at Chip Temperature = 25°C

Characteristic	Symbol	Test Conditions				Limits				Units
		Voltage V dc		Current mA dc		CH4036		CH4037		
		V_{CB}	V_{CE}	I_C	I_E	Min.	Max.	Min.	Max.	
Collector Cutoff Current	I_{CBO}	-60					-10		-10	μA
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$				-0.01	-6.5		-6.6		V
Collector-to-Emitter Sustaining Voltage: Base open [a]	$V_{CEO(sus)}$			-20		-65		-40		V
DC Forward-Current Transfer Ratio [b]	h_{FE}		-10	-150		35		35		



2N5262 Family (n-p-n)

CH5262

RCA-CH5262 is a double-diffused n-p-n epitaxial planar transistor chip similar to the RCA-2N5262 transistor. Its high speed and high current capability make it ideal for use in driving magnetic systems and in other applications requiring the switching of high currents through inductive loads.

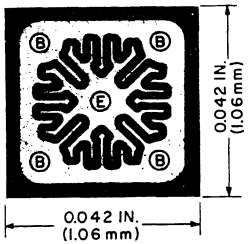
Ⓑ Base Bonding Areas 0.005 in. (0.13 mm) diameter

Ⓔ Emitter Bonding Area 0.005 in. (0.13 mm) diameter

ELECTRICAL CHARACTERISTICS, at Chip Temperature = 25°C

Characteristic	Symbol	Test Conditions				Limits		Units
		Voltage V dc		Current mA dc		CH5320		
		V_{CB}	V_{CE}	I_C	I_E	Min.	Max.	
Collector Cutoff Current	I_{CBO}	60					10	μA
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$				0.01	5		V
Collector-to-Emitter Sustaining Voltage: Base open [a]	$V_{CEO(sus)}$			10		35		V
DC Forward-Current Transfer Ratio [b]	h_{FE}		6	100		30		

[a] CAUTION: This voltage MUST NOT be measured on a curve tracer. [b] Pulse tested; 2% duty factor, less than or equal to 300 μs duration.



2N5320 Family (n-p-n)

CH5320
CH5321

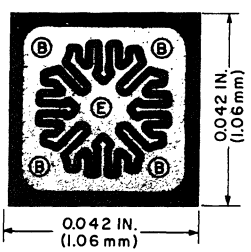
RCA-CH5320 and CH5321 are double-diffused n-p-n epitaxial planar transistor chips similar to RCA-2N5320 and 2N5321 transistors. They can be used singly or as complements of RCA p-n-p chips CH5322 and CH5323.

(B) 4 Base Bonding Areas 0.008 in. (0.20 mm) diameter

(E) Emitter Bonding Area 0.008 in. (0.20 mm) diameter

ELECTRICAL CHARACTERISTICS, at Chip Temperature = 25°C

Characteristic	Symbol	Test Conditions				Limits				Units
		Voltage V dc		Current mA dc		CH5320		CH5321		
		V_{CB}	V_{CE}	I_C	I_E	Min.	Max.	Min.	Max.	
Collector Cutoff Current	I_{CBO}	60					10		10	μA
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$				0.01	5		5		V
Collector-to-Emitter Sustaining Voltage: Base open [a]	$V_{CEO(sus)}$			20		80		55		V
DC Forward-Current Transfer Ratio [b]	h_{FE}		10	250		30		30		



2N5323 Family (p-n-p)

CH5322
CH5323

RCA-CH5322 and CH5323 are double-diffused p-n-p epitaxial planar transistor chips similar to RCA-2N5322 and 2N5323 transistors. They can be used singly or as complements of RCA n-p-n chips CH5320 and CH5321 for amplifying large signals at a medium power level.

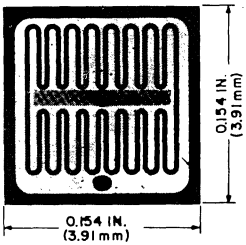
(B) 4 Base Bonding Areas 0.008 in. (0.20 mm) diameter

(E) Emitter Bonding Area 0.008 in. (0.20 mm) diameter

ELECTRICAL CHARACTERISTICS, at Chip Temperature = 25°C

Characteristic	Symbol	Test Conditions				Limits				Units
		Voltage V dc		Current mA dc		CH5322		CH5323		
		V_{CB}	V_{CE}	I_C	I_E	Min.	Max.	Min.	Max.	
Collector Cutoff Current	I_{CBO}	-60					-10		-10	μA
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$				-0.01	-5		-5		V
Collector-to-Emitter Sustaining Voltage: Base open [a]	$V_{CEO(sus)}$			-20		-80		-55		V
DC Forward-Current Transfer Ratio [b]	h_{FE}		-10	-250		30		30		

[a] CAUTION: This voltage MUST NOT be measured on a curve tracer. [b] Pulse tested; 2% duty factor, less than or equal to 300 μs duration.



CH6479 Family (n-p-n) CH6479

RCA-CH6479 is a double-diffused n-p-n epitaxial planar transistor chip similar to the RCA-2N6479 transistor. Radiation hardening makes this type suitable for aerospace applications, and high-switching speeds make it ideal for use in high-speed inverters, switching regulators, and military hybrid applications.

(B) Base Bonding Area 0.013 in. (0.33 mm) x 0.091 in. (2.31 mm)

(E) Emitter Bonding Area 0.013 in. (0.33 mm) x 0.091 in. (2.31 mm)

ELECTRICAL CHARACTERISTICS, at Chip Temperature = 25°C

Characteristic	Symbol	Test Conditions				Limits		Units
		Voltage V dc		Current mA dc		CH6479		
		V_{CB}	V_{CE}	I_C	I_E	Min.	Max.	
Collector Cutoff Current	I_{CBO}	100					1	mA
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$				1	5		V
Collector-to-Emitter Sustaining Voltage: Base open [a]	$V_{CEO(sus)}$			25		60		V
DC Forward-Current Transfer Ratio [b]	h_{FE}		2	500		40		

[a] CAUTION: This voltage MUST NOT be measured on a curve tracer.

[b] Pulse tested; 2% duty factor, less than or equal to 300 μs duration.

CH6479 Chip Special Clean-Up Schedule:

Before eutectic mounting, the CH6479 chip must be etched for 30 seconds in a 10% (by volume) electronic-grade hydrofluoric acid solution at 25°C ± 5°C with agitation. Normal precautions for using hydrofluoric acid should be observed. The chip must then be dried and mounted within 8 hours.

CHIP INSPECTION INFORMATION

Each lot is inspected to a 2.5% AQL (cumulative) according to Mil Std. 105 using 20 times magnification. The following defects determine the inspection criteria:

Foreign matter adhering to the base and emitter bond areas.

Improperly cut pellets that include a portion of another pellet.

Bridging by the metallization which causes a short.

Blistering, lifting or absence of the aluminum metallization.

Fractures or edges within 0.0005 in. (0.013) mm of the base collector junction.

Severed base-contact rings that isolate all the bonding pads and most of the base area.

Oxide missing from the junction area.