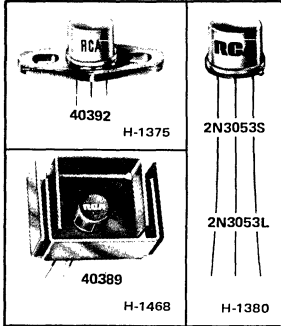




# Power Transistors

## 2N3053 40389 40392



### General-Purpose, Medium-Power Silicon N-P-N Planar Transistors

For Small-Signal Applications  
In Industrial and Commercial Equipment

**Features:**

- Maximum safe-area-of-operation curve
- Forward- and reverse-bias operation without second breakdown
- Low leakage current

These devices are available with either 1½-inch leads (TO-5 package) or ½-inch leads (TO-39 package). The longer-lead versions are specified by suffix "L" after the type number; the shorter-lead versions are specified by suffix "S" after the type number.

RCA-2N3053 is a silicon n-p-n planar transistor useful up to 20 MHz in small-signal, medium-power applications. Type 40389 is a 2N3053 with a factory-attached diamond-shaped mounting flange.

**Applications:**

- Audio amplifiers
- Controlled amplifiers
- Power supplies
- Power oscillators

**MAXIMUM RATINGS, Absolute-Maximum Values:**

	2N3053	40389 40392	
COLLECTOR-TO-BASE VOLTAGE . . . . .	60	60	V <sub>CBO</sub> V
COLLECTOR-TO-EMITTER SUSTAINING VOLTAGE: With external base-to-emitter resistance (RBE) = 10 Ω . . . . .	50	50	V <sub>CEr(sus)</sub> V
With base open . . . . .	40	40	V <sub>CEO(sus)</sub> V
With base-emitter-junction reverse-biased . . . . .	60	60	V <sub>CEV(sus)</sub> V
EMITTER-TO-BASE VOLTAGE . . . . .	5	5	V <sub>EB0</sub> V
COLLECTOR CURRENT . . . . .	0.7	0.7	I <sub>C</sub> A
TRANSISTOR DISSIPATION: At case temperatures up to 25°C . . . . .	5	7	P <sub>T</sub> W
At free-air temperatures up to 25°C . . . . .	1	3.5	W
At temperatures above 25°C . . . . .		(40392) (40389)	See Figs.1, 2, and 3
TEMPERATURE RANGE: Storage and operating (Junction) . . . . .	← -65 to +200 →		°C
LEAD TEMPERATURE (During soldering): At distance ≥ 1/32 in. (0.8 mm) from seating plane for 10 s max. . . . .	← 235 →		°C

ELECTRICAL CHARACTERISTICS, At Case Temperature ( $T_C$ ) = 25°C

Characteristics	Symbol	TEST CONDITIONS							LIMITS		Units
		DC Collector Voltage V		DC Emitter or Base Voltage V		DC Current mA			Types 2N3053 40389 40392		
		$V_{CB}$	$V_{CE}$	$V_{EB}$	$V_{BE}$	$I_C$	$I_E$	$I_B$	Min.	Max.	
Collector-Cutoff Current	$I_{CBO}$	30					0		—	0.25	$\mu A$
Emitter-Cutoff Current	$I_{EBO}$			4		0			—	0.25	$\mu A$
DC Forward-Current Transfer Ratio	$h_{FE}$		10			150 <sup>a</sup>			50	250	
Collector-to-Base Breakdown Voltage	$BV_{CBO}$					0.1	0		60	—	V
Emitter-to-Base Breakdown Voltage	$BV_{EBO}$					0	0.1		5	—	V
Collector-to-Emitter Sustaining Voltage: With base open	$V_{CEO(sus)}$					100 <sup>a</sup>		0	40	—	V
With external base-to-emitter resistance ( $R_{BE}$ ) = 10 $\Omega$	$V_{CER(sus)}$					100 <sup>a</sup>			50	—	V
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$					150		15	—	1.7	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$					150		15	—	1.4	V
Small-Signal, Forward Current Transfer Ratio (At 20 MHz)	$h_{fe}$		10			50			5	—	
Output Capacitance	$C_{ob}$	10					0		—	15	pF
Input Capacitance	$C_{ib}$			0.5		0			—	80	pF
Thermal Resistance:											
Junction-to-Case	$\theta_{J-C}$								35(max.) 2N3053		°C/W
									25(max.) 40392		°C/W
Junction-to-Free Air	$\theta_{J-FA}$								175(max.) 2N3053		°C/W
									50(max.) 40389		°C/W

<sup>a</sup>Pulsed; pulse duration = 300 $\mu s$ , duty factor = 1.8%.

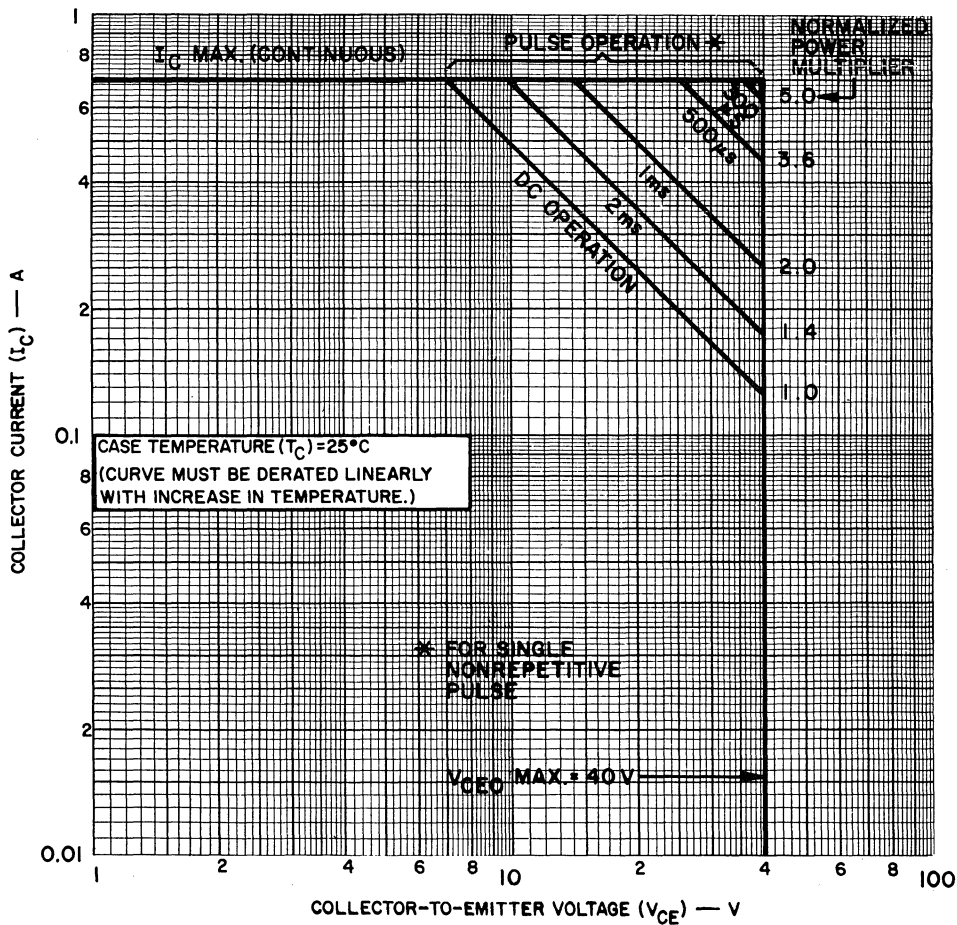
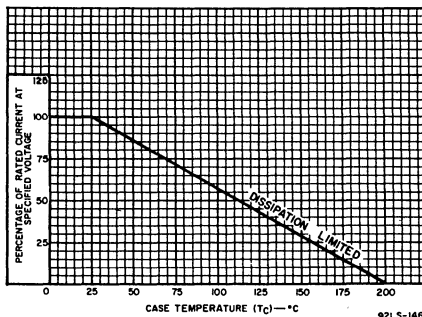
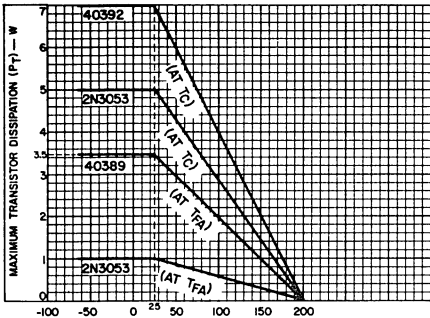


Fig.1 — Maximum operating areas for type 2N3053.

92SS-3362

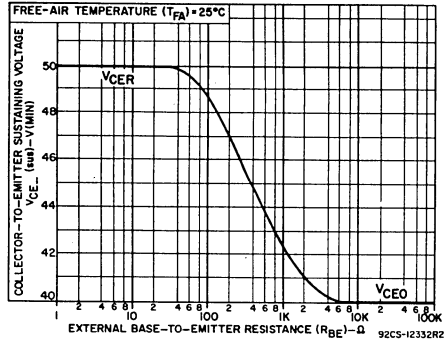
Fig.2 — Derating curve for type 2N3053.





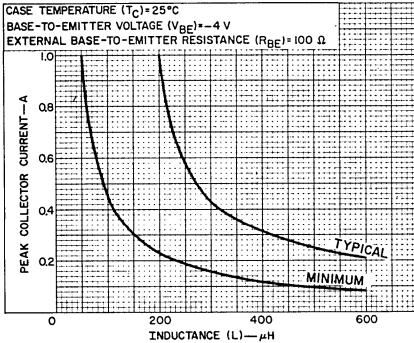
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Fig. 3 - Dissipation derating curves for all types.



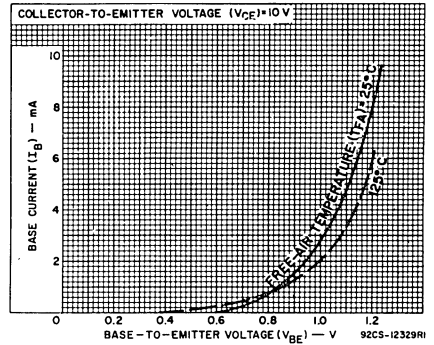
92CS-12332R2

Fig. 4 - Sustaining voltage vs. base-to-emitter resistance for all types.



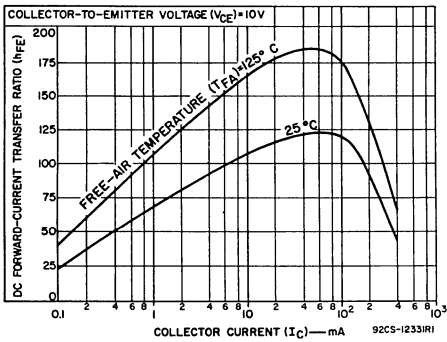
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Fig. 5 - Reverse-bias, second-breakdown characteristics for all types.



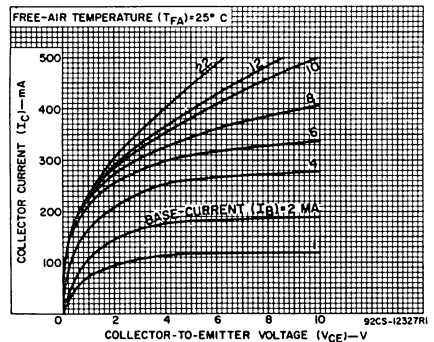
92CS-12332R1

Fig. 6 - Typical dc-beta characteristics for all types.



92CS-12331R1

Fig. 7 - Typical input characteristics for all types.



92CS-12327R1

Fig. 8 - Typical output characteristics for all types.

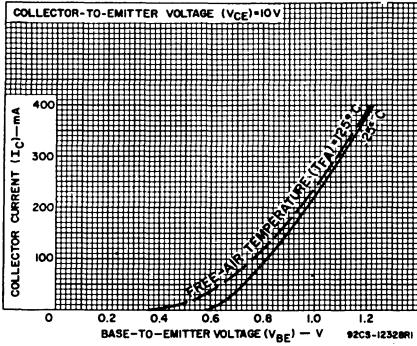


Fig. 9 - Typical transfer characteristics for all types.

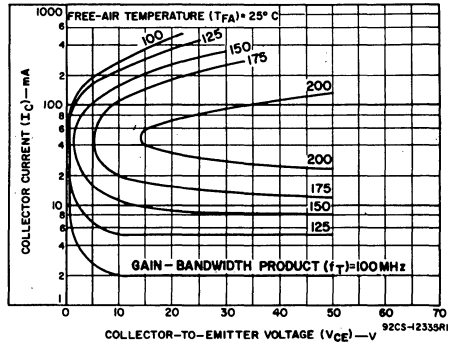


Fig. 10 - Typical variation of gain-bandwidth product with  $I_C$  and  $V_{CE}$  for all types.

**TERMINAL CONNECTIONS**

- Lead 1 — Emitter
- Lead 2 — Base
- Lead 3 — Collector