RoHS

Available on commercial versions

NPN MEDIUM POWER SILICON TRANSISTOR

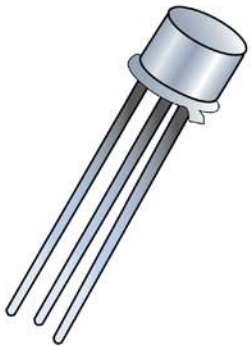
Qualified per MIL-PRF-19500/349

Qualified Levels:
JAN, JANTX and JANTXV

DESCRIPTION

This family of 2N3506L through 2N3507AL high-frequency, epitaxial planar transistors feature low saturation voltage. 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.



TO-5 Package

Also available in:

TO-39 (TO-205-AD) package
(leaded)
2N3506 – 2N3507A

U4 package
(surface mount)
2N3506U4 – 2N3507AU4

FEATURES

- JEDEC registered 2N3506 through 2N3507 series.
- RoHS compliant versions available (commercial grade only).
- $V_{CE(sat)}$ = 0.5 V @ I_C = 500 mA.
- Rise time t_r = 30 ns max @ I_C = 1.5 A, I_{B1} = 150 mA.
- Fall time t_f = 35 ns max @ I_C = 1.5 A, I_{B1} = I_{B2} = 150 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	2N3506L	2N3507L	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
Thermal Resistance Junction-to-Ambient	$R_{\Theta JA}$	175		°C/W
Thermal Resistance Junction-to-Case	$R_{\Theta JC}$	18		°C/W
Collector Current	I_C	3.0		A
Total Power Dissipation @ T_A = +25 °C (1) @ T_C = +110 °C (2)	P_D	1.0 5.0		W
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 °C.
2. Derate linearly 55.5 mW/°C for T_C > +110 °C.

MSC – Lawrence
6 Lake Street,
Lawrence, MA 01841
Tel: 1-800-446-1158 or
(978) 620-2600
Fax: (978) 689-0803

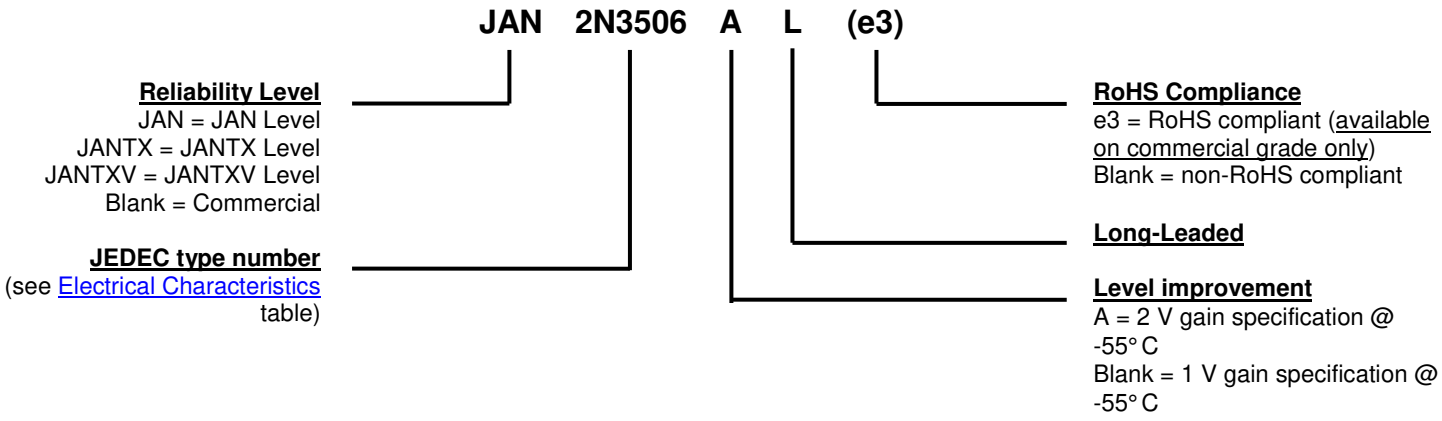
MSC – Ireland
Gort Road Business Park,
Ennis, Co. Clare, Ireland
Tel: +353 (0) 65 6840044
Fax: +353 (0) 65 6822298

Website:
www.microsemi.com

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 (commercial grade only) with pure matte tin (commercial grade only).
- MARKING: Part number, date code, manufacturer's ID.
- POLARITY: NPN (see package outline).
- WEIGHT: Approximately 1.14 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°C, unless otherwise noted)

OFF CHARACTERISTICS

Parameters / Test Conditions		Symbol	Min.	Max.	Unit
Collector-Emitter Breakdown Voltage I_C = 10 mA	2N3506L 2N3507L	$V_{(BR)CEO}$	40 50		V
Collector-Emitter Cutoff Current V_{CE} = 40 V; V_{EB} = 4 V V_{CE} = 60 V; V_{EB} = 4 V	2N3506L 2N3507L	I_{CEX}		1.0 1.0	µA
Collector-Base Breakdown Voltage I_C = 100 µA	2N3506L 2N3507L	$V_{(BR)CBO}$	60 80		V
Emitter-Base Breakdown Voltage I_E = 10 µA		$V_{(BR)EBO}$	5		V

ON CHARACTERISTICS (1)

Parameters / Test Conditions		Symbol	Min.	Max.	Unit
Forward-Current Transfer Ratio I_C = 500 mA, V_{CE} = 1 V	2N3506L 2N3507L	h_{FE}	50 35	250 175	
Forward-Current Transfer Ratio I_C = 1.5 A, V_{CE} = 2 V	2N3506L 2N3507L	h_{FE}	40 30	200 150	
Forward-Current Transfer Ratio I_C = 2.5 A, V_{CE} = 3 V	2N3506L 2N3507L	h_{FE}	30 25		
Forward-Current Transfer Ratio I_C = 3.0 A, V_{CE} = 5 V	2N3506L 2N3507L	h_{FE}	25 20		
Forward-Current Transfer Ratio I_C = 500 mA, V_{CE} = 1.0 V @ -55 °C	2N3506L 2N3507L	h_{FE}	25 17		
Forward-Current Transfer Ratio I_C = 500 mA, V_{CE} = 2.0 V @ -55 °C	2N3506AL 2N3507AL	h_{FE}	25 17		
Collector-Emitter Saturation Voltage I_C = 500 mA, I_B = 50 mA		$V_{CE(sat)}$		0.5	V
Collector-Emitter Saturation Voltage I_C = 1.5 A, I_B = 150 mA		$V_{CE(sat)}$		1.0	V
Collector-Emitter Saturation Voltage I_C = 2.5 A, I_B = 250 mA		$V_{CE(sat)}$		1.5	V
Base-Emitter Saturation Voltage I_C = 500 mA, I_B = 50 mA		$V_{BE(sat)}$		1.0	V
Base-Emitter Saturation Voltage I_C = 1.5 A, I_B = 150 mA		$V_{BE(sat)}$	0.8	1.3	V
Base-Emitter Saturation Voltage I_C = 2.5 A, I_B = 250 mA		$V_{BE(sat)}$		2.0	V

(1) Pulse Test: Pulse Width = 300 µs, duty cycle ≤ 2.0%.

ELECTRICAL CHARACTERISTICS (T_A = +25°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 mA, V_{CE} = 5Vdc, f = 20 MHz	$\|h_{fe}\|$	3.0	15	
Output Capacitance V_{CB} = 10 V, I_E = 0, 100 kHz ≤ f ≤ 1.0 MHz	C_{obo}		40	pF
Input Capacitance V_{EB} = 3.0 V, I_C = 0, 100 kHz ≤ f ≤ 1.0 MHz	C_{ibo}		300	pF

SWITCHING CHARACTERISTICS (2)

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

(2) Consult MIL-PRF-19500/349 for additional infornation.

GRAPHS

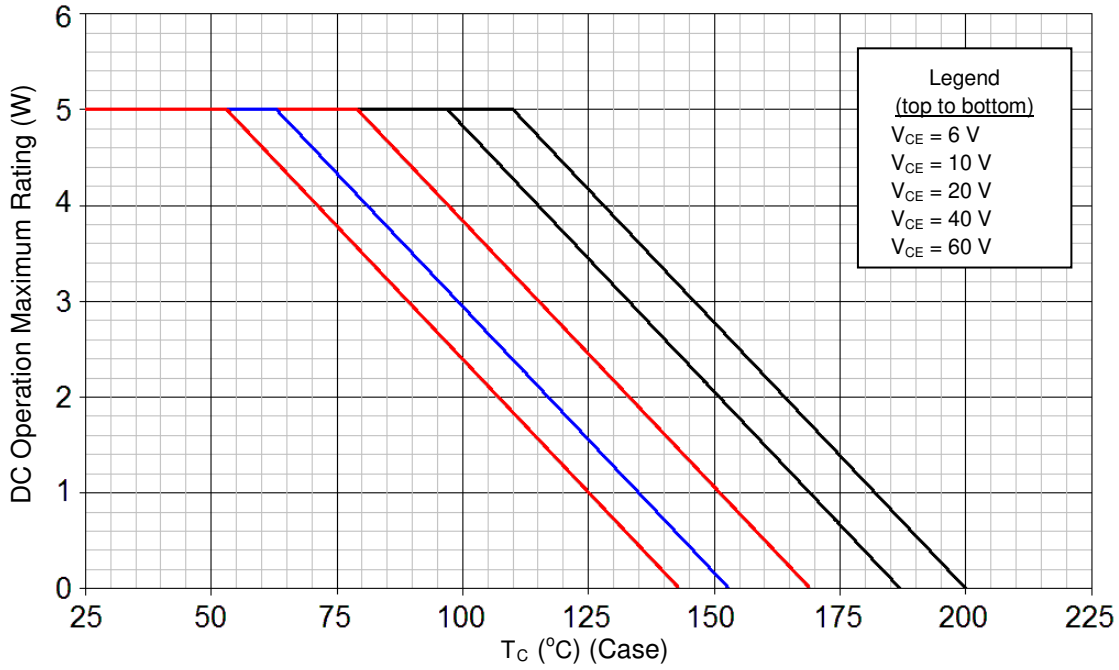


FIGURE 1
Temperature-Power Derating Curve
NOTE: Thermal Resistance Junction to Case = 18.0 °C/W

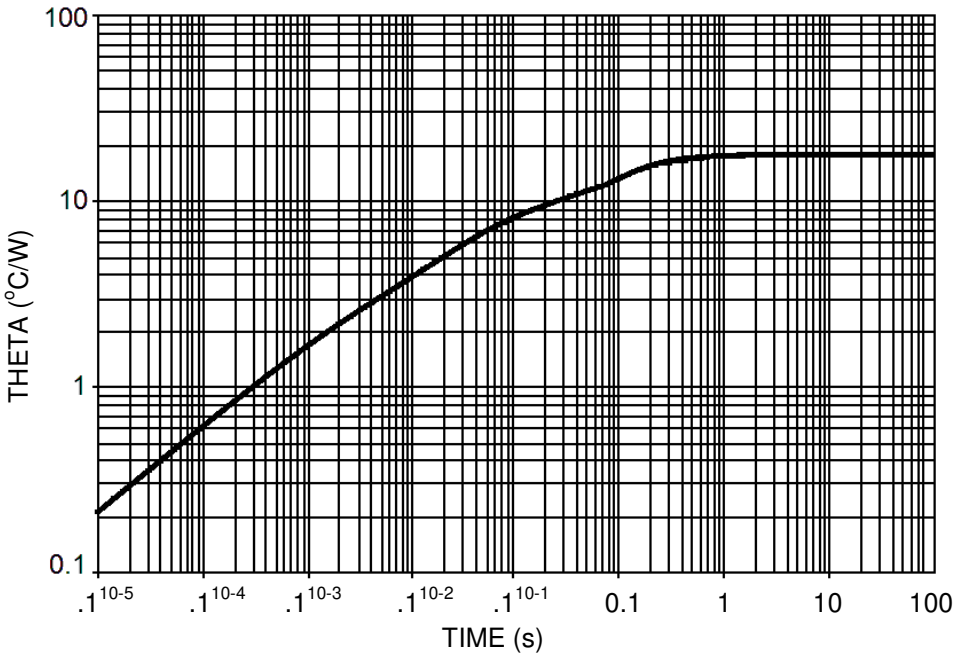
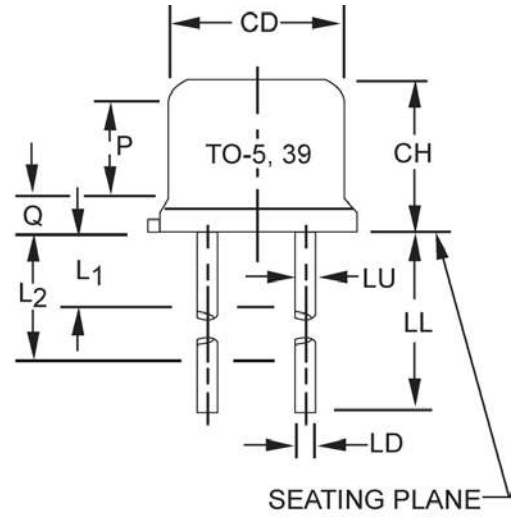
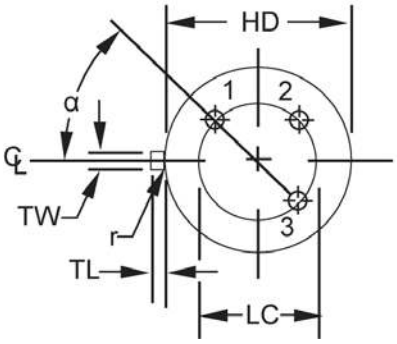


FIGURE 2
Maximum Thermal Impedance ($R_{\Theta JC}$)

PACKAGE DIMENSIONS





Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	0.305	0.335	7.75	8.51	
CH	0.240	0.260	6.10	6.60	
HD	0.335	0.370	8.51	9.40	
LC	0.200 TP		5.08 TP		6
LD	0.016	0.021	0.41	0.53	7, 8
LL	See notes 7, 8, 11				
LU	0.016	0.019	0.41	0.48	7, 8
L1		0.050		1.27	7, 8
L2	0.250		6.35		7, 8
P	0.100		2.54		5
Q		0.050		1.27	4
TL	0.029	0.045	0.74	1.14	3
TW	0.028	0.034	0.71	0.86	2
r		0.010		0.25	10
α	45° TP		45° TP		6

NOTES:

1. Dimension are in inches.
2. Millimeters are given for general information only.
3. Beyond r (radius) maximum, TH shall be held for a minimum length of .011 (0.28 mm).
4. Dimension TL measured from maximum HD.
5. Body contour optional within zone defined by HD, CD, and Q.
6. Leads at gauge plane .054 +.001 -.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC.
7. Dimension LU applies between L1 and L2. Dimension LD applies between L2 and LL minimum. Diameter is uncontrolled in L1 and beyond LL minimum.
8. All three leads.
9. The collector shall be internally connected to the case.
10. Dimension r (radius) applies to both inside corners of tab.
11. Dimension LL shall be 1.5 inches (38.1mm) minimum and 1.75 inches (44.4 mm) maximum.
12. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.
13. Lead 1 = emitter, lead 2 = base, lead 3 = collector.