



NPN MEDIUM POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/349

Qualified Levels:
JAN, JANTX and JANTXV

DESCRIPTION

This family of high-frequency, epitaxial planar transistors feature low saturation voltage. The U4 package is hermetically sealed and provides a low profile for minimizing board height. The 'A' version maintains it's forward current transfer ratio, h_{FE} , at low temperature at higher collector-emitter voltage. These devices also available in TO-5 and TO-39 packages. 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 2N3506U4 through 2N3507U4 series.
- RoHS compliant versions available (commercial grade only).
- $V_{ce(sat)} = 0.5\text{ V @ } I_C = 500\text{ mA}$
- Rise time $t_r = 30\text{ ns max @ } I_C = 1.5\text{ A, } I_{B1} = 150\text{ mA}$
- Fall time $t_f = 35\text{ ns max @ } I_C = 1.5\text{ A, } I_{B1} = I_{B2} = 150\text{ mA}$

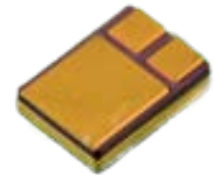
APPLICATIONS / BENEFITS

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

MAXIMUM RATINGS

Parameters / Test Conditions	Symbol	2N3506U4	2N3507U4	Unit
Collector-Emitter Voltage	V_{CEO}	40	50	V
Collector-Base Voltage	V_{CBO}	60	80	V
Emitter-Base Voltage	V_{EBO}	5.0		V
Collector Current	I_C	3.0		A
Total Power Dissipation	@ $T_A = +25\text{ °C}$ ⁽¹⁾	1.0		W
	@ $T_C = +100\text{ °C}$ ⁽²⁾	5.0		
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		°C


Notes: 1. Derate linearly 5.71 mW/°C for $T_A > +25\text{ °C}$.
2. $V_{ce} = 40\text{ V}$.



U4 Package

Also available in:

TO-39 package

(lead)
 [2N3506 – 2N3507A](#)

TO-5 package

(lead)
 [2N3506L – 2N3507AL](#)

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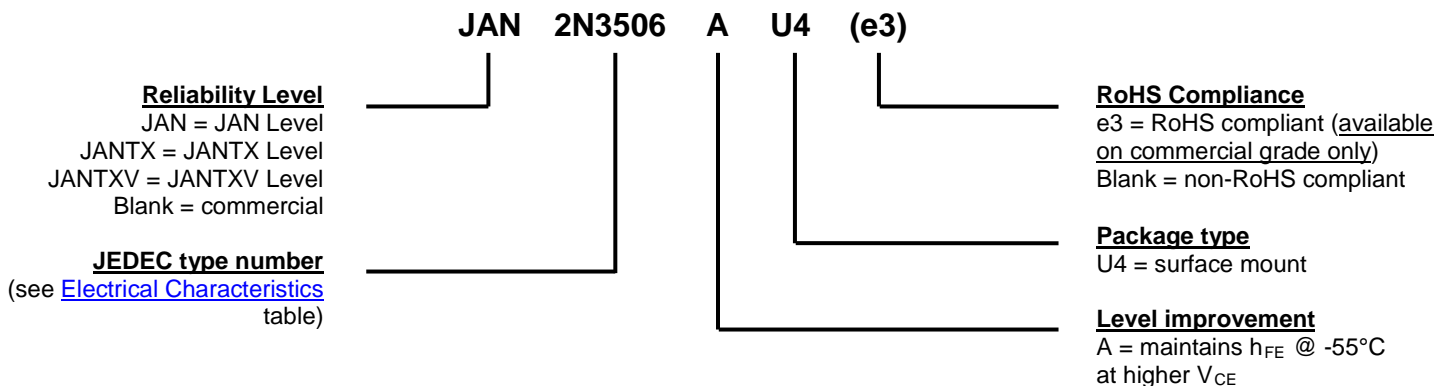
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MECHANICAL and PACKAGING

- 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.
- WEIGHT: .125 grams (125 milligrams).
- See [Package Dimensions](#) on last page.

PART NOMENCLATURE

SYMBOLS & DEFINITIONS

Symbol	Definition
C_{obo}	common-base open-circuit output capacitance
I_C	collector current, dc
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_{BE}	base-emitter voltage, dc
V_{CE}	collector-emitter voltage, dc
V_{CEO}	collector-emitter voltage, base open
V_{CBO}	collector-emitter voltage, emitter open
V_{EB}	emitter-base voltage, dc
V_{EBO}	emitter-base voltage, collector open

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Collector-Emitter Breakdown Voltage $I_C = 10\text{ mA}$	$V_{(BR)CEO}$	40 50		V
Collector-Emitter Cutoff Current $V_{CE} = 40\text{ V}$ $V_{CE} = 60\text{ V}$	I_{CEX}		1.0 1.0	μA
Collector-Base Breakdown Voltage $I_C = 100\text{ }\mu\text{A}$	$V_{(BR)CBO}$	60 80		V
Emitter-Base Breakdown Voltage $I_E = 10\text{ }\mu\text{A}$	$V_{(BR)EBO}$	5		V

ON CHARACTERISTICS ⁽³⁾

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Forward-Current Transfer Ratio $I_C = 500\text{ mA}$, $V_{CE} = 1\text{ V}$	h_{FE}	50 35	250 175	
Forward-Current Transfer Ratio $I_C = 1.5\text{ A}$, $V_{CE} = 2\text{ V}$	h_{FE}	40 30	200 150	
Forward-Current Transfer Ratio $I_C = 2.5\text{ A}$, $V_{CE} = 3\text{ V}$	h_{FE}	30 25		
Forward-Current Transfer Ratio $I_C = 3.0\text{ A}$, $V_{CE} = 5\text{ V}$	h_{FE}	25 20		
Forward-Current Transfer Ratio $I_C = 500\text{ mA}$, $V_{CE} = 1.0\text{ V @ } -55^\circ\text{C}$	h_{FE}	25 17		
Forward-Current Transfer Ratio $I_C = 500\text{ mA}$, $V_{CE} = 2.0\text{ V @ } -55^\circ\text{C}$	h_{FE}	25 17		
Collector-Emitter Saturation Voltage $I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$	$V_{CE(sat)}$		0.5	V
Collector-Emitter Saturation Voltage $I_C = 1.5\text{ A}$, $I_B = 150\text{ mA}$	$V_{CE(sat)}$		1.0	V
Collector-Emitter Saturation Voltage $I_C = 2.5\text{ A}$, $I_B = 250\text{ mA}$	$V_{CE(sat)}$		1.5	V
Base-Emitter Saturation Voltage $I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$	$V_{BE(sat)}$		1.0	V
Base-Emitter Saturation Voltage $I_C = 1.5\text{ A}$, $I_B = 150\text{ mA}$	$V_{BE(sat)}$	0.8	1.3	V
Base-Emitter Saturation Voltage $I_C = 2.5\text{ A}$, $I_B = 250\text{ mA}$	$V_{BE(sat)}$		2.0	V

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 100\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 20\text{ MHz}$	$ h_{fe} $	3.0	15	
Output Capacitance $V_{CB} = 10\text{ V}$, $I_E = 0$, $100\text{ kHz} \leq f \leq 1.0\text{ MHz}$	C_{obo}		40	pF
Input Capacitance $V_{EB} = 3.0\text{ V}$, $I_C = 0$, $100\text{ kHz} \leq f \leq 1.0\text{ MHz}$	C_{ibo}		300	pF

SWITCHING CHARACTERISTICS (4)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Delay Time $I_C = 1.5\text{ A}$, $I_{B1} = 150\text{ mA}$	t_d		15	ns
Rise Time $I_C = 1.5\text{ A}$, $I_{B1} = 150\text{ mA}$	t_r		30	ns
Storage Time $I_C = 1.5\text{ A}$, $I_{B1} = I_{B2} = 150\text{ mA}$	t_s		55	ns
Fall Time $I_C = 1.5\text{ A}$, $I_{B1} = I_{B2} = 150\text{ mA}$	t_f		35	ns

- NOTES:** (3) Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$.
 (4) Consult MIL-PRF-19500/349 for additional information.

GRAPHS

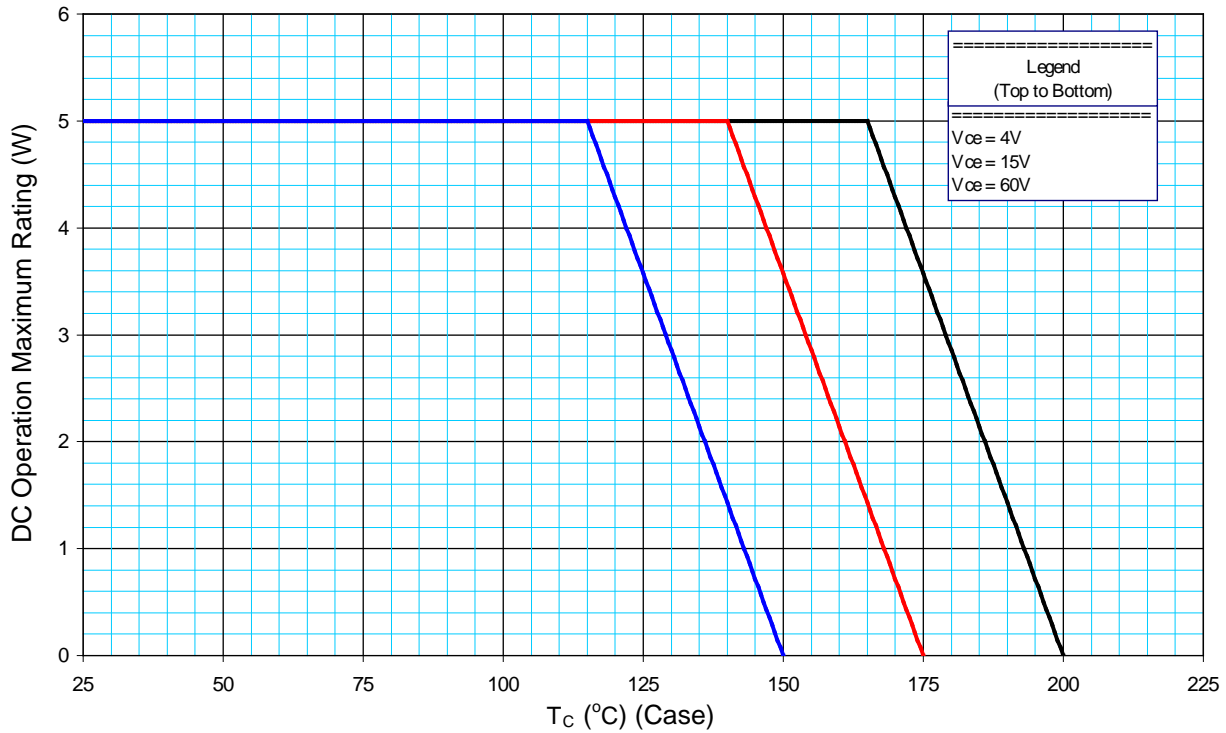


FIGURE 1
 Temperature-Power Derating Curve
NOTES: Thermal Resistance Junction to Case = 7.0 °C/W
 Case mounted to infinite sink.

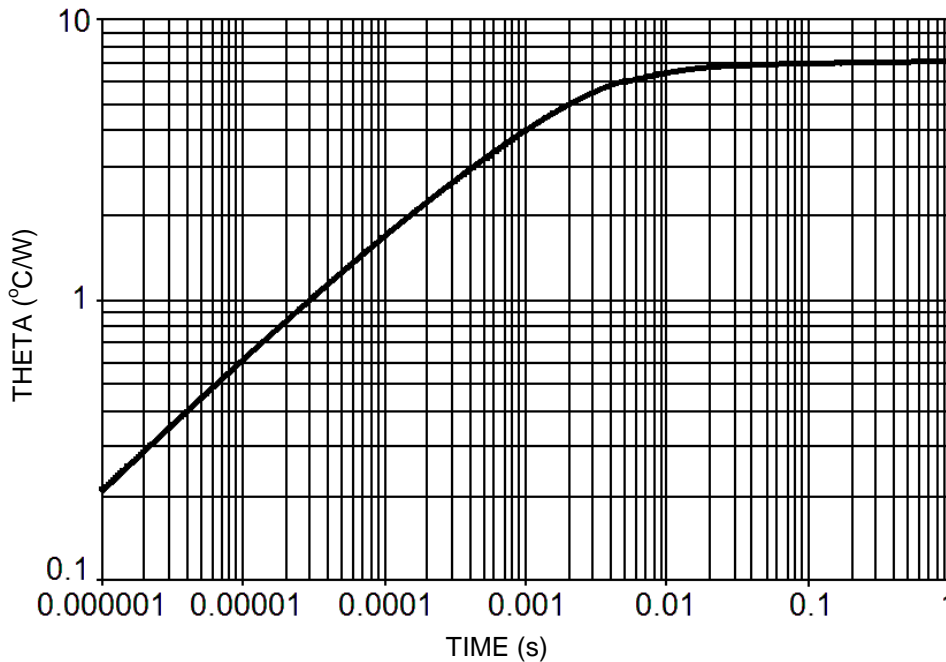
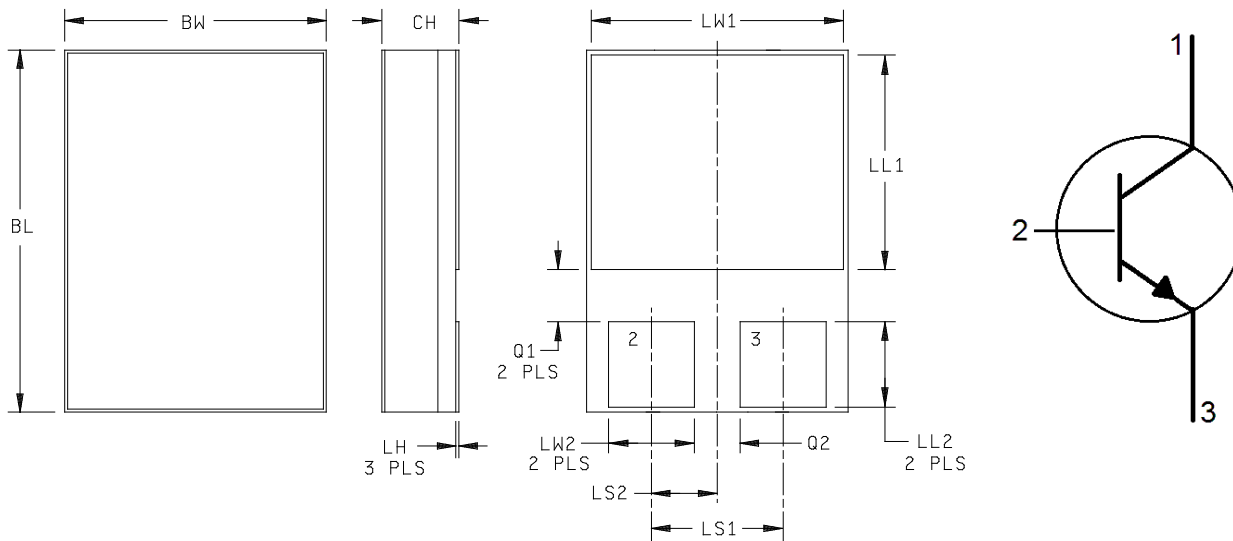


FIGURE 2
 Maximum Thermal Impedance ($R_{\theta JC}$)

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			
	Inches		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	3.17
LL2	0.045	0.075	1.14	1.90
LS1	0.070	0.095	1.78	2.41
LS2	0.035	0.048	0.89	1.21
Q1	0.03	0.070	0.76	1.78
Q2	0.02	0.035	0.51	0.88
TERMINAL				
1	COLLECTOR			
2	BASE			
3	EMITTER			