

[illegible]

MIL-S-19500/440 has been cancelled.  
This drawing may be used as a substitute.

CURRENT DESIGN ACTIVITY CAGE CODE 037Z3  
DEFENSE LOGISTICS AGENCY  
DLA LAND AND MARITIME,  
COLUMBUS, OHIO 43218-3990



Prepared in accordance with ASME Y14.100

### Source controlled drawing

### Revision Status of Sheets

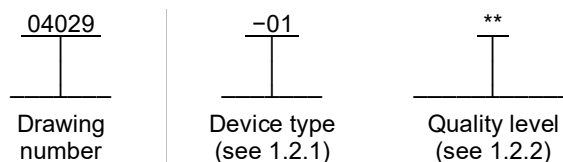
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|-------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|--|--|--|--|--|--|--|
| REV   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |  |  |  |  |  |  |  |
| SHEET |   |   |   |   |   |   |   |   |   |    |    |    |    |    |  |  |  |  |  |  |  |
| REV   | A | A | A | A | A | A | A | A | A | A  | A  | A  | A  | A  |  |  |  |  |  |  |  |
| SHEET | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |  |  |  |  |  |  |  |

|                                                                      |                                    |                           |                                                                   |              |
|----------------------------------------------------------------------|------------------------------------|---------------------------|-------------------------------------------------------------------|--------------|
| <b>PMIC N/A</b><br><br>Original date of drawing<br><br>14 March 2005 | <b>PREPARED BY</b><br>Roger Kissel |                           | <b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OH</b>               |              |
|                                                                      | <b>CHECKED BY</b><br>Alan Barone   |                           | <b>TITLE</b><br>TRANSISTOR, NPN, SILICON, HIGH POWER, TYPE 2N5927 |              |
|                                                                      | <b>APPROVED BY</b><br>Thomas Hess  |                           |                                                                   |              |
|                                                                      | <b>SIZE</b><br><br>A               | <b>CAGE CODE</b><br>037Z3 | <b>DWG NO.</b>                                                    | <b>04029</b> |
|                                                                      | <b>REV</b> A                       | <b>PAGE</b>               | <b>1 OF 14</b>                                                    |              |

## 1. SCOPE

1.1 Scope. This drawing describes the requirements for NPN, silicon, high-power transistors.

1.2 Part or Identifying Number (PIN). The complete PIN is as shown in the following example:



1.2.1 Device type. The device types consist of the drawing and dash number that identify the devices as follows: 04029-01

1.2.2 Quality levels. The quality level designators for encapsulated devices that are applicable for this drawing from the lowest to the highest level are as follows: non-TX (-01, with no suffix), "TX" and "TXV". These suffixes correspond to the JAN, JANTX and JANTXV equivalent quality requirements in [MIL-PRF-19500](#). The "TX" and "TXV" suffix are to be included in the PIN.

1.3 Maximum ratings. Unless otherwise specified,  $T_C = +25^\circ\text{C}$ .

| $P_T$ (1)<br>$T_C = +25^\circ\text{C}$ | $P_T$ (1)<br>$T_C = +100^\circ\text{C}$ | $V_{CEO}$   | $V_{CBO}$   | $V_{EBO}$   | $I_B$ (2)   | $I_C$ (3)   | $T_J$<br>and $T_{STG}$ | $R_{\theta JC}$ |
|----------------------------------------|-----------------------------------------|-------------|-------------|-------------|-------------|-------------|------------------------|-----------------|
| <u>W</u>                               | <u>W</u>                                | <u>V dc</u> | <u>V dc</u> | <u>V dc</u> | <u>A dc</u> | <u>A dc</u> | <u>°C</u>              | <u>°C/W</u>     |
| 350                                    | 200                                     | 120         | 150         | 10          | 20          | 100         | -65 to +200            | 0.5             |

(1) Between  $T_C = +25^\circ\text{C}$  and  $T_C = +200^\circ\text{C}$ , linear derating factor (average) = 2.0 W/°C.

(2) Pulsed (see [4.5.1](#)) = 24 A.

(3) Pulsed (see [4.5.1](#)) = 120 A

1.4 Primary electrical characteristics. Unless otherwise specified, primary electrical characteristics at  $T_C = +25^\circ\text{C}$ .

| Limits | $h_{fe}$ (1)                                        |                                                    |                                                    |                                                    | $V_{BE}$ (1)                                                      |                                                                    | $V_{CE(sat)}$ (1)                                              |                                                                  |
|--------|-----------------------------------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------|
|        | $I_C = 120\text{ A dc}$<br>$V_{CE} = 4\text{ V dc}$ | $I_C = 70\text{ A dc}$<br>$V_{CE} = 2\text{ V dc}$ | $I_C = 40\text{ A dc}$<br>$V_{CE} = 2\text{ V dc}$ | $I_C = 20\text{ A dc}$<br>$V_{CE} = 2\text{ V dc}$ | $I_C = 70\text{ A dc}$<br>$V_{CE} = 2\text{ V dc}$<br><u>V dc</u> | $I_C = 120\text{ A dc}$<br>$V_{CE} = 4\text{ V dc}$<br><u>V dc</u> | $I_C = 70\text{ A dc}$<br>$I_B = 7\text{ A dc}$<br><u>V dc</u> | $I_C = 120\text{ A dc}$<br>$I_B = 24\text{ A dc}$<br><u>V dc</u> |
| Min    | 5.0                                                 | 10                                                 | 15                                                 | 30                                                 | 1.5                                                               | 3.0                                                                | 0.75                                                           | 2.0                                                              |
| Max    |                                                     | 40                                                 | 50                                                 | 120                                                |                                                                   |                                                                    |                                                                |                                                                  |

(1) Pulsed (see [4.5.1](#)).

| Limits | $R_{\theta JC}$<br>°C/W | $ h_{fe} $<br>$I_C = 5\text{ A dc}$<br>$V_{CE} = 10\text{ V dc}$<br>$f = 100\text{ KHz}$ | $t_{on}$               | $t_s$             | $t_f$             |
|--------|-------------------------|------------------------------------------------------------------------------------------|------------------------|-------------------|-------------------|
|        |                         |                                                                                          | $I_C = 70\text{ A dc}$ |                   |                   |
| Min    |                         | 5                                                                                        |                        |                   |                   |
| Max    | .5                      | 20                                                                                       | 7.0 $\mu\text{s}$      | 4.0 $\mu\text{s}$ | 6.0 $\mu\text{s}$ |

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## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents in sections 3 and 4 of this specification, whether or not they are listed.

### 2.2 Government documents.

2.2.2 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

#### DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-19500 – Semiconductor Devices, General Specification for.

#### DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-750 – Test Methods for Semiconductor Devices.

(Copies of these documents are available online at <https://quicksearch.dla.mil>.)

2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 General. The individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein. All devices described herein shall meet all requirements of MIL-PRF-19500 as specified herein except qualification is not required for these devices. It is prohibited for a manufacturer not listed in 6.5 to mark devices with this drawing number.

### 3.2 Certification and manufacturer eligibility.

3.2.1 Certification as approved source of supply. In order to be listed as an approved source of supply of rectifiers compliant to this drawing (see 6.5), a manufacturer shall submit a certificate of compliance to DLA Land and Maritime – VAC prior to listing as an approved source of supply. The certificate of compliance shall state that the manufacturer's product meets the screening requirements of MIL-PRF-19500 and the requirements herein.

3.2.2 Manufacturer eligibility. To be eligible for listing as an approved source of supply, a manufacturer shall be either listed on the MIL-PRF-19500 Qualified Manufacturers List for at least one device type or, when specified, perform eligibility inspection in accordance with this drawing (see 4.2) on a sample of parts agreed upon by the manufacturer and DLA Land and Maritime VAC.

3.2.3 Certificate of conformance. A certificate of conformance shall be provided with each shipment of devices delivered in accordance with this drawing to the customer.

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

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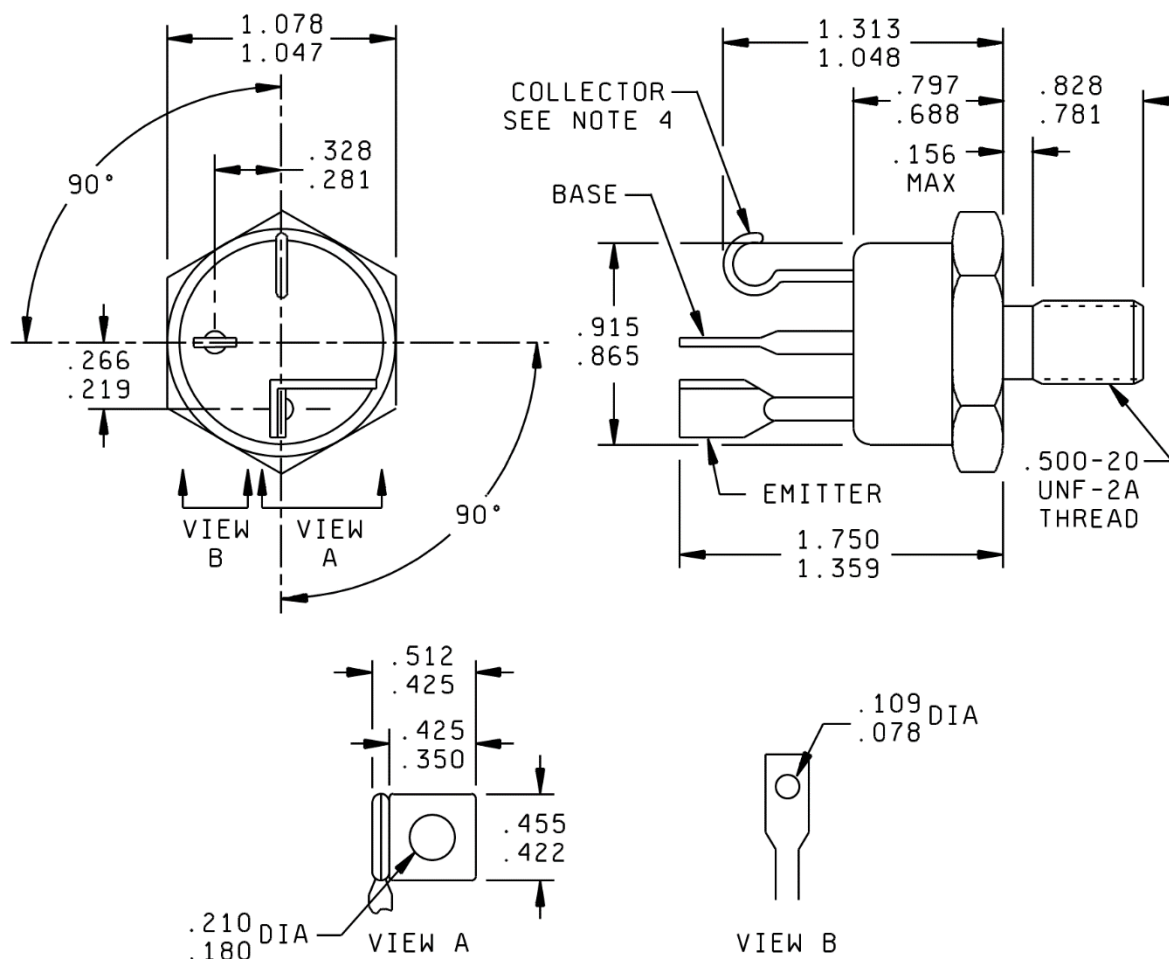
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| Inches | mm   | Inches | mm   | Inches | mm    | Inches | mm    | Inches | mm    |
|--------|------|--------|------|--------|-------|--------|-------|--------|-------|
| .078   | 1.98 | .210   | 5.33 | .422   | 10.72 | .781   | 19.48 | 1.047  | 26.35 |
| .109   | 2.77 | .219   | 5.56 | .425   | 10.80 | .797   | 20.34 | 1.048  | 26.62 |
| .120   | 3.05 | .266   | 6.76 | .455   | 11.56 | .828   | 21.03 | 1.078  | 27.38 |
| .156   | 3.96 | .281   | 7.14 | .500   | 12.70 | .865   | 21.97 | 1.313  | 33.35 |
| .160   | 4.06 | .328   | 8.33 | .512   | 13.00 | .915   | 23.24 | 1.359  | 34.42 |
| .180   | 4.57 | .350   | 8.89 | .688   | 17.48 |        |       | 1.750  | 44.45 |

NOTES:

1. Dimensions are in inches. Metric equivalents are given for general information only.
2. Position of leads in relation to hex is not controlled.
3. Maximum pitch diameter of plated threads shall be basic pitch diameter .4675 inch (11.875 mm).
4. Collector shall be electrically connected to the case.

FIGURE 1. Physical dimensions of TO-114 case mount stud package.

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3.4 Item requirements. The individual item requirements shall be in accordance with MIL-PRF-19500 and as specified herein.

3.4.1 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500 and figure 1 herein. Package shall be a TO-114 and the dimensions shall be in accordance with figure 1 of this drawing.

3.4.2 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead material or finish is desired, it shall be specified in the acquisition document (see 6.2).

3.4.3 Internal construction. Multiple chip construction shall not be permitted.

3.4.4 Terminal connections. The terminal connections shall be in accordance with figure 1.

3.5 Marking. The marking shall be in accordance with MIL-PRF-19500 and herein. All device marking shall appear on the unit package used as the initial packaging for delivery.

3.6 Electrical performance characteristics. The electrical performance characteristics shall be as specified in 1.3, tables I and IV.

3.6.1 Device capability. The devices must be capable of meeting the following MIL-STD-750 test conditions:

| Step | Method | Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | 3053   | Load condition C (unclamped inductive load), $T_C = +25^\circ\text{C}$ , single 10 ms pulse, $t_r = t_f \leq 1\ \mu\text{s}$ , $R_{BB1} = 1\ \Omega$ , $R_{BB2} = \infty$ , $V_{BB1} = 6.2\ \text{V dc}$ , $V_{BB2} = 0\ \text{V dc}$ , $I_C = 50\ \text{A dc}$ , $V_{CC} = 25\ \text{V dc}$ , $L = 5\ \text{mH}$ . See 3.6.2. Endpoints: Group A, subgroup 2.                                                                                                                               |
| 2    | 3053   | Load condition B (clamped switching destructive), $T_A = 25^\circ\text{C}$ , single 2 ms pulse, $t_r = t_f \leq 1\ \mu\text{s}$ , $R_{BB1} = 1\ \Omega$ , $R_{BB2} = 20\ \Omega$ , $V_{BB1} = 8.5\ \text{V dc}$ , $V_{BB2} = 3\ \text{V dc}$ , $I_C = 70\ \text{A dc}$ , $V_{CLAMP} = 125\ \text{V dc}$ , $L = 68\ \mu\text{H}$ , $R_L = 0$ , clamping diode = 2N5926 with emitter shorted to base. Device fails if clamp voltage is not reached. See 3.1.2. Endpoints: Group A, subgroup 2. |
| 3    | 3051   | $T_C = 100^\circ\text{C}$ , $t = 1\ \text{s}$ , 1 cycle, see 3.6.2 and figure 2.<br>Test 1: $V_{CE} = 4\ \text{V dc}$ , $I_C = 50\ \text{A dc}$<br>Test 2: $V_{CE} = 50\ \text{V dc}$ , $I_C = 4\ \text{A dc}$<br>Test 3: $V_{CE} = 120\ \text{V dc}$ , $I_C = 850\ \text{mA dc}$                                                                                                                                                                                                            |
| 4    | 3131   | $I_M$ measurement..... 10 mA.<br>$V_{CE}$ measurement voltage..... 25 V.<br>$I_H$ collector heating current..... 10 A.<br>$V_H$ collector-emitter heating voltage..... 20 V.<br>$t_H$ heating time..... Steady-state (see method for definition).<br>$t_{MD}$ measurement delay time..... 20 $\mu\text{s}$ maximum.<br>$t_{SW}$ sample window time..... 10 $\mu\text{s}$ maximum.                                                                                                            |

3.6.2 Safe operating area (dc operation) test. Each transistor shall sustain the applicable test conditions and the following acceptance criteria shall apply:

- $I_C$  (for each transistor) shall not vary more than  $\pm 10\%$  during the dc operation; and
- All other specified end-point test(s) limits shall not be exceeded, after the dc-operation test.
- Correlation note: satisfactory endurance of the transistors throughout tests 1, 2, and 3 respectively (paragraph 3.6.1, step 3) is directly associable with ascertainment of the safe operating area for the transistors as illustrated in the nomograph of figure 2.

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3.7 Electrical test requirements. The electrical test requirements shall be in accordance with [tables I, II and IV](#) as applicable.

3.8 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.9 Workmanship. The semiconductor device shall be uniform in quality and free from any defects that will affect life, serviceability or appearance.

#### 4. VERIFICATION

4.1 Sampling and inspection. Unless otherwise specified, sampling and inspection procedures shall be performed in accordance with [MIL-PRF-19500](#) and as specified herein.

4.1.1 Inspection of product for delivery. Inspection of product for delivery shall consist of conformance inspection in accordance with [4.4.1](#) and [4.4.2](#) (groups A and B inspection).

4.2 Eligibility verification. When conformance testing is used to verify a device manufacturer eligibility, a sample of devices shall be subjected to inspection of product for delivery in accordance with 4.1.1. When specified, group E inspection shall be performed. In addition, the device manufacturer shall make available to DLA Land and Maritime VAC, upon request, all pertinent test data on its production of the listed parts, including, but not limited to, the results of testing in accordance with [tables I, II and III](#) as applicable.

4.2.1 Group E inspection. Group E inspection shall be performed on test specimens that are representative of subsequent production.

4.2.2 Inspection routines. Group E inspection shall consist of either a full inspection or partial inspection as directed by DLA Land and Maritime VAC.

4.2.2.1 Full inspection. A sample of test specimens shall be submitted for group E inspection and subjected to the testing of each subgroup of [table III](#) in the order shown. Alternately, separate samples of test specimens of the same PIN may be tested for each subgroup. All product characteristics of the PINs to be listed for a manufacturer shall be covered in the full group E inspection.

4.2.2.2 Partial inspection. At the discretion of DLA Land and Maritime VAC, a manufacturer may be required to perform a partial group E inspection for the reasons listed in 4.2.3. The manufacturer shall coordinate with DLA Land and Maritime VAC to determine the applicable subgroups of [table III](#) and sample quantities required to be tested.

4.2.2.3 Extent of listing. A group E inspection on a particular diode PIN shall be extended to cover all other diode PINs of this drawing.

4.2.3 Design, location, material, or process changes. A full or partial group E inspection may be required when any of the following events occurs:

- a. A change in the design affecting form, fit, or function of the part.
- b. A change in the location of the manufacture.
- c. A change in manufacturing source(s), process(es), inspection method(s), tooling or materials, affecting form, fit, or function.
- d. A natural or man-made event, which may adversely affect the manufacturing process.

4.2.4 Nonconformance. The group E inspection is not complete until all non-conformances affecting the part are addressed and corrective actions have been implemented and accepted. The group E inspection shall be repeated for the affected characteristics and the results recorded.

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4.3 Screening. All quality level TX and TXV devices shall be screened in accordance with table E-IV of MIL-PRF-19500 as appropriate, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

| Screen | Measurements for quality levels TX and TXV                                                                                                                        |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4      | Optional                                                                                                                                                          |
| 9      | Not applicable                                                                                                                                                    |
| 11     | $I_{CES1}$ and $h_{FE1}$                                                                                                                                          |
| 12     | Burn-in (see 4.3.1).                                                                                                                                              |
| 13     | $\Delta I_{CES1}$ = 100 percent of initial, maximum, subgroup 2 of table I herein;<br>$\Delta h_{FE1}$ = $\pm 25$ percent, maximum, subgroup 2 of table I herein. |

4.3.1 Power burn in. Power burn-in conditions shall be in accordance with method 1039 of MIL-STD-750, test condition B and as follows:  $T_A = 30^\circ\text{C}$ ,  $\pm 5^\circ\text{C}$ ,  $V_{CE} \geq 4.5$  V dc,  $T_J = 187.5^\circ\text{C} \pm 12.5^\circ\text{C}$ . NOTE: No heatsink or forced air cooling on the devices shall be permitted.

4.4 Conformance inspections. Conformance inspection shall be in accordance with MIL-PRF-19500 and consist of the examinations and tests specified in tables I and II herein.

4.4.1 Group A inspection. Group A inspection shall consist of the inspections and tests specified in table I.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing of table E-IVB in MIL-PRF-19500 and table II herein. Electrical measurements shall be in accordance with table I, subgroup 2. Samples selected from group B inspection shall meet all of the following requirements:

- Must be chosen from an inspection lot that has been submitted to and passed table I, subgroup 2, conformance inspection.
- When the final lead finish is solder or any plating prone to oxidation at high temperature, the samples for life test (group B for non-TX, TX, and TXV) may be pulled prior to the application of final lead finish.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

TABLE I. Group A inspection.

| Inspection <u>1/</u>                    | MIL-STD-750 |                                                                           | Symbol         | Limit | Limit | Unit  |
|-----------------------------------------|-------------|---------------------------------------------------------------------------|----------------|-------|-------|-------|
|                                         | Method      | Condition                                                                 |                | Min   | Max   |       |
| <u>Subgroup 1</u>                       |             |                                                                           |                |       |       |       |
| Visual and mechanical examination       | 2071        |                                                                           |                |       |       |       |
| <u>Subgroup 2</u>                       |             |                                                                           |                |       |       |       |
| Breakdown voltage, collector to emitter | 3011        | Bias condition D; $I_C = 200$ mA dc; pulsed (see 4.5.1)                   | $V_{(BR)CEO}$  | 120   |       | V dc  |
| Collector to base cutoff current        | 3041        | Bias condition C; $V_{BE} = 0$ V dc; $V_{CE} = 150$ V dc                  | $I_{CES1}$     |       | 2     | mA dc |
| Emitter to base current                 | 3061        | Bias condition D; $V_{EB} = 10$ V dc                                      | $I_{EBO}$      |       | 1     | mA dc |
| Base emitter voltage                    | 3066        | Test condition B, $I_C = 70$ A dc, $V_{CE} = 2$ V dc, pulsed (see 4.5.1)  | $V_{BE1}$      |       | 1.5   | V dc  |
| Base emitter voltage                    | 3066        | Test condition B, $I_C = 120$ A dc, $V_{CE} = 4$ V dc, pulsed (see 4.5.1) | $V_{BE2}$      |       | 3.0   | V dc  |
| Saturation voltage and resistance       | 3071        | $I_C = 70$ A dc; $I_B = 7$ A dc; pulsed (see 4.5.1)                       | $V_{CE(SAT)1}$ |       | 0.75  | V dc  |
| Saturation voltage and resistance       | 3071        | $I_C = 120$ A dc; $I_B = 24$ A dc; pulsed (see 4.5.1)                     | $V_{CE(SAT)2}$ |       | 2.0   | V dc  |
| Forward-current transfer ratio          | 3076        | $V_{CE} = 2$ V dc; $I_C = 20$ A dc pulsed (see 4.5.1)                     | $h_{FE1}$      | 30    | 120   |       |
| Forward-current transfer ratio          | 3076        | $V_{CE} = 2$ V dc; $I_C = 70$ A dc pulsed (see 4.5.1)                     | $h_{FE2}$      | 10    | 40    |       |
| Forward-current transfer ratio          | 3076        | $V_{CE} = 2$ V dc; $I_C = 40$ A dc pulsed (see 4.5.1)                     | $h_{FE3}$      | 15    | 50    |       |

See footnote at end of table.

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TABLE I. Group A inspection - Continued.

| Inspection <u>1/</u>                                                                  | MIL-STD-750 |                                                                                                                                                                 | Symbol            | Limit | Limit | Unit  |
|---------------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------|-------|-------|
|                                                                                       | Method      | Condition                                                                                                                                                       |                   | Min   | Max   |       |
| <u>Subgroup 3</u>                                                                     |             |                                                                                                                                                                 |                   |       |       |       |
| High-temperature operation                                                            |             | T <sub>A</sub> = +150°C; n = 15, c = 0                                                                                                                          |                   |       |       |       |
| Collector-base cutoff current                                                         | 3041        | Bias condition C; V <sub>CE</sub> = 100 V dc, V <sub>BE</sub> = 0 V dc                                                                                          | I <sub>CES2</sub> |       | 10    | mA dc |
| Low-temperature operation                                                             |             | T <sub>A</sub> = -65°C                                                                                                                                          |                   |       |       |       |
| Forward-current transfer ratio                                                        | 3076        | V <sub>CE</sub> = 2 V dc; I <sub>C</sub> = 70 A dc; pulsed (see 4.5.1)                                                                                          | h <sub>FE4</sub>  | 10    |       |       |
| <u>Subgroup 4</u>                                                                     |             |                                                                                                                                                                 |                   |       |       |       |
| Pulse response                                                                        | 3251        | Test condition B, V <sub>CC</sub> = 70 V dc, R <sub>c</sub> = 1 Ω, V <sub>BE1</sub> = 8.5 V dc, R <sub>b</sub> = 1 Ω, V <sub>BE2</sub> = 10 V dc; n = 15, c = 0 |                   |       |       |       |
| Turn-on time                                                                          |             |                                                                                                                                                                 | t <sub>on</sub>   |       | 7.0   | μs    |
| Turn-off time                                                                         |             |                                                                                                                                                                 | t <sub>s</sub>    |       | 4.0   | μs    |
| Fall time                                                                             |             |                                                                                                                                                                 | t <sub>f</sub>    |       | 6.0   | μs    |
| Magnitude of common emitter small signal short-circuit forward-current transfer ratio | 3306        | V <sub>CE</sub> = 10 V dc; I <sub>C</sub> = 5 A dc; f = 100 kHz                                                                                                 | h <sub>fe</sub>   | 5     | 20    |       |
| <u>Subgroups 5, 6 and 7</u>                                                           |             |                                                                                                                                                                 |                   |       |       |       |
| Not applicable                                                                        |             |                                                                                                                                                                 |                   |       |       |       |

1/ For sampling plan, see MIL-PRF-19500.

TABLE II. Group B inspection.

| Inspection <u>1/</u>                        | MIL-STD-750 |                                                                                                                                                         | Small lot CI  |
|---------------------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|                                             | Method      | Conditions                                                                                                                                              |               |
| <u>Subgroup 1</u>                           |             |                                                                                                                                                         |               |
| Solderability                               | 2026        |                                                                                                                                                         |               |
| Resistance to solvents                      | 1022        |                                                                                                                                                         | n = 3, c = 0  |
| <u>Subgroup 2</u>                           |             |                                                                                                                                                         |               |
| Temperature cycling (air to air)            | 1051        | Test condition C.                                                                                                                                       | n = 6, c = 0  |
| Hermetic seal                               | 1071        | Fine and gross leak.                                                                                                                                    |               |
| Electrical measurements                     |             | See <a href="#">table I</a> , subgroup 2 herein.                                                                                                        |               |
| <u>Subgroup 3</u>                           |             |                                                                                                                                                         |               |
| Steady state operation life                 | 1027        | $T_A = 30^\circ\text{C} \pm 5^\circ\text{C}$ , $V_{CE} \geq 4.5 \text{ V dc}$ , $T_J = 187.5^\circ\text{C}, \pm 12.5^\circ\text{C}$ , 168 hours minimum | n = 12, c = 0 |
| Electrical measurements                     | 3041        | $\Delta I_{CES1} = +100\%$ of initial value, maximum                                                                                                    |               |
|                                             | 3076        | $\Delta h_{FE1} \pm 25$ percent change of initial value, maximum                                                                                        |               |
| <u>Subgroup 4</u>                           |             |                                                                                                                                                         |               |
| Decap internal visual (design verification) | 2075        |                                                                                                                                                         | n = 1, c = 0  |
| <u>Subgroup 5</u>                           |             |                                                                                                                                                         |               |
| Thermal resistance                          | 3131        | $R_{\theta JC} = .5^\circ\text{C/W}$ ; see <a href="#">3.6.1</a>                                                                                        | n = 6, c = 0  |
| <u>Subgroup 6</u>                           |             |                                                                                                                                                         |               |
| High-temperature life (nonoperating)        | 1032        | t = 168 hours minimum, T = +200°C                                                                                                                       | n = 12, c = 0 |
| Electrical measurements                     |             | See <a href="#">table I</a> , subgroup 2 herein                                                                                                         |               |

1/ For sampling plan, see [MIL-PRF-19500](#).

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TABLE III. Group E inspection.

| Inspection                                                                    | MIL-STD-750  |                                                                                                                 | Sampling plan     |
|-------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------|-------------------|
|                                                                               | Method       | Conditions                                                                                                      |                   |
| <u>Subgroup 1</u><br>Temperature cycling<br>Electrical measurements           | 1051         | 250 cycles.<br><br>See <a href="#">table IV</a> , steps 1 and 2.                                                | 22 devices, c = 0 |
| <u>Subgroup 2</u><br>Steady-state dc blocking life<br>Electrical measurements | 1039 or 1049 | Condition A, 340 hours.<br><br>See <a href="#">table IV</a> , steps 3 and 4.                                    | 22 devices, c = 0 |
| <u>Subgroups 3</u><br>DPA                                                     | 2101         | Photos of cross sections shall be submitted in the certification report. Vendors shall retain duplicate photos. | 10 devices, c = 0 |
| <u>Subgroups 4</u><br>Thermal resistance                                      | 3131         | $R_{\theta JC} = 0.5^{\circ}\text{C/W}$ maximum, see <a href="#">3.6.1</a> , step 4.                            |                   |
| <u>Subgroups 5</u><br>Not applicable                                          |              |                                                                                                                 |                   |
| <u>Subgroup 6</u><br>ESD                                                      | 1020         |                                                                                                                 |                   |

TABLE IV. Electrical end-point and delta electrical measurements.

| Step | Inspection                          | MIL-STD-750 |                                                                               | Symbol            | Limit                                                                        | Limit | Unit                                               |
|------|-------------------------------------|-------------|-------------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------------|-------|----------------------------------------------------|
|      |                                     | Method      | Conditions                                                                    |                   | Min                                                                          | Max   |                                                    |
| 1    | Collector to emitter cutoff current | 3041        | Bias condition A,<br>$V_{BE} = 0\text{ V dc}$ ;<br>$V_{CE} = 150\text{ V dc}$ | $I_{CES1}$        |                                                                              | 2     | mA dc                                              |
| 2    | Forward-current transfer ratio      | 3076        | $V_{CE} = 2\text{ V dc}$ ;<br>$I_C = 20\text{ A dc}$ ;<br>pulsed (see 4.5.1)  | $h_{FE1}$         | 30                                                                           | 90    | V (pk)                                             |
| 3    | Collector to emitter Cutoff current | 3041        | Bias condition A,<br>$V_{BE} = 0\text{ V dc}$ ;<br>$V_{CE} = 150\text{ V dc}$ | $\Delta I_{CES1}$ | 100 percent of initial value or 200 $\mu\text{A dc}$ , whichever is greater. |       |                                                    |
| 4    | Forward-current transfer ratio      | 3076        | $V_{CE} = 2\text{ V dc}$ ;<br>$I_C = 20\text{ A dc}$ ;<br>pulsed (see 4.5.1)  | $\Delta h_{FE1}$  |                                                                              |       | $\pm 25$ percent change in initial recorded value. |

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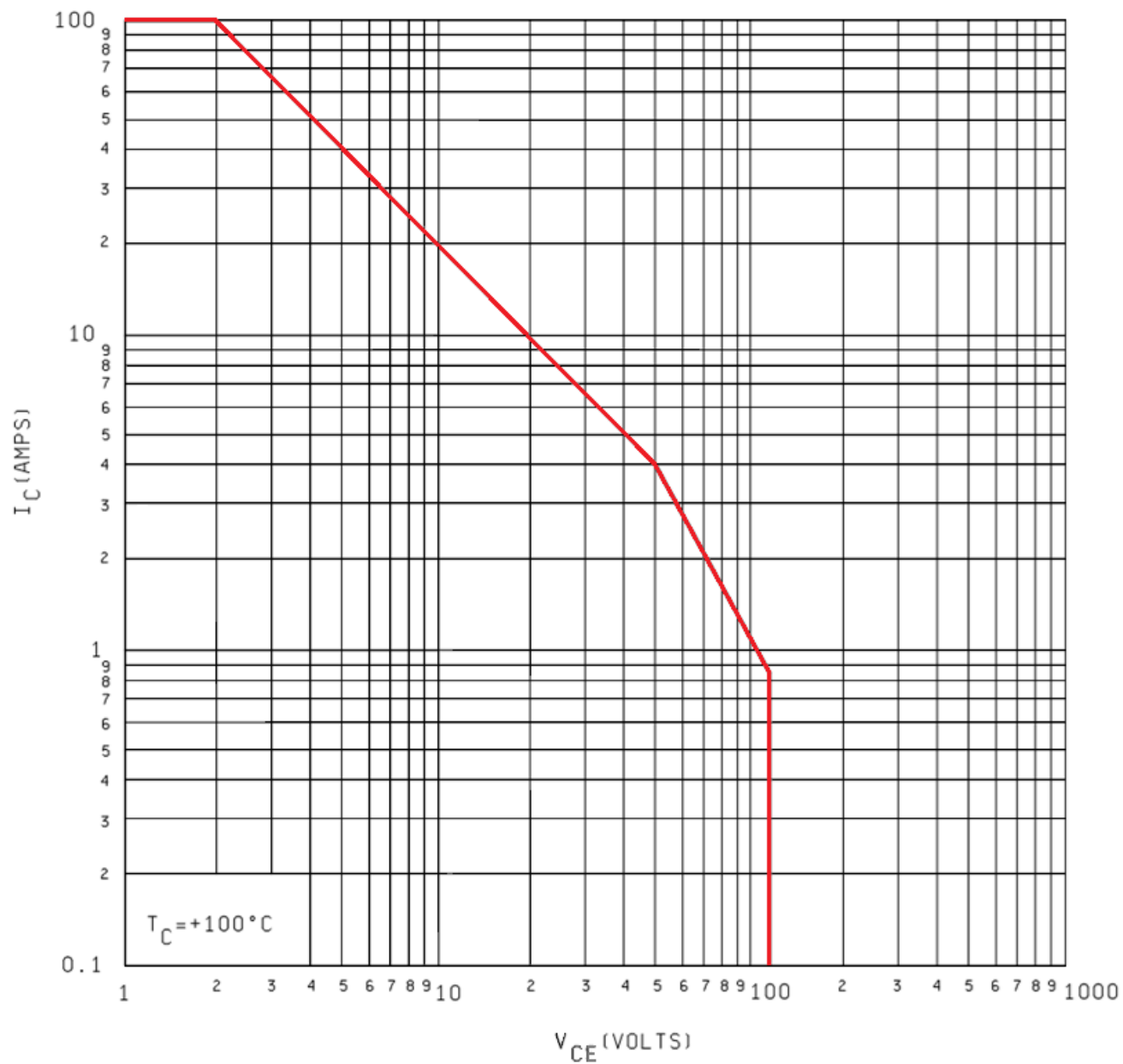


FIGURE 2. Maximum safe operating graph (continuous dc).

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## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's system command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. Devices conforming to this drawing are intended for use when performance specifications do not exist and qualified performance devices that will perform the required function are not available for OEM application. This drawing is intended exclusively to prevent the proliferation of duplicate specifications, drawings, and stock number listings. When a product covered by this drawing has been listed on [QPDSIS-19500](#), this drawing will be inactivated and will not be used for new design. The [QPDSIS-19500](#) products are the preferred item for all applications.

6.2 Acquisition requirements. The acquisition requirements should specify the following:

- a. Complete PIN (see [1.2](#)).
- b. Title, number, and date of this specification.
- c. Requirements for delivery of one copy of the conformance inspection data or certificate of compliance that parts have passed conformance inspection with each shipment of parts by the manufacturer.
- d. Requirements for packaging and packing.
- e. Lead finish may be specified (see [3.4.2](#)).

6.3 Users of record. Coordination of this document for future revisions are coordinated only with the suggested sources of supply and the users of record of this document. Requests to be added as a recorded user of this drawing should be in writing to: DLA Land and Maritime, ATTN: VAC, Post Office Box 3990, Columbus, OH 43216-5000 or by e-mail to [semiconductor@dla.mil](mailto:semiconductor@dla.mil).

6.4 Replaceability. Devices covered by this drawing replace the same device covered by specification sheet MIL-S-19500/440, which has been cancelled.

| Superseding<br>DSCC drawing PIN       | Superseded PIN that were<br>specified within<br>MIL-S-19500/440A(ER),<br>dated 10 June 1991 |
|---------------------------------------|---------------------------------------------------------------------------------------------|
| 04029-01<br>04029-01TX<br>04029-01TXV | JAN2N5927<br>JANTX2N5927<br>JANTXV2N5927                                                    |

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6.5 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed with this drawing and have submitted a certificate of compliance (see 3.2.1 herein) to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990 or emailed to [semiconductor@dla.mil](mailto:semiconductor@dla.mil).

| DSCC drawing<br>PIN (1)               | Vendor similar<br>designation or type number (2) | Vendor<br>CAGE | Vendor name and address                                                                                                                                                                                                                                                                          |
|---------------------------------------|--------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 04029-01<br>04029-01TX<br>04029-01TXV | 2N5927<br>2N5927<br>2N5927                       | 32953          | Power Tech Incorporated<br>123 Pleasant Avenue<br>Upper Saddle River, NJ 07458<br><br>TEL: (201) 791-5050<br>FAX: (201) 791-6805<br><br>E-mail: <a href="mailto:mlanning@power-tech.com">mlanning@power-tech.com</a><br>URL: <a href="https://www.power-tech.com">https://www.power-tech.com</a> |

- (1) Parts must be purchased to this DSCC PIN to assure that all performance requirements and tests are met.
- (2) CAUTION: Do not use vendor PIN's for acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

6.6 Comments. Comments on this drawing should be addressed to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to [semiconductor@dla.mil](mailto:semiconductor@dla.mil).

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