

NPN switching transistor

BSX20

FEATURES

- Low current (max. 200 mA)
- Low voltage (max. 15 V).

APPLICATIONS

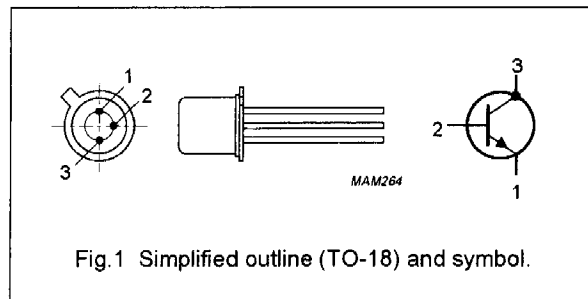
- High-speed saturated switching (and HF amplifier applications).

DESCRIPTION

NPN switching transistor in a TO-18 metal package.

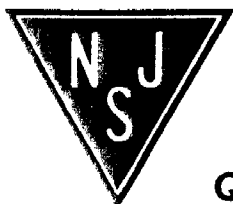
PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	collector, connected to case



QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	15	V
I_C	collector current (DC)		–	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25^\circ C$	–	360	mW
h_{FE}	DC current gain	$I_C = 10\text{ mA}; V_{CE} = 1\text{ V}$	40	120	
		$I_C = 100\text{ mA}; V_{CE} = 2\text{ V}$	20	–	
f_T	transition frequency	$I_C = 10\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$	500	–	MHz
t_{off}	turn-off time	$I_{Con} = 10\text{ mA}; I_{Bon} = 3\text{ mA}; I_{Boff} = -1.5\text{ mA}$	–	30	ns



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LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	15	V
V_{EBO}	emitter-base voltage	open collector	–	4.5	V
I_C	collector current (DC)		–	200	mA
I_{CM}	peak collector current	$t \leq 10 \mu s$	–	300	mA
I_{BM}	peak base current		–	100	mA
P_{tot}	total power dissipation		–	360	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	200	°C
T_{amb}	operating ambient temperature		–65	+150	°C

THERMAL CHARACTERISTICS

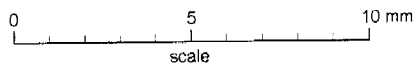
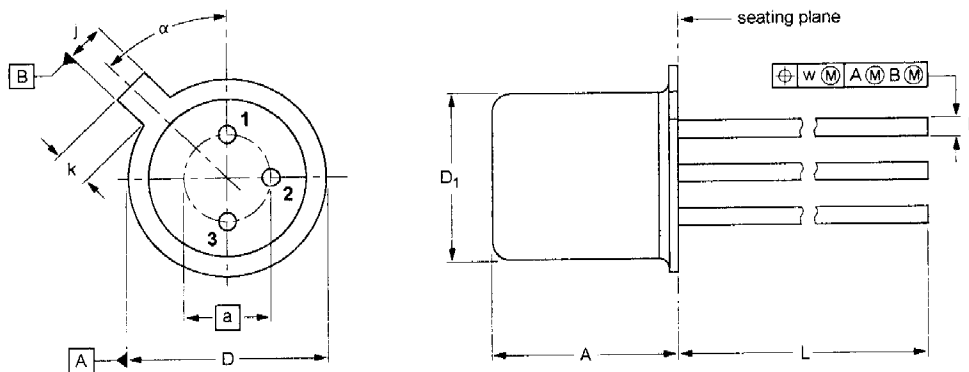
SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	in free air	480	K/W
$R_{th\ j-c}$	thermal resistance from junction to case		150	K/W

CHARACTERISTICS

$T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0; V_{CB} = 20 \text{ V}$	–	–	400	nA
		$I_E = 0; V_{CB} = 20 \text{ V}; T_j = 150 \text{ }^\circ\text{C}$	–	–	30	μA
I_{EBO}	emitter cut-off current	$I_C = 0; V_{EB} = 4 \text{ V}$	–	–	100	nA
h_{FE}	DC current gain	$I_C = 10 \text{ mA}; V_{CE} = 1 \text{ V}$	40	–	120	
		$I_C = 10 \text{ mA}; V_{CE} = 1 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	20	–	–	
		$I_C = 100 \text{ mA}; V_{CE} = 2 \text{ V}$	20	–	–	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10 \text{ mA}; I_B = 0.3 \text{ mA}$	–	–	300	mV
		$I_C = 10 \text{ mA}; I_B = 1 \text{ mA}$	–	–	250	mV
		$I_C = 100 \text{ mA}; I_B = 10 \text{ mA}$	–	–	600	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = 10 \text{ mA}; I_B = 1 \text{ mA}$	700	–	850	mV
		$I_C = 100 \text{ mA}; I_B = 10 \text{ mA}$	–	–	1.5	V
C_c	collector capacitance	$I_E = I_E = 0; V_{CB} = 5 \text{ V}; f = 1 \text{ MHz}$	–	–	4	pF
C_e	emitter capacitance	$I_C = I_C = 0; V_{EB} = 1 \text{ V}; f = 1 \text{ MHz}$	–	–	4.5	pF
f_T	transition frequency	$I_C = 10 \text{ mA}; V_{CE} = 10 \text{ V}; f = 100 \text{ MHz}$	500	600	–	MHz

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Switching times (between 10% and 90% levels)						
t_{on}	turn-on time	$I_{Con} = 10 \text{ mA}; I_{Bon} = 3 \text{ mA};$ $I_{Boff} = -1.5 \text{ mA};$ see Fig.2, test conditions A	-	-	10	ns
t_d	delay time		-	-	4	ns
t_r	rise time		-	-	6	ns
t_{off}	turn-off time		-	-	30	ns
t_s	storage time		-	-	15	ns
t_f	fall time		-	-	15	ns
t_{on}	turn-on time	$I_{Con} = 100 \text{ mA}; I_{Bon} = 40 \text{ mA};$ $I_{Boff} = -20 \text{ mA};$ see Fig.2, test conditions B	-	-	13	ns
t_d	delay time		-	-	3	ns
t_r	rise time		-	-	10	ns
t_{off}	turn-off time		-	-	35	ns
t_s	storage time		-	-	25	ns
t_f	fall time		-	-	10	ns



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	a	b	D	D ₁	j	k	L	w	α
mm	5.31 4.74	2.54	0.47 0.41	5.45 5.30	4.70 4.55	1.03 0.94	1.1 0.9	15.0 12.7	0.40	45°