



NPN LOW POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/368

*Qualified Levels:
JAN, JANTX, JANTXV
and JANS*
(*2N3440U4 only)*

DESCRIPTION

This family of 2N3439U4 through 2N3440U4 high-frequency, epitaxial planar transistors feature low saturation voltage. The U4 package is hermetically sealed and provides a low profile for minimizing board height. These devices are also available in UA, TO-5 and TO-39 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 2N3439U4 through 2N3440U4 series.
- RoHS compliant by design.
- $V_{ce(sat)} = 0.5 \text{ V @ } I_C = 50 \text{ mA}$.
- Turn-On time $t_{on} = 1.0 \mu\text{s max @ } I_C = 20 \text{ mA}, I_{B1} = 2.0 \text{ mA}$.
- Turn-Off time $t_{off} = 10 \mu\text{s max @ } I_C = 20 \text{ mA}, I_{B1} = -I_{B2} = 2.0 \text{ mA}$.

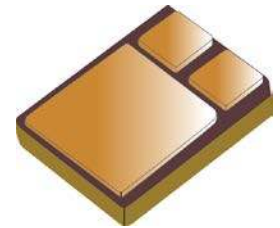
APPLICATIONS / BENEFITS

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

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

Parameters / Test Conditions	Symbol	2N3439U4	2N3440U4	Unit
Collector-Emitter Voltage	V_{CEO}	350	250	V
Collector-Base Voltage	V_{CBO}	450	300	V
Emitter-Base Voltage	V_{EBO}	7.0		V
Collector Current	I_C	1.0		A
Total Power Dissipation	P_D	@ $T_A = +25^\circ\text{C}$ ⁽¹⁾	0.8	W
		@ $T_C = +25^\circ\text{C}$ ⁽²⁾	5.0	
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		$^\circ\text{C}$


- Notes:**
1. Derate linearly @ 4.57 mW/ $^\circ\text{C}$ for $T_A > +25^\circ\text{C}$.
 2. Derate linearly @ 28.5 mW/ $^\circ\text{C}$ for $T_C > +25^\circ\text{C}$.




U4 Package

Also available in:

UA package
(surface mount)

 [2N3439UA – 2N3440UA](#)

TO-5 package
(long leaded)

 [2N3439L – 2N3440L](#)

TO-39 package
(leaded)

 [2N3439 – 2N3440](#)

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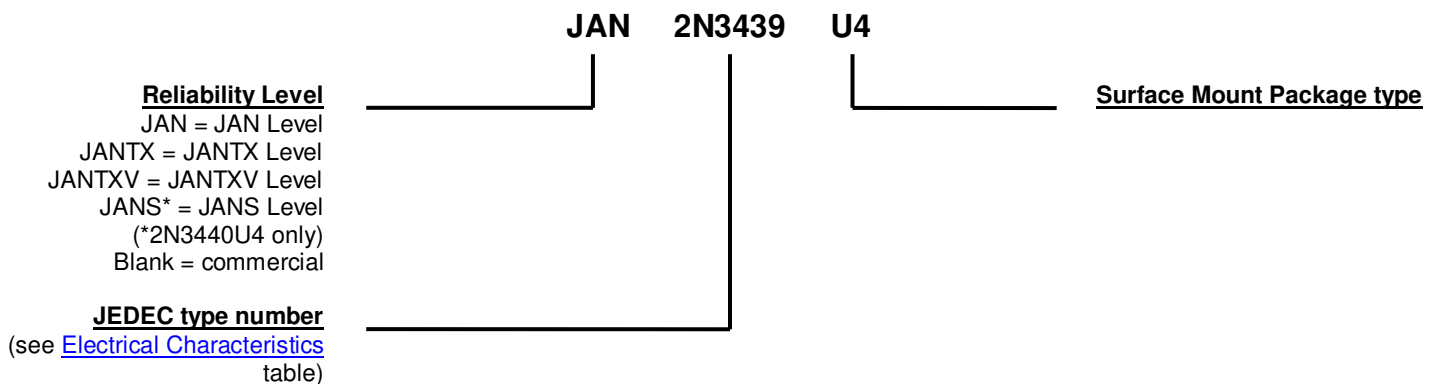
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MECHANICAL and PACKAGING

- 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. Consult factory for quantities.
- WEIGHT: 0.125 grams (125 milligrams).
- See [Package Dimensions](#) on last page.

PART NOMENCLATURE

SYMBOLS & DEFINITIONS

Symbol	Definition
C_{ibo}	Common-base open-circuit input capacitance.
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_{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 $I_C = 10 \text{ mA}$ $R_{BB1} = 470 \Omega$; $V_{BB1} = 6 \text{ V}$ $L = 25 \text{ mH (min)}$; $f = 30 - 60 \text{ Hz}$	2N3439U4 2N3440U4 $V_{(BR)CEO}$	350 250		V
Collector-Emitter Cutoff Current $V_{CE} = 300 \text{ V}$ $V_{CE} = 200 \text{ V}$	2N3439U4 2N3440U4 I_{CEO}		2.0 2.0	μA
Emitter-Base Cutoff Current $V_{EB} = 7.0 \text{ V}$	I_{EBO}		10	μA
Collector-Emitter Cutoff Current $V_{CE} = 450 \text{ V}$, $V_{BE} = -1.5 \text{ V}$ $V_{CE} = 300 \text{ V}$, $V_{BE} = -1.5 \text{ V}$	2N3439U4 2N3440U4 I_{CEX}		5.0 5.0	μA
Collector-Base Cutoff Current $V_{CB} = 360 \text{ V}$ $V_{CB} = 250 \text{ V}$ $V_{CB} = 450 \text{ V}$ $V_{CB} = 300 \text{ V}$	2N3439U4 2N3440U4 2N3439U4 2N3440U4 I_{CBO}		2.0 2.0 5.0 5.0	μA

ON CHARACTERISTICS ⁽¹⁾

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Forward-Current Transfer Ratio $I_C = 20 \text{ mA}$, $V_{CE} = 10 \text{ V}$ $I_C = 2.0 \text{ mA}$, $V_{CE} = 10 \text{ V}$ $I_C = 0.2 \text{ mA}$, $V_{CE} = 10 \text{ V}$	h_{FE}	40 30 10	160	
Collector-Emitter Saturation Voltage $I_C = 50 \text{ mA}$, $I_B = 4.0 \text{ mA}$	$V_{CE(sat)}$		0.5	V
Base-Emitter Saturation Voltage $I_C = 50 \text{ mA}$, $I_B = 4.0 \text{ mA}$	$V_{BE(sat)}$		1.3	V

DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 10 \text{ mA}$, $V_{CE} = 10 \text{ V}$, $f = 5.0 \text{ MHz}$	$ h_{fe} $	3.0	15	
Forward Current Transfer Ratio $I_C = 5.0 \text{ mA}$, $V_{CE} = 10\text{V}$, $f = 1.0 \text{ kHz}$	h_{fe}	25		
Output Capacitance $V_{CB} = 10 \text{ V}$, $I_E = 0$, $100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	C_{obo}		10	pF
Input Capacitance $V_{CB} = 5.0 \text{ V}$, $I_E = 0$, $100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	C_{ibo}		75	pF

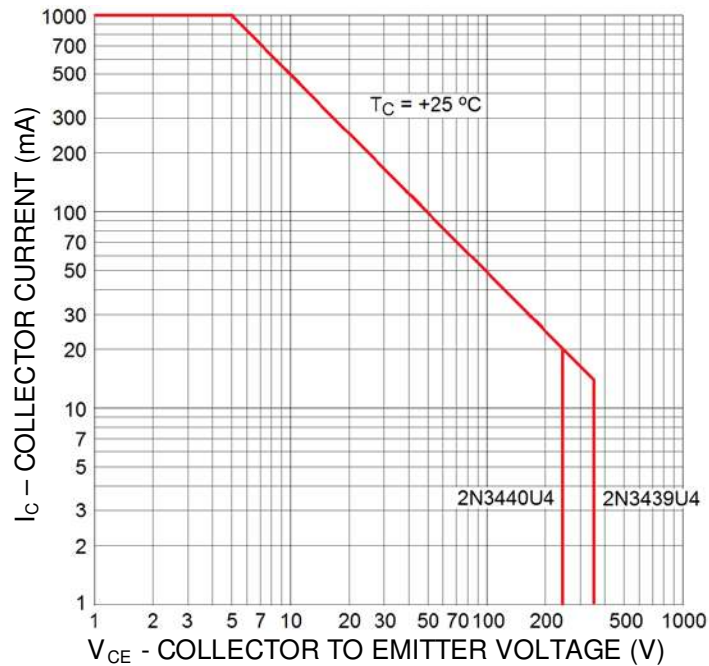
(1) Pulse Test: Pulse Width = 300 μs , duty cycle $\leq 2.0\%$.

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Turn-On Time $V_{CC} = 200\text{ V}; I_C = 20\text{ mA}, I_{B1} = 2.0\text{ mA}$	t_{on}		1.0	μs
Turn-Off Time $V_{CC} = 200\text{ V}; I_C = 20\text{ mA}, I_{B1} = -I_{B2} = 2.0\text{ mA}$	t_{off}		10	μs

SAFE OPERATING AREA (See graph below and reference [MIL-STD-750, method 3053](#))

DC Tests	
$T_C = +25^\circ\text{C}$, 1 Cycle, $t = 1.0\text{ s}$	
Test 1 $V_{CE} = 5.0\text{ V}, I_C = 1.0\text{ A}$	Both Types
Test 2 $V_{CE} = 350\text{ V}, I_C = 14\text{ mA}$	2N3439U4
Test 3 $V_{CE} = 250\text{ V}, I_C = 20\text{ mA}$	2N3440U4


Maximum Safe Operating Area (continuous dc)

GRAPHS

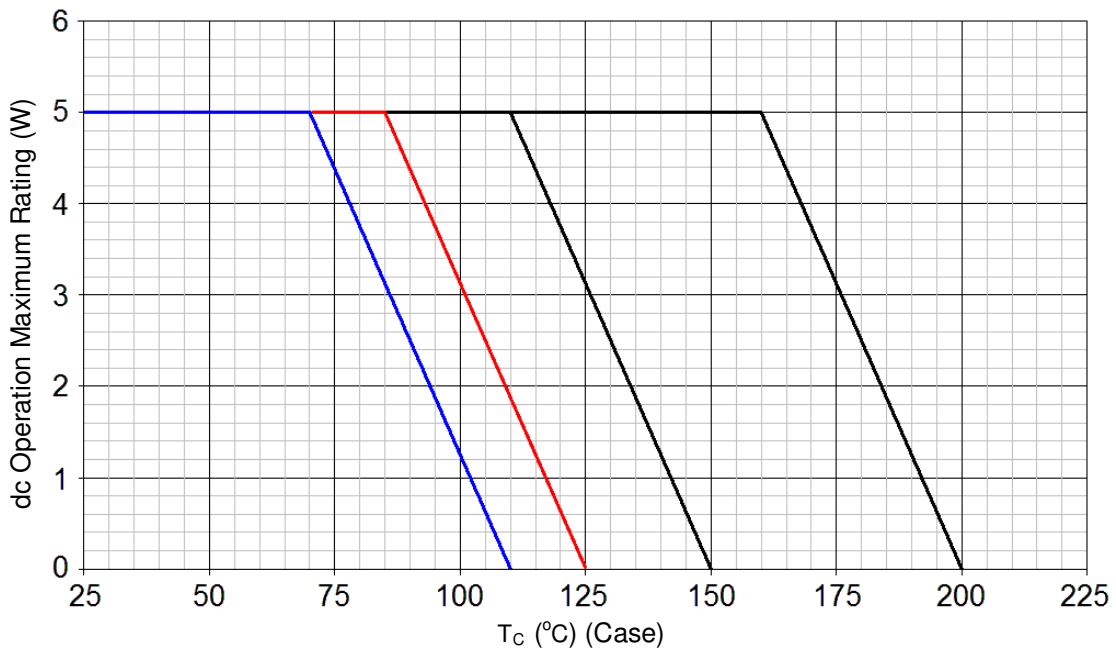


FIGURE 1

Temperature-Power Derating Curve

NOTES: Thermal Resistance Junction to Case = 8.0 °C/W
Max Finish-Alloy Temp = 175 °C

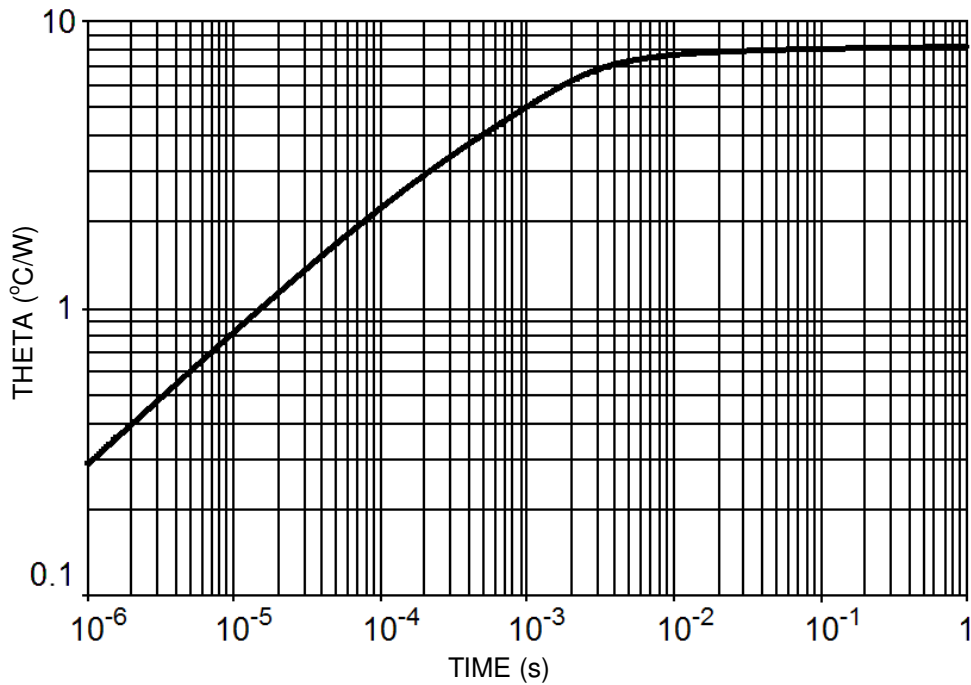
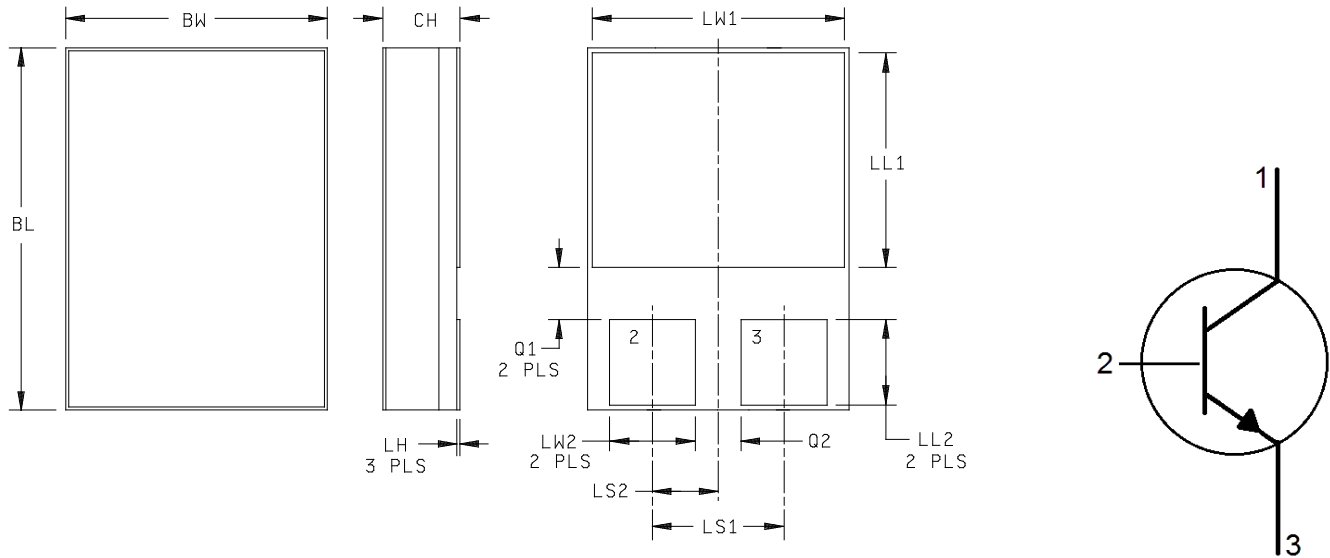


FIGURE 2

Maximum Thermal Impedance

NOTE: T_C = +25 °C, Thermal Resistance R_{θJC} = 8.0 °C/W

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		0.020		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	0.030	0.070	0.76	1.78
Q2	0.020	0.035	0.51	0.89
TERMINAL				
1	COLLECTOR			
2	BASE			
3	EMITTER			