



NPN SILICON TRANSISTOR

Qualified per MIL-PRF-19500/366

Qualified Levels:
JAN, JANTX, JANTXV
and JANS

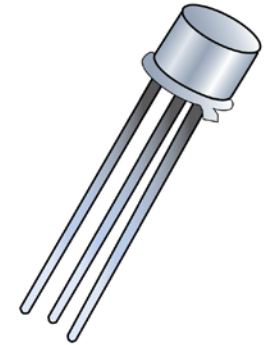
DESCRIPTION

This family of 2N3498 thru 2N3501 epitaxial planar transistors are military qualified up to a JANS level for high-reliability applications. These devices are also available in TO-5 and low profile U4 packaging. Microsemi also offers numerous other transistor products to meet higher and lower power ratings with various switching speed requirements in both through-hole and surface-mount packages.

Important: For the latest information, visit our website <http://www.microsemi.com>.

FEATURES

- JEDEC registered 2N3498 through 2N3501 series.
- JAN, JANTX, JANTXV, and JANS qualifications are available per MIL-PRF-19500/366. (See [part nomenclature](#) for all available options.)
- RoHS compliant versions available (commercial grade only).




TO-39 (TO-205AD) Package

Also available in:


APPLICATIONS / BENEFITS

- General purpose transistors for medium power applications requiring high frequency switching and low package profile.
- Military and other high-reliability applications.

TO-5 package
 (long-leaded)

 2N3498L – 2N3501L

U4 package

(surface mount)
 2N3498U4 – 2N3501U4

MAXIMUM RATINGS

Parameters / Test Conditions	Symbol	2N3498 2N3499	2N3500 2N3501	Unit
Collector-Emitter Voltage	V_{CE0}	100	150	V
Collector-Base Voltage	V_{CB0}	100	150	V
Emitter-Base Voltage	V_{EB0}	6.0	6.0	V
Collector Current	I_C	500	300	mA
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	175		$^{\circ}C/W$
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	30		$^{\circ}C/W$
Total Power Dissipation @ $T_A = +25^{\circ}C$ ⁽¹⁾ @ $T_C = +25^{\circ}C$ ⁽²⁾	P_T	1.0 5.0		W
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		$^{\circ}C$

- Notes:**
1. See [figure 1](#).
 2. See [figure 2](#).

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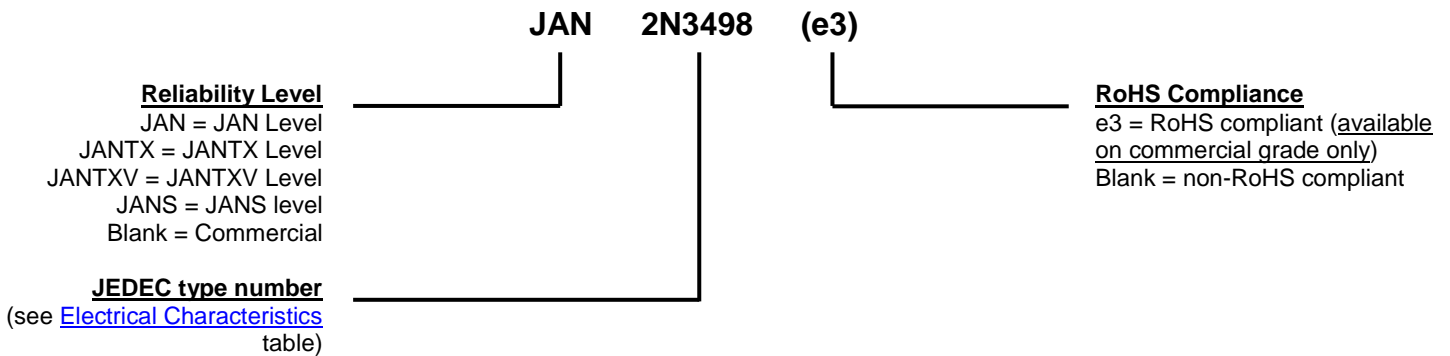
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MECHANICAL and PACKAGING

- CASE: Hermetically sealed, kovar base, nickel cap.
- TERMINALS: Leads are kovar, nickel plated, and finish is solder dip (Sn63/Pb37). Can be RoHS compliant with pure matte-tin (commercial grade only).
- MARKING: Part number, date code, manufacturer's ID.
- WEIGHT: Approximately 1.064 grams.
- See [Package Dimensions](#) on last page.

PART NOMENCLATURE

SYMBOLS & DEFINITIONS

Symbol	Definition
C_{obo}	Common-base open-circuit output capacitance
I_{CEO}	Collector cutoff current, base open
I_{CEX}	Collector cutoff current, circuit between base and emitter
I_{EBO}	Emitter cutoff current, collector open
h_{FE}	Common-emitter static forward current transfer ratio
V_{CEO}	Collector-emitter voltage, base open
V_{CBO}	Collector-emitter voltage, emitter open
V_{EBO}	Emitter-base voltage, collector open

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

Characteristic	Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage $I_C = 10\text{ mA}$, pulsed	$V_{(BR)CEO}$	100		V
2N3498, 2N3499 2N3500, 2N3501		150		
Collector-Base Cutoff Current	I_{CBO}		50	nA
$V_{CB} = 50\text{ V}$		2N3498, 2N3499	50	nA
$V_{CB} = 75\text{ V}$		2N3500, 2N3501	10	μA
$V_{CB} = 100\text{ V}$		2N3498, 2N3499	10	μA
Emitter-Base Cutoff Current	I_{EBO}		25	nA
$V_{EB} = 4.0\text{ V}$ $V_{EB} = 6.0\text{ V}$		2N3500, 2N3501	10	μA

ON CHARACTERISTICS ⁽¹⁾

Forward-Current Transfer Ratio	h_{FE}	20		
$I_C = 0.1\text{ mA}$, $V_{CE} = 10\text{ V}$		35		
		25		
$I_C = 1.0\text{ mA}$, $V_{CE} = 10\text{ V}$		50		
		35		
$I_C = 10\text{ mA}$, $V_{CE} = 10\text{ V}$		75		
		40	120	
$I_C = 150\text{ mA}$, $V_{CE} = 10\text{ V}$		100	300	
	15			
$I_C = 300\text{ mA}$, $V_{CE} = 10\text{ V}$	20			
	15			
$I_C = 500\text{ mA}$, $V_{CE} = 10\text{ V}$	20			
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.2	V
$I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$		All Types	0.6	
$I_C = 300\text{ mA}$, $I_B = 30\text{ mA}$		2N3498, 2N3499	0.4	
$I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$	2N3500, 2N3501			
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.8	V
$I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$		All Types	1.4	
$I_C = 300\text{ mA}$, $I_B = 30\text{ mA}$		2N3498, 2N3499	1.2	
$I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$	2N3500, 2N3501			

DYNAMIC CHARACTERISTICS

Forward Current Transfer Ratio, Magnitude $I_C = 20\text{ mA}$, $V_{CE} = 20\text{ V}$, $f = 100\text{ MHz}$	$ h_{fe} $	1.5	8.0	
Output Capacitance $V_{CB} = 10\text{ V}$, $I_E = 0$, $100\text{ kHz} \leq f \leq 1.0\text{ MHz}$	C_{obo}		10	pF
2N3498, 2N3499 2N3500, 2N3501			8.0	
Input Capacitance $V_{EB} = 0.5\text{ V}$, $I_C = 0$, $100\text{ kHz} \leq f \leq 1.0\text{ MHz}$	C_{ibo}		80	pF

(1) Pulse Test: pulse width = 300 μs , duty cycle $\leq 2.0\%$.

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

Characteristic	Symbol	Min.	Max.	Unit
Turn-On Time $V_{EB} = 5\text{ V}; I_C = 150\text{ mA}; I_{B1} = 15\text{ mA}$	t_{on}		115	ns
Turn-Off Time $I_C = 150\text{ mA}; I_{B1} = I_{B2} = -15\text{ mA}$	t_{off}		1150	ns

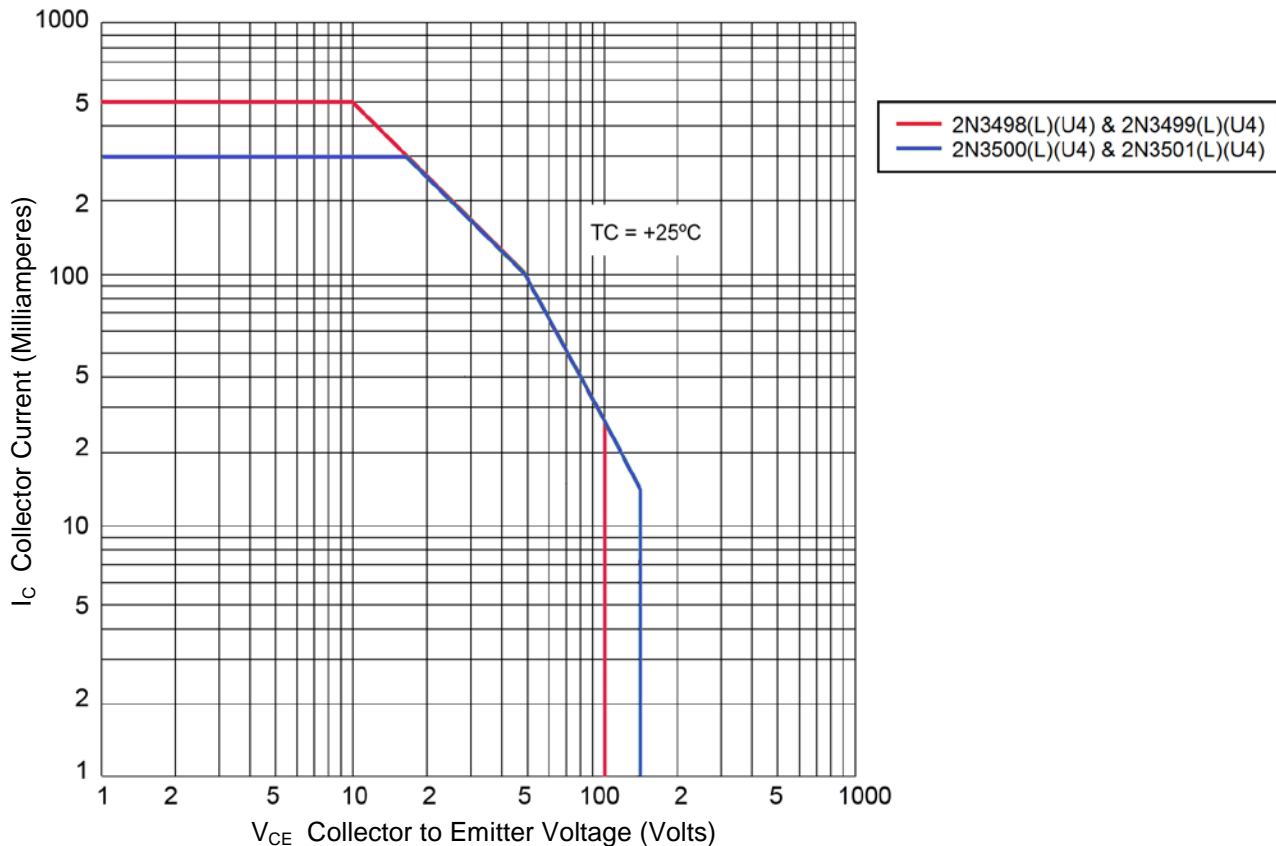
SAFE OPERATING AREA (See SOA figure and reference [MIL-STD-750 method 3053](#))
DC Tests
 $T_C = +25^\circ\text{C}$, $t_r \geq 10\text{ ns}$; 1 Cycle, $t = 1.0\text{ s}$
Test 1
 $V_{CE} = 10\text{ V}, I_C = 500\text{ mA}$ 2N3498, 2N3499

 $V_{CE} = 16.67\text{ V}, I_C = 300\text{ mA}$ 2N3500, 2N3501

Test 2
 $V_{CE} = 50\text{ V}, I_C = 100\text{ mA}$ All Types

Test 3
 $V_{CE} = 80\text{ V}, I_C = 40\text{ mA}$ All Types

Clamped Switching
 $T_A = +25^\circ\text{C}$
Test 1
 $I_B = 85\text{ mA}, I_C = 500\text{ mA}$ 2N3498, 2N3499

 $I_B = 50\text{ mA}, I_C = 300\text{ mA}$ 2N3500, 2N3501

Maximum Safe Operating Area

GRAPHS

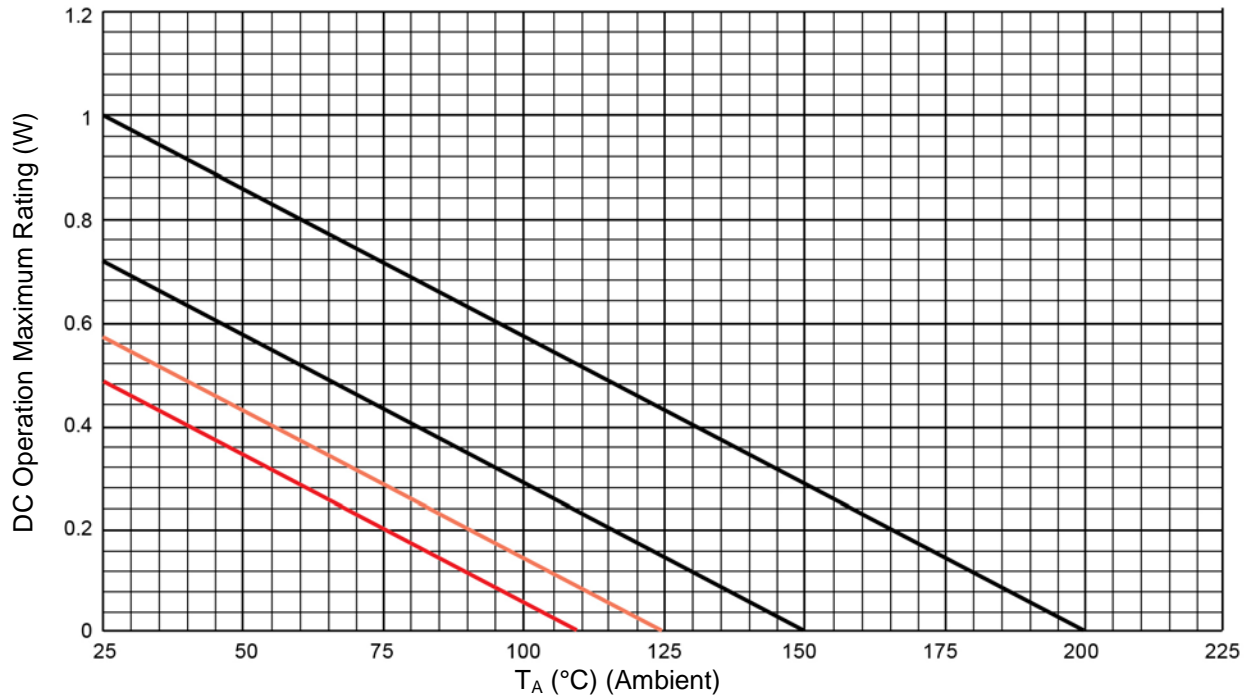


FIGURE 1
Derating for all devices ($R_{\theta JA}$)

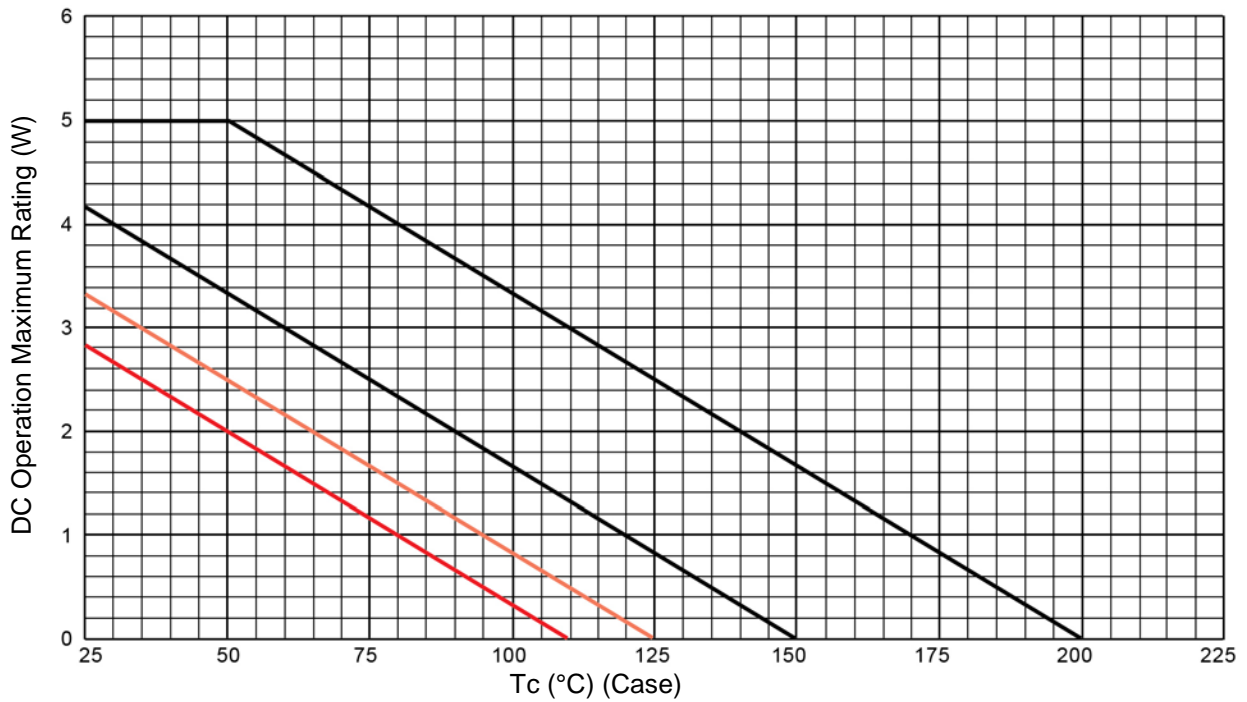


FIGURE 2
Derating for all devices ($R_{\theta JC}$)

GRAPHS

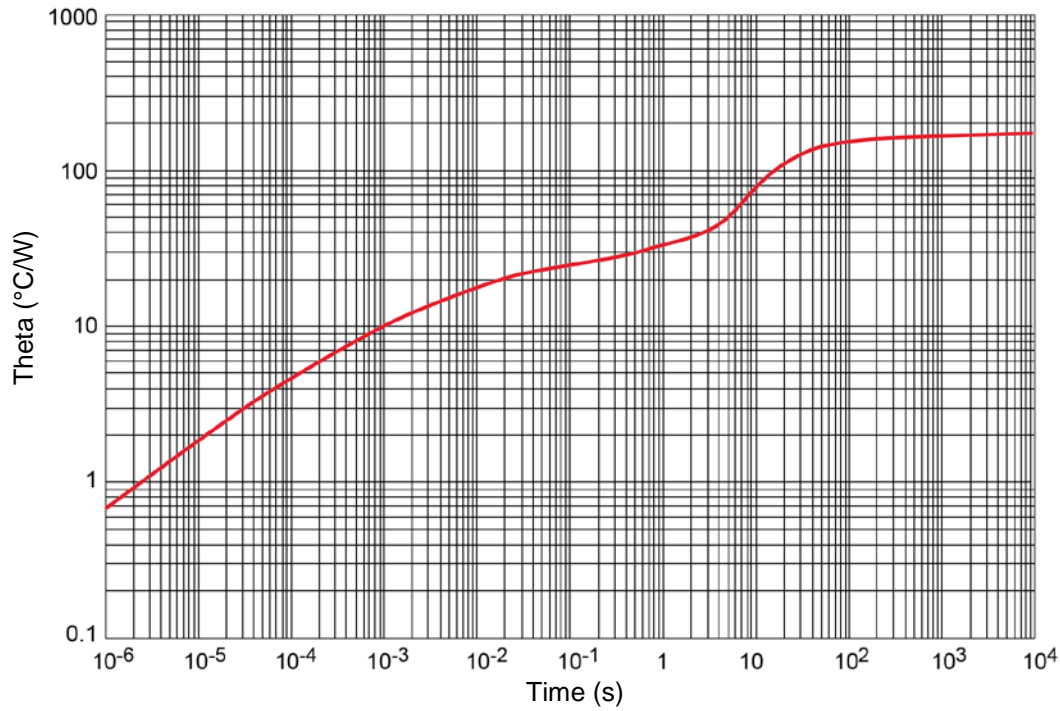


FIGURE 3

Thermal Impedance Graph ($R_{\theta JA}$)

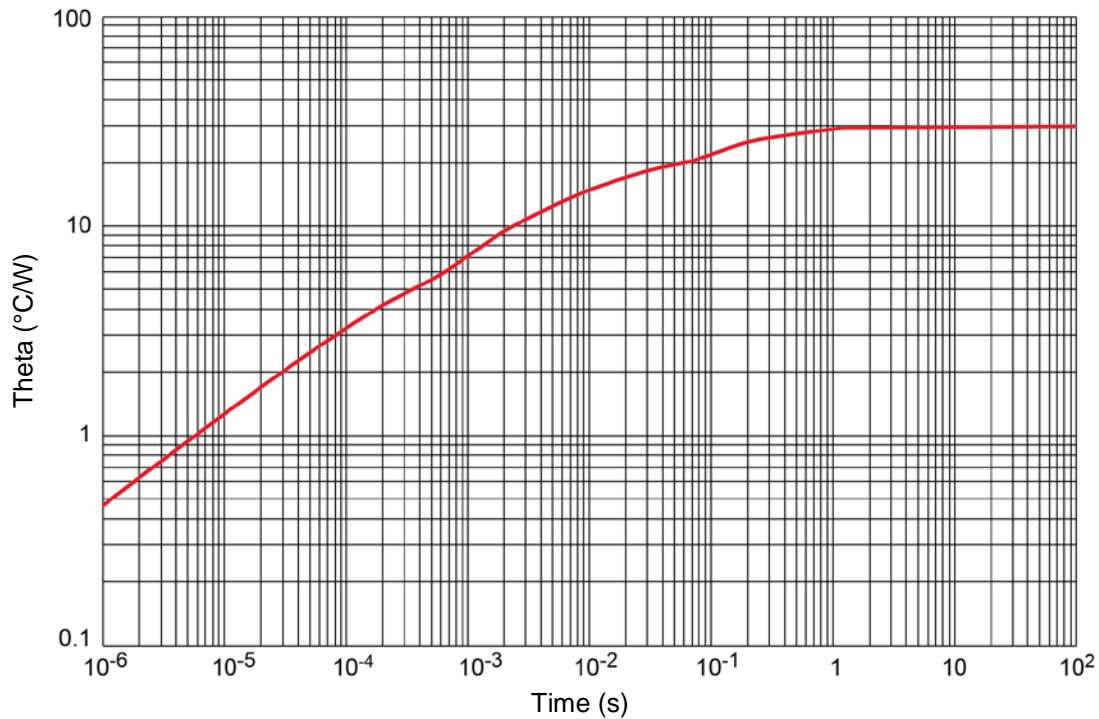


FIGURE 4

Thermal Impedance Graph ($R_{\theta JC}$)