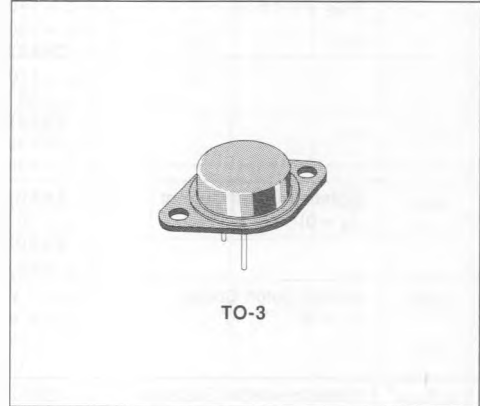


## HIGH CURRENT POWER SWITCH

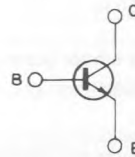
### DESCRIPTION

The 2N5038, 2N5039 and 2N6496 are silicon planar multiepitaxial NPN transistors in Jedec TO-3 metal case.

They are especially intended for high current and fast switching applications.



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	2N5038	2N5039	2N6496	Unit
$V_{CBO}$	Collector-base Voltage ( $I_E = 0$ )	150	120	150	V
$V_{CEX}$	Collector-emitter Voltage ( $V_{BE} = -1.5$ V, $R_{BE} = 100 \Omega$ )	150	120	150	V
$V_{CER}$	Collector-emitter Voltage ( $R_{BE} \leq 50 \Omega$ )	110	95	130	V
$V_{CEO}$	Collector-emitter Voltage ( $I_B = 0$ )	90	75	110	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	7	7	7	V
$I_C$	Collector Current	20	20	15	V
$I_{CM}$	Collector Peak Current	30	30		V
$I_B$	Base Current		5		A
$P_{tot}$	Total Power Dissipation at $T_{case} \leq 25^\circ\text{C}$		140		W
$T_{stg}$	Storage Temperature		- 65 to 200		$^\circ\text{C}$
$T_J$	Junction Temperature		200		$^\circ\text{C}$

**THERMAL DATA**

$R_{th\ j-case}$	Thermal Resistance Junction-case	Max	1.25	°C/W
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**ELECTRICAL CHARACTERISTICS** ( $T_{case} = 25\text{ °C}$  unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$I_{CEV}$	Collector Cutoff Current ( $V_{BE} = -1.5\text{ V}$ )	for <b>2N5038</b> $V_{CE} = 140\text{ V}$ $V_{CE} = 100\text{ V}$ for <b>2N5039</b> $V_{CE} = 110\text{ V}$ $V_{CE} = 85\text{ V}$ for <b>2N6496</b> $V_{CE} = 130\text{ V}$ $V_{CE} = 130\text{ V}$	$T_{case} = 150\text{ °C}$		50	mA	
		10			mA		
			$T_{case} = 150\text{ °C}$			50	mA
			$T_{case} = 150\text{ °C}$			10	mA
					20	mA	
					25	mA	
$I_{CEO}$	Collector Cutoff Current ( $I_B = 0$ )	for <b>2N5038</b> $V_{CE} = 70\text{ V}$ for <b>2N5039</b> $V_{CE} = 55\text{ V}$			20	mA	
					20	mA	
$I_{EBO}$	Emitter Cutoff Current ( $I_C = 0$ )	$V_{EB} = 7\text{ V}$ $V_{EB} = 5\text{ V}$			50	mA	
		for <b>2N5038</b> for <b>2N5039</b>			5	mA	
					15	mA	
$V_{CEX(sus)}^*$	Collector-emitter Sustaining Voltage ( $V_{BE} = -1.5\text{ V}$ , $R_{BE} = 100\ \Omega$ )	$I_C = 200\text{ mA}$	for <b>2N5038</b> for <b>2N5039</b> for <b>2N6496</b>	150 120 150		V	
						V	
						V	
$V_{CER(sus)}^*$	Collector-emitter Sustaining Voltage ( $R_{BE} = 50\ \Omega$ )	$I_C = 200\text{ mA}$	for <b>2N5038</b> for <b>2N5039</b> for <b>2N6496</b>	110 95 130		V	
						V	
						V	
$V_{CEO(sus)}^*$	Collector-emitter Sustaining Voltage ( $I_B = 0$ )	$I_C = 200\text{ mA}$	for <b>2N5038</b> for <b>2N5039</b> for <b>2N6496</b>	90 75 110		V	
						V	
						V	
$V_{CE(sat)}^*$	Collector-emitter Saturation Voltage	for <b>2N5038</b> $I_C = 12\text{ A}$ $I_C = 20\text{ A}$ for <b>2N5039</b> $I_C = 10\text{ A}$ $I_C = 20\text{ A}$ for <b>2N6496</b> $I_C = 8\text{ A}$	$I_B = 1.2\text{ A}$ $I_B = 5\text{ A}$ $I_B = 1\text{ A}$ $I_B = 5\text{ A}$ $I_B = 0.8\text{ A}$		1 2.5	V V	
					1 2.5	V V	
					1	V	
					2.5	V	
					1	V	
$V_{BE(sat)}^*$	Base-emitter Saturation Voltage	for <b>2N5038</b> and <b>2N5039</b> $I_C = 20\text{ A}$ for <b>2N6496</b> $I_C = 8\text{ A}$	$I_B = 5\text{ A}$ $I_B = 0.8\text{ A}$		3.3	V	
					2	V	
$V_{BE}^*$	Base-emitter Voltage	for <b>2N5038</b> $I_C = 12\text{ A}$ for <b>2N5039</b> $I_C = 10\text{ A}$ for <b>2N6496</b> $I_C = 8\text{ A}$	$V_{CE} = 5\text{ V}$ $V_{CE} = 5\text{ V}$ $V_{CE} = 2\text{ V}$		1.8 1.8 1.6	V V V	

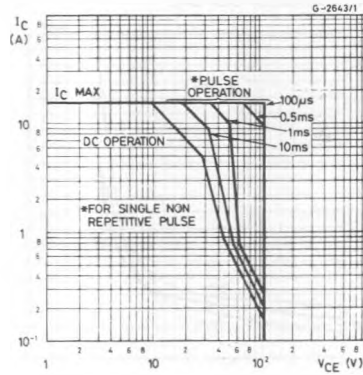
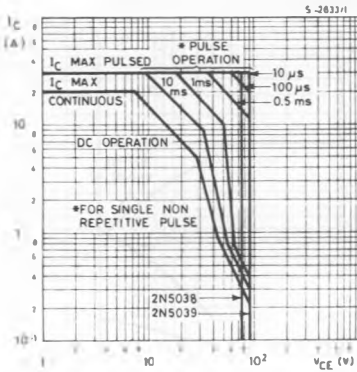
ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$h_{FE}^*$	DC Current Gain	for <b>2N5038</b> $I_C = 2\text{ A}$ $V_{CE} = 5\text{ V}$ $I_C = 12\text{ A}$ $V_{CE} = 5\text{ V}$ for <b>2N5039</b> $I_C = 2\text{ A}$ $V_{CE} = 5\text{ V}$ $I_C = 10\text{ A}$ $V_{CE} = 5\text{ V}$ for <b>2N6496</b> $I_C = 8\text{ A}$ $V_{CE} = 2\text{ V}$	50 20		250 100	
$h_{fe}$	Small Signal Current Gain	$I_C = 2\text{ A}$ $V_{CE} = 10\text{ V}$ $f = 5\text{ MHz}$	12			
$C_{CB0}$	Collector-base Capacitance	$I_E = 0$ $V_{CB} = 10\text{ V}$ $f = 1\text{ MHz}$			300	pF
$t_r$	Rise Time	for <b>2N5038</b> $I_C = 12\text{ A}$ $V_{CC} = 30\text{ V}$ $I_{B1} = -I_{B2} = 1.2\text{ A}$			0.5	$\mu\text{s}$
$t_s$	Storage Time	for <b>2N5039</b> $I_C = 10\text{ A}$ $V_{CC} = 30\text{ V}$ $I_{B1} = -I_{B2} = 1\text{ A}$			1.5	$\mu\text{s}$
$t_f$	Fall Time	for <b>2N6496</b> $I_C = 8\text{ A}$ $V_{CC} = 30\text{ V}$ $I_{B1} = -I_{B2} = 0.8\text{ A}$			0.5	$\mu\text{s}$
$I_{S/b}^{**}$	Second Breakdown Collector Current	$V_{CE} = 28\text{ V}$ $V_{CE} = 45\text{ V}$	5 0.9			A A
$E_{S/b}$	Second Breakdown Energy	$V_{BE} = -4\text{ V}$ $R_{BE} = 20\ \Omega$ $L = 180\ \mu\text{H}$ for <b>2N5038</b> for <b>2N5039</b> for <b>2N6496</b>	13 13 5.7			mJ mJ mJ

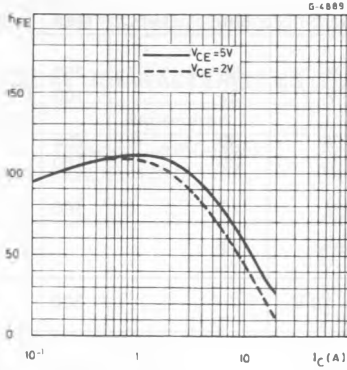
\* Pulsed : pulse duration = 300 $\mu\text{s}$  duty cycle = 1.5%  
 \*\* Pulsed : 1 s non repetitive pulse

Safe Operating Areas (for **2N5038** and **2N5039**).

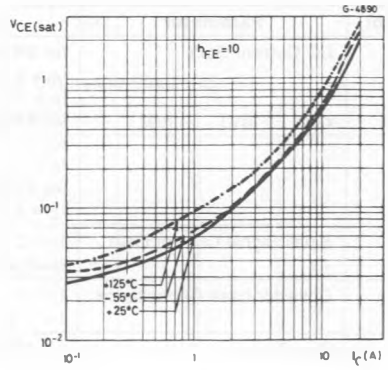
Safe Operating Areas (for **2N6496**).



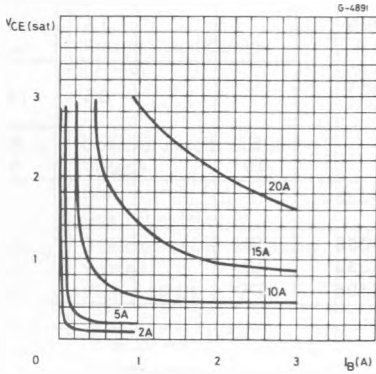
DC Current Gain.



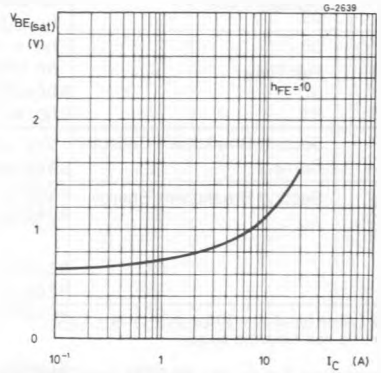
Collector-emitter Saturation Voltage.



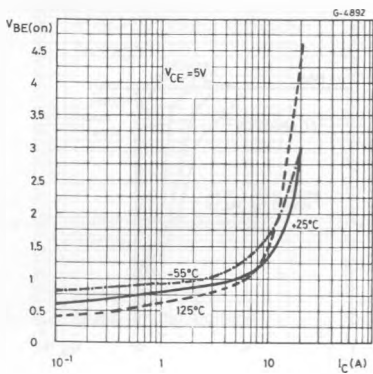
Collector-emitter Saturation Voltage.



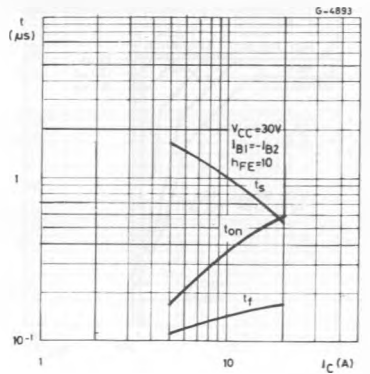
Base-emitter Saturation Voltage.



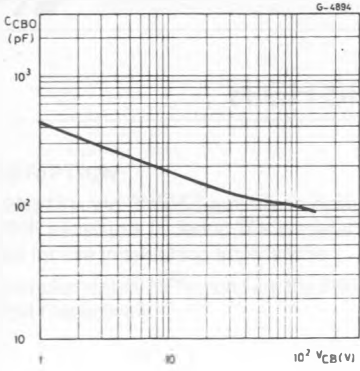
$V_{BE(on)}$  vs. Collector Current.



Saturated Switching Characteristics.



Collector-base Capacitance.



Transition Frequency.

