



# NPN Silicon High-Frequency Transistor

Qualified per MIL-PRF-19500/398

*Qualified Levels:  
JAN, JANTX, JANTXV  
and JANS*

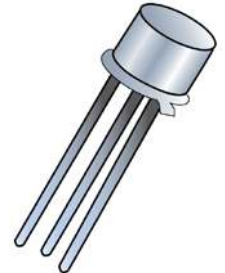
## DESCRIPTION

This 2N3866(A) silicon VHF-UHF amplifier transistor is military qualified up to the JANS level for high-reliability applications. It is also available in a low profile UB package.

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


## FEATURES

- JEDEC registered 2N3866 number
- JAN, JANTX, JANTXV and JANS qualifications also available per MIL-PRF-19500/398
- RoHS compliant



**TO-205AD**  
(formerly TO-39)  
**Package**

Also available in:

**UB package**  
(surface mount)  
 [2N3866\(A\)UB](#)

## APPLICATIONS / BENEFITS

- Short leaded TO-205AD package
- Lightweight
- Military and other high-reliability applications

## MAXIMUM RATINGS @ $T_A = +25\text{ }^\circ\text{C}$ unless otherwise noted

Parameters / Test Conditions	Symbol	Value	Unit	
Junction & Storage Temperature	$T_J, T_{stg}$	-65 to +200	$^\circ\text{C}$	
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	60	$^\circ\text{C/W}$	
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	175	$^\circ\text{C/W}$	
Collector – Emitter Voltage	$V_{CEO}$	30	V	
Collector – Base Voltage	$V_{CBO}$	60	V	
Emitter - Base Voltage	$V_{EBO}$	3.5	V	
Total Power Dissipation <sup>(1)</sup>	$P_T$	@ $T_A = +25\text{ }^\circ\text{C}$ <sup>(1)</sup>	1.0	W
		@ $T_C = +25\text{ }^\circ\text{C}$ <sup>(2)</sup>	2.9	
Collector Current	$I_C$	0.4	A	

**Notes:** 1. Derated linearly 5.71 mW/ $^\circ\text{C}$  for  $T_A > +25\text{ }^\circ\text{C}$   
2. Derated at 16.6 mW/ $^\circ\text{C}$  for  $T_C > +25\text{ }^\circ\text{C}$

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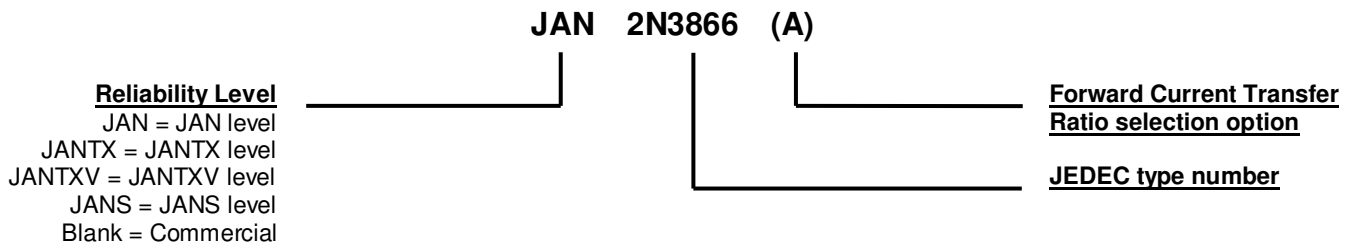
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**MECHANICAL and PACKAGING**

- CASE: Hermetically sealed, kovar base, nickel cap
- TERMINALS: Gold plate, solder dip (Sn63/Pb37) available upon request. NOTE: Solder dip will eliminate RoHS compliance.
- MARKING: Part number, date code, manufacturer's ID and serial number
- POLARITY: NPN
- WEIGHT: Approximately 1.064 grams
- See [Package Dimensions](#) on last page.

**PART NOMENCLATURE**

**SYMBOLS & DEFINITIONS**

Symbol	Definition
$I_B$	Base current: The value of the dc current into the base terminal.
$I_C$	Collector current: The value of the dc current into the collector terminal.
$V_{BE}$	Base-emitter voltage: The dc voltage between the base and the emitter.
$V_{CB}$	Collector-base voltage: The dc voltage between the collector and the base.
$V_{CBO}$	Collector-base voltage, base open: The voltage between the collector and base terminals when the emitter terminal is open-circuited.
$V_{CE}$	Collector-emitter voltage: The dc voltage between the collector and the emitter.
$V_{CEO}$	Collector-emitter voltage, base open: The voltage between the collector and the emitter terminals when the base terminal is open-circuited.
$V_{CC}$	Collector-supply voltage: The supply voltage applied to a circuit connected to the collector.
$V_{EBO}$	Emitter-base voltage, collector open: The voltage between the emitter and base terminals with the collector terminal open-circuited.

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

Characteristics	Symbol	Min	Max	Unit
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**OFF CHARACTERISTICS**

Collector-Emitter Breakdown Voltage $I_C = 5\text{ mA}$	$V_{(BR)CEO}$	30		V
Collector-Base Breakdown Voltage $I_C = 100\text{ }\mu\text{A}$	$V_{(BR)CBO}$	60		V
Emitter-Base Breakdown Voltage $I_E = 100\text{ }\mu\text{A}$	$V_{(BR)EBO}$	3.5		V
Collector-Emitter Cutoff Current $V_{CE} = 28\text{ V}$	$I_{CEO}$		20	$\mu\text{A}$
Collector-Emitter Cutoff Current $V_{CE} = 55\text{ V}$	$I_{CES1}$		100	$\mu\text{A}$

**ON CHARACTERISTICS <sup>(1)</sup>**

Forward-Current Transfer Ratio $I_C = 50\text{ mA}$ , $V_{CE} = 5.0\text{ V}$	2N3866 2N3866A	$h_{FE}$	15 25	200 200	
$I_C = 360\text{ mA}$ , $V_{CE} = 5.0\text{ V}$	2N3866 2N3866A		5 8		
Collector-Emitter Saturation Voltage $I_C = 100\text{ mA}$ , $I_B = 10\text{ mA}$		$V_{CE(sat)}$		1.0	V
Collector-Emitter Cutoff Current – High Temp Operation $V_{CE} = 55\text{ V}$ , $T_A = +150\text{ }^\circ\text{C}$		$I_{CES2}$		2.0	mA
Forward-Current Transfer Ratio – Low Temperature Operation $V_{CE} = 5.0\text{ V}$ , $I_C = 50\text{ mA}$ , $T_A = -55\text{ }^\circ\text{C}$	2N3866 2N3866A	$h_{FE3}$	7 12		

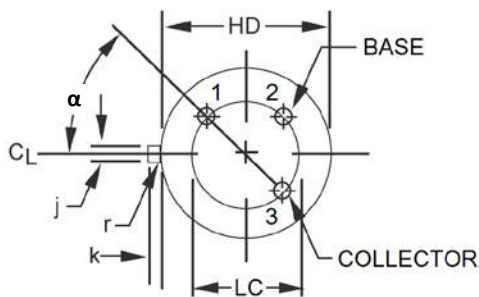
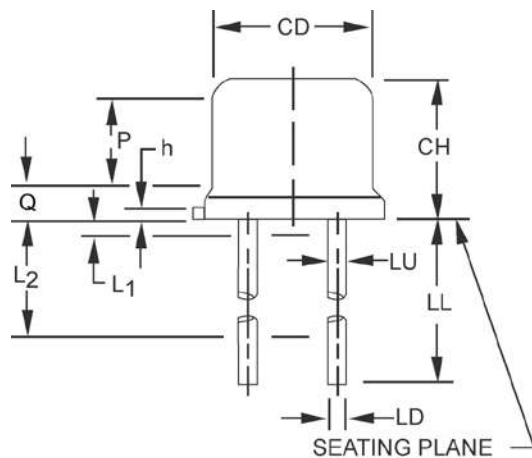
**DYNAMIC CHARACTERISTICS**

Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 50\text{ mA}$ , $V_{CE} = 15\text{ V}$ , $f = 200\text{ MHz}$	2N3866 2N3866A	$ h_{FE} $	2.5 4.0	8.0 7.5	
Output Capacitance $V_{CB} = 28\text{ V}$ , $I_E = 0$ , $100\text{ kHz} \leq f \leq 1.0\text{ MHz}$		$C_{obo}$		3.5	pF

**POWER OUTPUT CHARACTERISTICS**

Power Output $V_{CC} = 28\text{ V}$ ; $P_{in} = 0.15\text{ W}$ ; $f = 400\text{ MHz}$ * $V_{CC} = 28\text{ V}$ ; $P_{in} = 0.075\text{ W}$ ; $f = 400\text{ MHz}$ * * See Figure 4 on MIL-PRF-19500/398		$P_{1out}$ $P_{2out}$	1.0 0.5	2.0	W
Collector Efficiency $V_{CC} = 28\text{ V}$ ; $P_{in} = 0.15\text{ W}$ ; $f = 400\text{ MHz}$ $V_{CC} = 28\text{ V}$ ; $P_{in} = 0.075\text{ W}$ ; $f = 400\text{ MHz}$		n1 n2	45 40		%
Clamp Inductive Collector-Emitter Breakdown Voltage $V_{BE} = -1.5\text{ V}$ , $I_C = 40\text{ mA}$		$V_{(BR)CEX}$	55		V

(1) Pulse Test: pulse width = 300  $\mu\text{s}$ , duty cycle  $\leq 2.0\%$

**PACKAGE DIMENSIONS**


Ltr	Dimensions				Notes
	Inch		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	
h	0.009	0.041	0.23	1.04	
j	0.028	0.034	0.71	0.86	3
k	0.029	0.045	0.74	1.14	3, 4
LD	0.016	0.021	0.41	0.53	8, 9
LL	0.500	0.750	12.7	19.05	
LC	0.200 TP		5.08 TP		7
LU	0.016	0.019	0.41	0.48	8, 9
L1	-	0.050	-	1.27	8, 9
L2	0.250	-	6.35	-	8, 9
P	0.100	-	2.54	-	7
Q	-	0.030	-	0.76	5
r	-	0.010	-	0.25	10
α	45° TP		45° TP		7

**NOTES:**

- Dimensions are in inches.
- Millimeters are given for information only.
- Beyond r (radius) maximum, TL shall be held for a minimum length of 0.011 inch (0.28 mm).
- Dimension TL measured from maximum HD.
- Body contour optional within zone defined by HD, CD, and Q.
- CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
- Leads at gauge plane 0.054 +0.001 -0.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within 0.007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC.
- Dimension LU applies between L1 and L2. Dimension LD applies between L2 and LL minimum. Diameter is uncontrolled in L1 and beyond LL minimum.
- All three leads.
- The collector shall be internally connected to the case.
- Dimension r (radius) applies to both inside corners of tab.
- In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.
- Lead 1 = emitter, lead 2 = base, lead 3 = collector.