



PNP Silicon Low-Power Transistor

Qualified per MIL-PRF-19500/485

Qualified Levels:
JAN, JANTX, JANTXV
and JANS

DESCRIPTION

This family of 2N5415U4 and 2N5416U4 epitaxial planar transistors are military qualified up to a JANS level for high-reliability applications. These devices are also available in the long-leaded TO-5, short-leaded TO-39 and low profile UA packaging.

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

FEATURES

- JEDEC registered 2N5415 through 2N5416 series
- JAN, JANTX, JANTXV, and JANS qualifications are available per MIL-PRF-19500/485. (See [part nomenclature](#) for all available options.)
- RoHS compliant

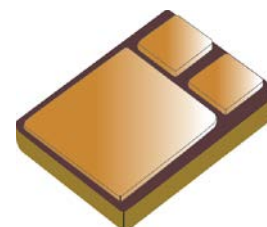
APPLICATIONS / BENEFITS

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

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

Parameters / Test Conditions	Symbol	2N5415U4	2N5416U4	Unit
Collector-Emitter Voltage	V_{CEO}	200	300	V
Collector-Base Voltage	V_{CBO}	200	350	V
Emitter-Base Voltage	V_{EBO}	6.0	6.0	V
Collector Current	I_C	1.0	1.0	A
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		$^{\circ}\text{C}$
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	145		$^{\circ}\text{C/W}$
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	12		$^{\circ}\text{C/W}$
Total Power Dissipation @ $T_A = +25\text{ }^{\circ}\text{C}$ ⁽¹⁾ @ $T_C = +25\text{ }^{\circ}\text{C}$ ⁽²⁾	P_T	1 15		W

Notes: 1. Derate linearly 6.90 mW/ $^{\circ}\text{C}$ for $T_A > +25\text{ }^{\circ}\text{C}$
2. Derate linearly 86 mW/ $^{\circ}\text{C}$ for $T_C > +25\text{ }^{\circ}\text{C}$



U4 Package

Also available in:

TO-5 package
(long-leaded)

 [2N5415 – 2N5416](#)

TO-39 (TO-205AD)
package
(short-leaded)

 [2N5415S – 2N5416S](#)

UA package
(surface mount)

 [2N5415UA – 2N5416UA](#)

MSC – Lawrence

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

MSC – Ireland

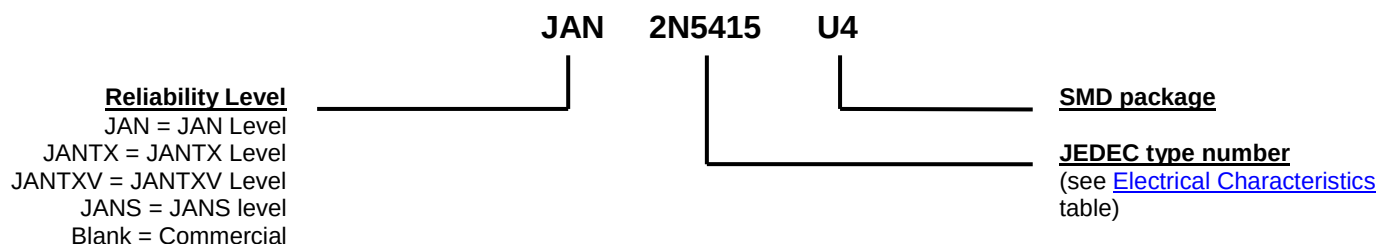
Gort Road Business Park,
Ennis, Co. Clare, Ireland
Tel: +353 (0) 65 6840044
Fax: +353 (0) 65 6822298

Website:

www.microsemi.com

MECHANICAL and PACKAGING

- CASE: Hermetically sealed, 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: PNP
- TAPE & REEL option: Standard per EIA-481D. Consult factory for quantities
- WEIGHT: Approximately 0.125 grams (125 milligrams)
- See [Package Dimensions](#) on last page.

PART NOMENCLATURE

SYMBOLS & DEFINITIONS

Symbol	Definition
C_{obo}	Common-base open-circuit output capacitance
I_{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
OFF CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Collector-Emitter Breakdown Voltage $I_C = 50\text{ mA}$, $I_B = 5\text{ mA}$, $L = 25\text{ mH}$; $f = 30 - 60\text{ Hz}$	$V_{(BR)CEO}$	200 300		V
Emitter-Base Cutoff Current $V_{EB} = 6.0\text{ V}$	I_{EBO}		20	μA
Collector-Emitter Cutoff Current $V_{CE} = 200\text{ V}$, $V_{BE} = 1.5\text{ V}$ $V_{CE} = 300\text{ V}$, $V_{BE} = 1.5\text{ V}$	I_{CEX}		50	μA
Collector-Emitter Cutoff Current $V_{CE} = 150\text{ V}$ $V_{CE} = 250\text{ V}$	I_{CEO1}		50	μA
Collector-Emitter Cutoff Current $V_{CE} = 200\text{ V}$ $V_{CE} = 300\text{ V}$	I_{CEO2}		1	mA
Collector-Base Cutoff Current $V_{CB} = 175\text{ V}$ $V_{CB} = 280\text{ V}$	I_{CBO1}		50	μA
$V_{CB} = 200\text{ V}$ $V_{CB} = 350\text{ V}$	I_{CBO2}		500	μA
$V_{CB} = 175\text{ V}$, $T_A = +150\text{ }^{\circ}\text{C}$ $V_{CB} = 280\text{ V}$, $T_A = +150\text{ }^{\circ}\text{C}$	I_{CBO3}		1	mA

ON CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Forward-Current Transfer Ratio $I_C = 50\text{ mA}$, $V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$, $V_{CE} = 10\text{ V}$ $I_C = 50\text{ mA}$, $V_{CE} = 10\text{ V}$, $T_A = +150\text{ }^{\circ}\text{C}$	h_{FE}	30 15 15	120	
Collector-Emitter Saturation Voltage $I_C = 50\text{ mA}$, $I_B = 5\text{ mA}$	$V_{CE(sat)}$		2.0	V
Base-Emitter Voltage Non-Saturation $I_C = 50\text{ mA}$, $V_{CE} = 10\text{ V}$	V_{BE}		1.5	V

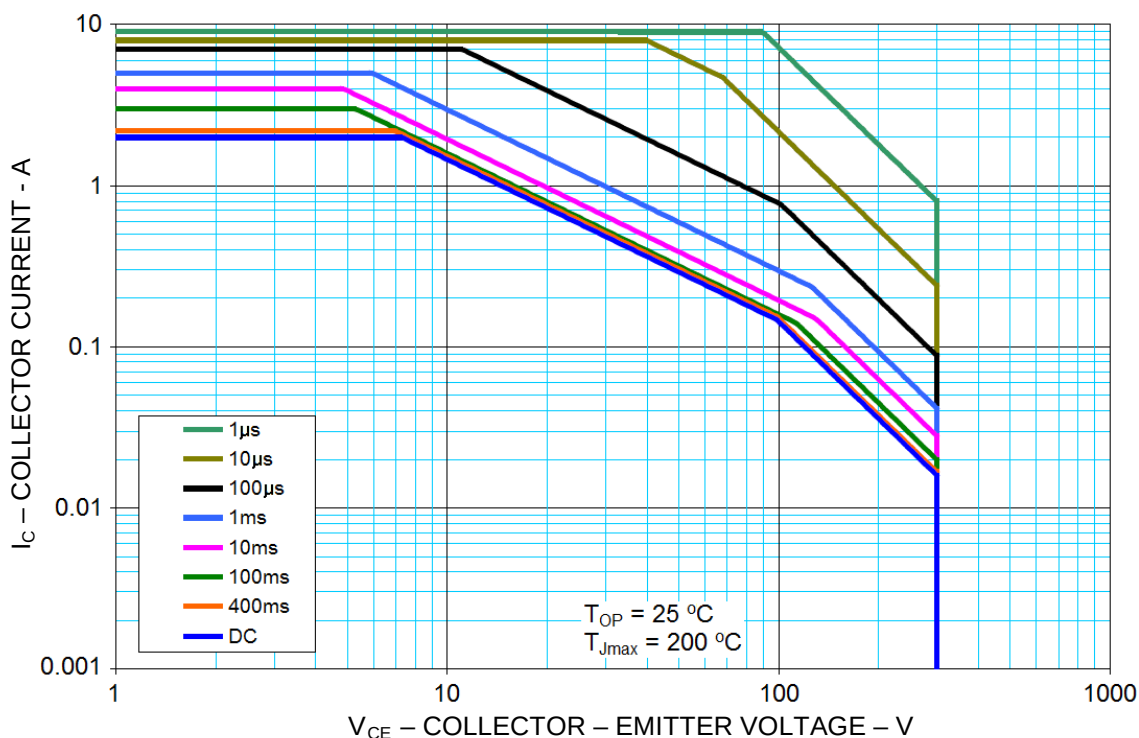
DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 10\text{ mA}$, $V_{CE} = 10\text{ V}$, $f = 5\text{ MHz}$	$ h_{fe} $	3	15	
Small-signal short Circuit Forward-Current Transfer Ratio $I_C = 5\text{ mA}$, $V_{CE} = 10\text{ V}$, $f \leq 1\text{ kHz}$	h_{fe}	25		
Output Capacitance $V_{CB} = 10\text{ V}$, $I_E = 0$, $100\text{ kHz} \leq f \leq 1\text{ MHz}$	C_{obo}		15	pF

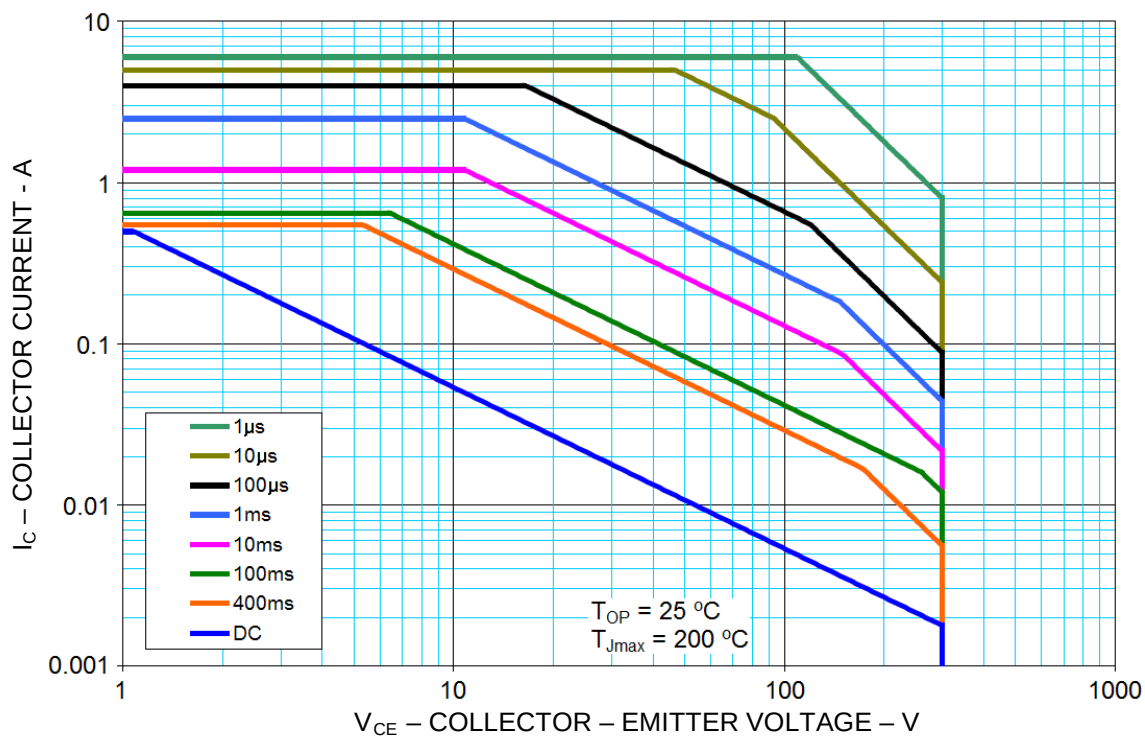
ELECTRICAL CHARACTERISTICS @ $T_A = +25\text{ }^{\circ}\text{C}$ unless otherwise noted. (continued)**SWITCHING CHARACTERISTICS**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Turn-On Time $V_{CC} = 200\text{ V}$, $I_C = 50\text{ mA}$, $I_{B1} = 5\text{ mA}$	t_{on}		1	μs
Turn-Off Time $V_{CC} = 200\text{ V}$, $I_C = 50\text{ mA}$, $I_{B1} = I_{B2} = 5\text{ mA}$	t_{off}		10	μs

SAFE OPERATING AREA (See SOA graph below and [MIL-STD-750, method 3053](#))**DC Tests** $T_C = +25\text{ }^{\circ}\text{C}$, $t_P = 0.4\text{ s}$, 1 Cycle**Test 1** $V_{CE} = 10\text{ V}$, $I_C = 1\text{ A}$ **Test 2** $V_{CE} = 100\text{ V}$, $I_C = 100\text{ mA}$ **Test 3** $V_{CE} = 200\text{ V}$, $I_C = 24\text{ mA}$ **Test 4** $V_{CE} = 300\text{ V}$, $I_C = 10\text{ mA}$ *See SOA graphs on next page*

SAFE OPERATING AREA


Maximum Safe Operating Area ($T_J = 200\text{ °C}$, U4 on copper sink $T_C = 25\text{ °C}$)



Maximum Safe Operating Area ($T_J = 200\text{ °C}$)

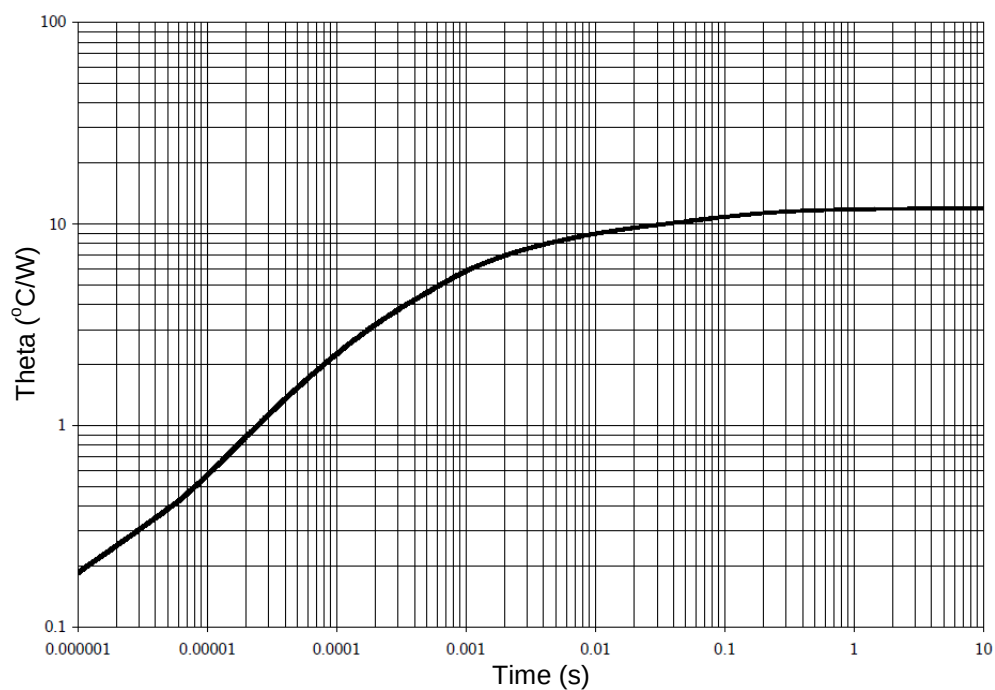
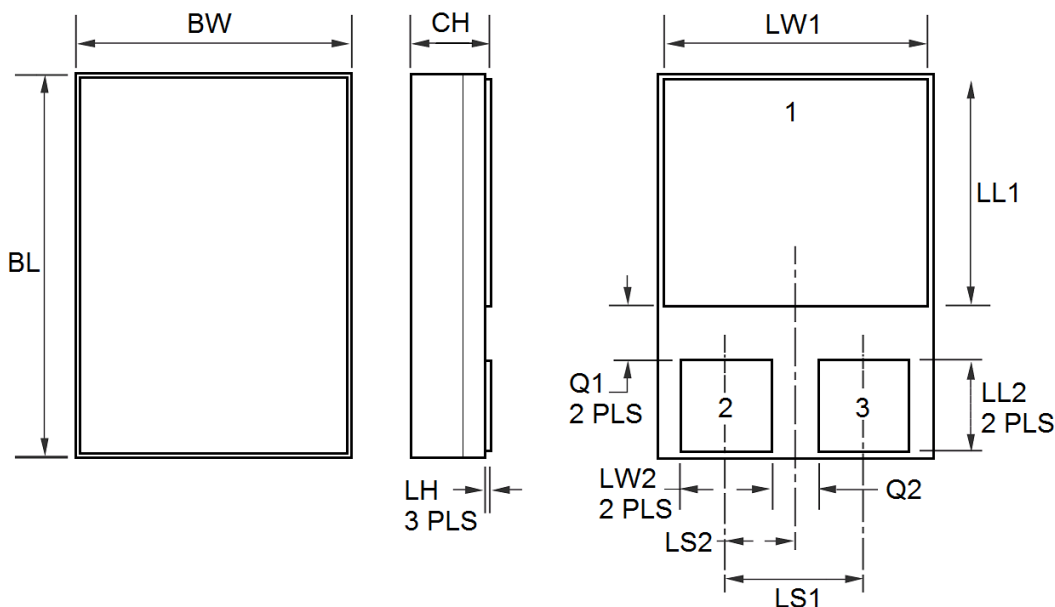
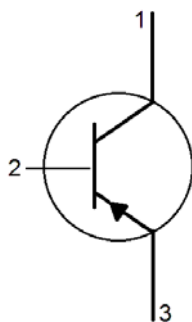
GRAPHS


FIGURE 1
Thermal impedance graph ($R_{\theta JA}$)

PACKAGE DIMENSIONS

NOTES:

1. Dimensions are in inches.
2. Millimeter equivalents are given for 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			