



NPN SILICON TRANSISTOR

Qualified per MIL-PRF-19500/366

Qualified Levels:
JAN, JANTX, and
JANTXV

DESCRIPTION

This family of 2N3498U4 through 2N3501U4 epitaxial planar transistors are military qualified up to a JANTXV level for high-reliability applications. These devices are also available in TO-39 and TO-5 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.

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FEATURES

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

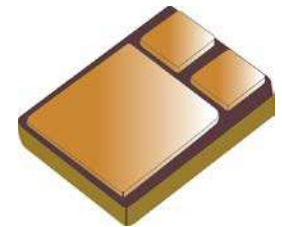
APPLICATIONS / BENEFITS

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

MAXIMUM RATINGS

Parameters / Test Conditions	Symbol	2N3498U4	2N3500U4	Unit
		2N3499U4	2N3501U4	
Collector-Emitter Voltage	V_{CEO}	100	150	V
Collector-Base Voltage	V_{CBO}	100	150	V
Emitter-Base Voltage	V_{EBO}	6.0	6.0	V
Collector Current	I_C	500	300	mA
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	175		$^{\circ}\text{C}/\text{W}$
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	15		$^{\circ}\text{C}/\text{W}$
Total Power Dissipation	P_T	@ $T_A = +25^{\circ}\text{C}$ ⁽¹⁾		W
		@ $T_C = +25^{\circ}\text{C}$ ⁽²⁾		
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		$^{\circ}\text{C}$

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



U4 Package

Also available in:

TO-39 (TO-205AD)
package

(leaded)
2N3498 – 2N3501

TO-5 package

(long-leaded)
2N3498L – 2N3501L

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MECHANICAL and PACKAGING

- CASE: Hermetically sealed, aluminum nitride (AlN) ceramic body with gold over nickel plated kovar lid.
- TERMINALS: Gold over nickel plated surface mount terminations.
- MARKING: Part number, date code, manufacturer's ID.
- POLARITY: See package dimensions.
- TAPE & REEL option: Standard per EIA-481D. Consult factory for quantities.
- WEIGHT: 0.125 grams (125 milligrams).
- See [Package Dimensions](#) on last page.

PART NOMENCLATURE

JAN 2N3498 U4 (e3)

Reliability Level

JAN = JAN Level
 JANTX = JANTX Level
 JANTXV = JANTXV Level
 Blank = Commercial

JEDEC type number

(see [Electrical Characteristics](#) table)

RoHS Compliance

e3 = RoHS compliant (available on commercial grade only)
 Blank = non-RoHS compliant

Surface Mount package
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 2N3498U4, 2N3499U4 2N3500U4, 2N3501U4	$V_{(BR)CEO}$	100 150		V
Collector-Base Cutoff Current $V_{CB} = 50\text{ V}$ $V_{CB} = 75\text{ V}$ $V_{CB} = 100\text{ V}$ $V_{CB} = 150\text{ V}$ 2N3498U4, 2N3499U4 2N3500U4, 2N3501U4 2N3498U4, 2N3499U4 2N3500U4, 2N3501U4	I_{CBO}		50 50 10 10	nA nA μA μA
Emitter-Base Cutoff Current $V_{EB} = 4.0\text{ V}$ $V_{EB} = 6.0\text{ V}$	I_{EBO}		25 10	nA μA

ON CHARACTERISTICS ⁽¹⁾

Forward-Current Transfer Ratio $I_C = 0.1\text{ mA}$, $V_{CE} = 10\text{ V}$ 2N3498U4, 2N3500U4 2N3499U4, 2N3501U4 $I_C = 1.0\text{ mA}$, $V_{CE} = 10\text{ V}$ 2N3498U4, 2N3500U4 2N3499U4, 2N3501U4 $I_C = 10\text{ mA}$, $V_{CE} = 10\text{ V}$ 2N3498U4, 2N3500U4 2N3499U4, 2N3501U4 $I_C = 150\text{ mA}$, $V_{CE} = 10\text{ V}$ 2N3498U4, 2N3500U4 2N3499U4, 2N3501U4 $I_C = 300\text{ mA}$, $V_{CE} = 10\text{ V}$ 2N3500U4 2N3501U4 $I_C = 500\text{ mA}$, $V_{CE} = 10\text{ V}$ 2N3498U4 2N3499U4	h_{FE}	20 35 25 50 35 75 40 100 15 20 15 20	120 300	
Collector-Emitter Saturation Voltage $I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$ $I_C = 300\text{ mA}$, $I_B = 30\text{ mA}$ $I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$ All Types 2N3498U4, 2N3499U4 2N3500U4, 2N3501U4	$V_{CE(sat)}$		0.2 0.6 0.4	V
Base-Emitter Saturation Voltage $I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$ $I_C = 300\text{ mA}$, $I_B = 30\text{ mA}$ $I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$ All Types 2N3498U4, 2N3499U4 2N3500U4, 2N3501U4	$V_{BE(sat)}$		0.8 1.4 1.2	V

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 $V_{CB} = 10\text{ V}$, $I_E = 0$, $100\text{ kHz} \leq f \leq 1.0\text{ MHz}$ 2N3498U4, 2N3499U4 2N3500U4, 2N3501U4	C_{obo}		10 8.0	pF
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

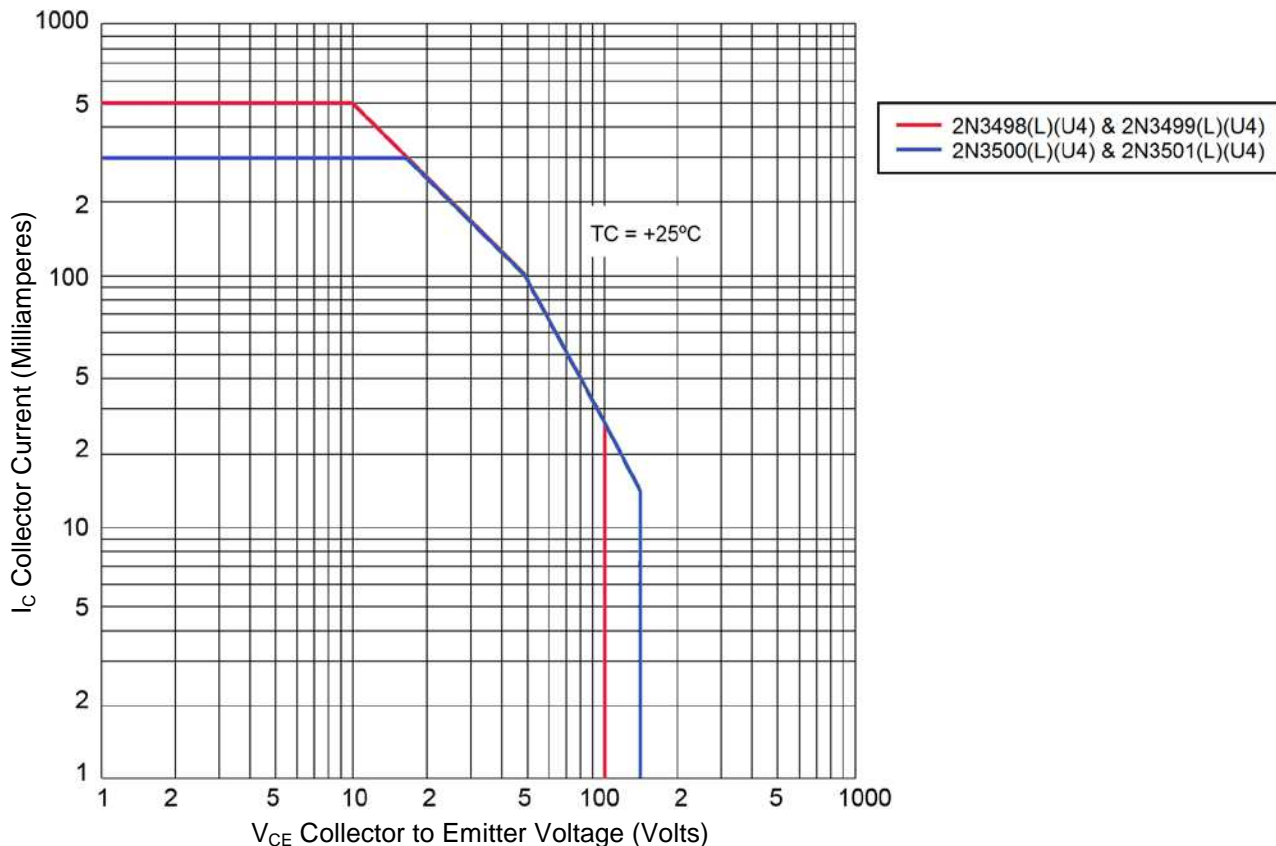
SAFE OPERATING AREA (See SOA figure and reference [MIL-STD-750 method 3053](#))
DC Tests
 $T_C = +25^\circ\text{C}$, $t_r \geq 10\text{ ns}$; 1 Cycle, $t = 1.0\text{ s}$
Test 1
 $V_{CE} = 10\text{ V}, I_C = 500\text{ mA}$ 2N3498U4, 2N3499U4

 $V_{CE} = 16.67\text{ V}, I_C = 300\text{ mA}$ 2N3500U4, 2N3501U4

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
 $I_B = 85\text{ mA}, I_C = 500\text{ mA}$ 2N3498U4, 2N3499U4

 $I_B = 50\text{ mA}, I_C = 300\text{ mA}$ 2N3500U4, 2N3501U4


GRAPHS

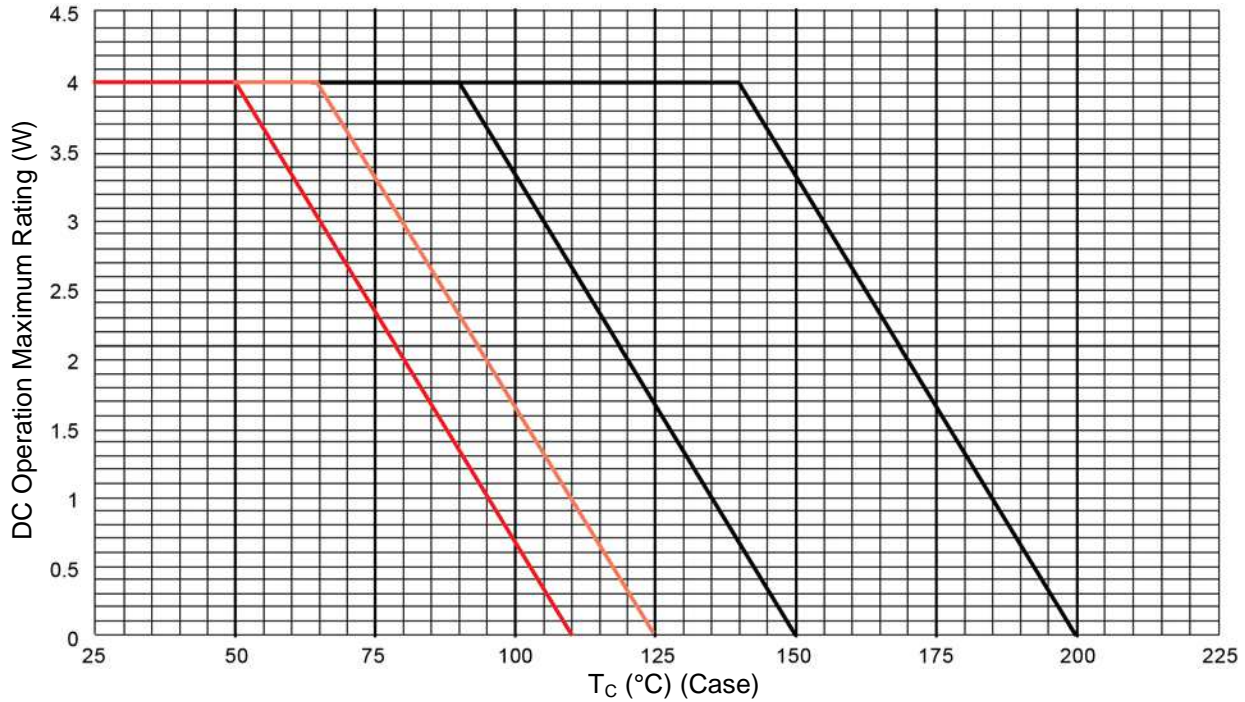


FIGURE 1
Derating for all devices ($R_{\theta JC}$)

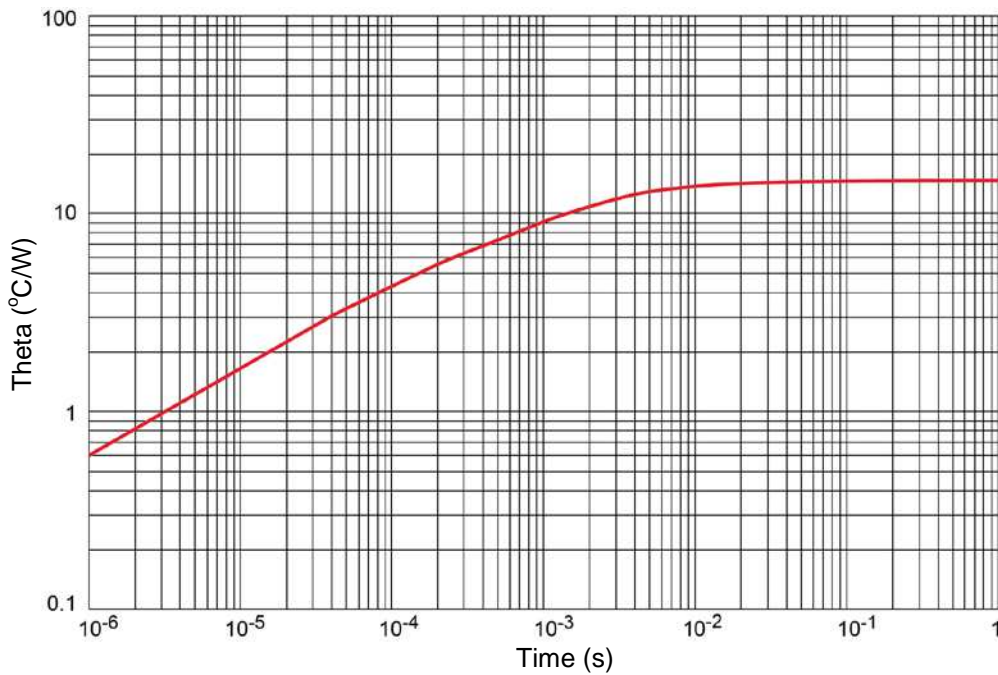
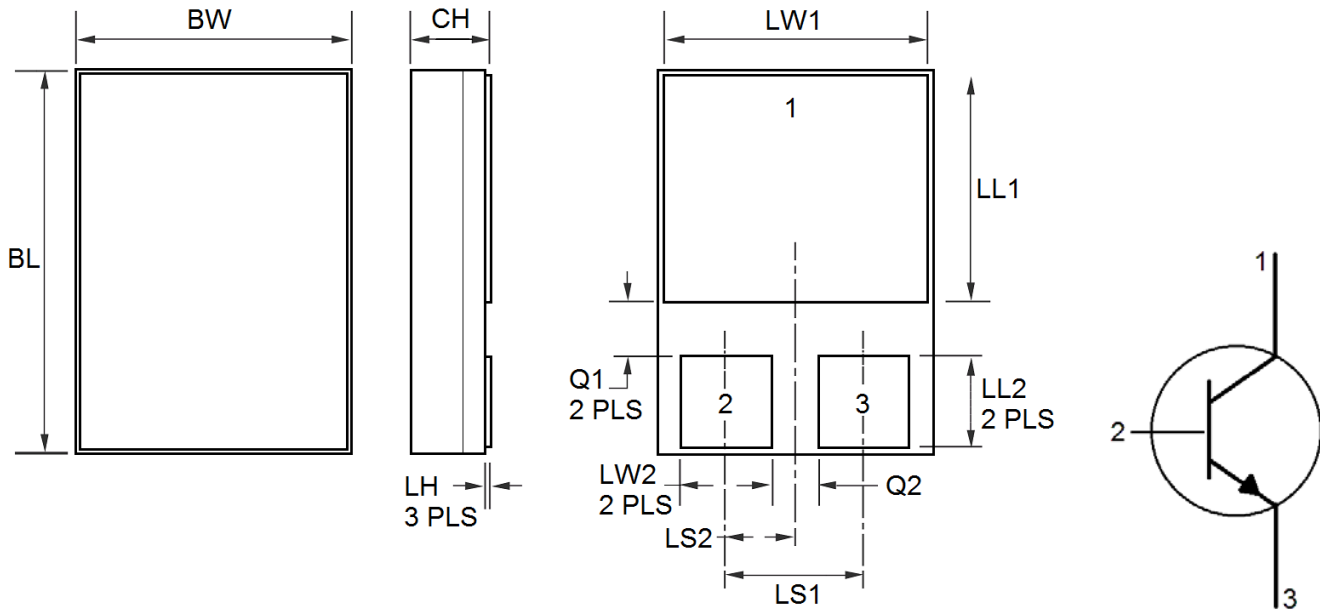


FIGURE 2
Thermal Impedance Graph ($R_{\theta JC}$)

PACKAGE DIMENSIONS

NOTES:

1. Dimensions are in inches.
2. Millimeter equivalents are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to Φ x symbology.

Ltr	Dimensions			
	Inch		Millimeters	
	Min	Max	Min	Max
BL	0.215	0.225	5.46	5.72
BW	0.145	0.155	3.68	3.94
CH	0.049	0.075	1.24	1.91
LH		0.02		0.51
LW1	0.135	0.145	3.43	3.68
LW2	0.047	0.057	1.19	1.45
LL1	0.085	0.125	2.16	3.18
LL2	0.045	0.075	1.14	1.91
LS1	0.070	0.095	1.78	2.41
LS2	0.035	0.048	0.89	1.22
Q1	0.030	0.070	0.76	1.78
Q2	0.020	0.035	0.51	0.89
TERMINAL				
1	COLLECTOR			
2	BASE			
3	EMITTER			