

RADIATION HARDENED NPN SILICON SWITCHING TRANSISTOR *Qualified per MIL-PRF-19500/366*

DEVICES

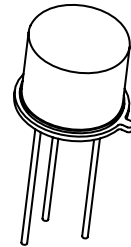
2N3498	2N3499	2N3500	2N3501
2N3498L	2N3499L	2N3500L	2N3501L 2N3501UB

LEVELS

JANSM – 3K Rads (Si)
JANSD – 10K Rads (Si)
JANSP – 30K Rads (Si)
JANSL – 50K Rads (Si)
JANSR – 100K Rads (Si)

ABSOLUTE MAXIMUM RATINGS ($T_C = +25^\circ\text{C}$ unless otherwise noted)

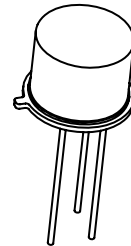
Parameters / Test Conditions	Symbol	2N3498*	2N3501*	Unit
		2N3499*	2N3501*	
Collector-Emitter Voltage	V_{CEO}	100	150	Vdc
Collector-Base Voltage	V_{CBO}	100	150	Vdc
Emitter-Base Voltage	V_{EBO}	6.0	6.0	Vdc
Collector Current	I_C	500	300	mAdc
Total Power Dissipation @ $T_A = +25^\circ\text{C}$ @ $T_C = +25^\circ\text{C}$	P_T	1.0		W
		5.0		W
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		$^\circ\text{C}$



TO-5*
 2N3498L, 2N3499L
 2N2500L, 2N3501L

THERMAL CHARACTERISTICS

Parameters / Test Conditions	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	30	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	175	$^\circ\text{C}/\text{W}$



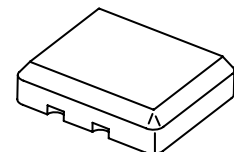
TO-39* (TO-205AD)
 2N3498, 2N3499
 2N3500, 2N3501

* Electrical characteristics for “L” suffix devices are identical to the “non L” corresponding devices.

- Derate linearly 5.71 W/ $^\circ\text{C}$ for $T_A > 25^\circ\text{C}$
- Derate linearly 28.6 W/ $^\circ\text{C}$ for $T_C > 25^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, unless otherwise noted)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage $I_C = 10\text{mAdc}$	$V_{(BR)CEO}$	100		Vdc
2N3498, 2N3499 2N3500, 2N3501		150		
Collector-Base Cutoff Current $V_{CB} = 50\text{Vdc}$	I_{CBO}		50	ηAdc
$V_{CB} = 75\text{Vdc}$			50	ηAdc
$V_{CB} = 100\text{Vdc}$			10	μAdc
$V_{CB} = 150\text{Vdc}$			10	μAdc



3 PIN
 2N3501UB

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ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, unless otherwise noted)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS				
Emitter-Base Cutoff Current $V_{EB} = 4.0\text{Vdc}$ $V_{EB} = 6.0\text{Vdc}$	I_{EBO}		25 10	ηAdc μAdc
ON CHARACTERISTICS ⁽³⁾				
Forward-Current Transfer Ratio $I_C = 0.1\text{mAdc}$, $V_{CE} = 10\text{Vdc}$		2N3498, 2N3500 2N3499, 2N3501	20 35	
$I_C = 1.0\text{mAdc}$, $V_{CE} = 10\text{Vdc}$		2N3498, 2N3500 2N3499, 2N3501	25 50	
$I_C = 10\text{mAdc}$, $V_{CE} = 10\text{Vdc}$		2N3498, 2N3500 2N3499, 2N3501	35 75	
$I_C = 150\text{mAdc}$, $V_{CE} = 10\text{Vdc}$		2N3498, 2N3500 2N3499, 2N3501	40 100	120 300
$I_C = 300\text{mAdc}$, $V_{CE} = 10\text{Vdc}$		2N3500 2N3501	15 20	
$I_C = 500\text{mAdc}$, $V_{CE} = 10\text{Vdc}$		2N3498 2N3499	15 20	
Collector-Emitter Saturation Voltage $I_C = 10\text{mAdc}$, $I_B = 1.0\text{mAdc}$ $I_C = 300\text{mAdc}$, $I_B = 30\text{mAdc}$ $I_C = 150\text{mAdc}$, $I_B = 15\text{mAdc}$		All Types 2N3498, 2N3499 2N3500, 2N3501	$V_{CE(sat)}$	0.2 0.6 0.4 Vdc
Base-Emitter Saturation Voltage $I_C = 10\text{mAdc}$, $I_B = 1.0\text{mAdc}$ $I_C = 300\text{mAdc}$, $I_B = 30\text{mAdc}$ $I_C = 150\text{mAdc}$, $I_B = 15\text{mAdc}$		All Types 2N3498, 2N3499 2N3500, 2N3501	$V_{BE(sat)}$	0.8 1.4 1.2 Vdc

DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude, Forward Current Transfer Ratio $I_C = 20\text{mAdc}$, $V_{CE} = 20\text{Vdc}$, $f = 100\text{MHz}$	$ h_{fe} $	1.5	8.0	
Output Capacitance $V_{CB} = 10\text{Vdc}$, $I_E = 0$, $100\text{kHz} \leq f \leq 1.0\text{MHz}$	C_{obo}	2N3498, 2N3499 2N3500, 2N3501	10 8.0	pF
Input Capacitance $V_{EB} = 0.5\text{Vdc}$, $I_C = 0$, $100\text{kHz} \leq f \leq 1.0\text{MHz}$	C_{ibo}		80	pF

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SWITCHING CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Turn-On Time $V_{EB} = 5V_{dc}; I_C = 150mA_{dc}; I_{B1} = 15mA_{dc}$	t_{on}		115	ηs
Turn-Off Time $I_C = 150mA_{dc}; I_{B1} = I_{B2} = 15mA_{dc}$	t_{off}		1150	ηs

SAFE OPERATING AREA

DC Tests		
$T_C = +25^\circ C, t_r \geq 10\eta s; 1 \text{ Cycle}, t = 1.0s$		
Test 1		
$V_{CE} = 10V_{dc}, I_C = 500mA_{dc}$		2N3498, 2N3499
$V_{CE} = 16.67V_{dc}, I_C = 300mA_{dc}$		2N3500, 2N3501
$V_{CE} = 10V_{dc}, I_C = 113mA_{dc}$		2N3501UB
Test 2		
$V_{CE} = 50V_{dc}, I_C = 100mA_{dc}$		All Types
$V_{CE} = 50V_{dc}, I_C = 23mA_{dc}$		2N3501UB
Test 3		
$V_{CE} = 80V_{dc}, I_C = 40mA_{dc}$		All Types
$V_{CE} = 80V_{dc}, I_C = 14mA_{dc}$		2N3501UB
Clamped Switching		
$T_A = +25^\circ C$		
Test 1		
$I_B = 85mA_{dc}, I_C = 500mA_{dc}$		2N3498, 2N3499
$I_B = 50mA_{dc}, I_C = 300mA_{dc}$		2N3500, 2N3501

(3) Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$