



# GENERAL PURPOSE AMPS AND SWITCHES (Continued)

| Type No. | Case Style | V <sub>CB0</sub> (V)<br>Min                   | V <sub>CE0</sub> (V)<br>Min | V <sub>EB0</sub> (V)<br>Min | I <sub>CB0</sub> (nA)<br>Max | V <sub>CB</sub> (V)<br>@ | h <sub>FE</sub><br>Min | Max | I <sub>C</sub> (mA)<br>@ | V <sub>CE</sub> (V)<br>@ | V <sub>CE</sub> (SAT) (V)<br>Max | V <sub>BE</sub> (SAT) (V)<br>Min | I <sub>C</sub> (mA)<br>Max | C <sub>ob</sub> (pF)<br>Max | f <sub>T</sub> (MHz)<br>Min | I <sub>C</sub> (mA)<br>Max | t <sub>off</sub> (ns)<br>Max | NF (dB)<br>Max | Test Conditions | Process No. |    |
|----------|------------|-----------------------------------------------|-----------------------------|-----------------------------|------------------------------|--------------------------|------------------------|-----|--------------------------|--------------------------|----------------------------------|----------------------------------|----------------------------|-----------------------------|-----------------------------|----------------------------|------------------------------|----------------|-----------------|-------------|----|
| 2N4141   | TO-92 (92) | Same as PN4141, see page 1-22 for explanation |                             |                             |                              |                          |                        |     |                          |                          |                                  |                                  |                            |                             |                             |                            |                              |                |                 | 19          |    |
| 2N4969   | TO-92 (92) | Same as PN2221, see below for explanation     |                             |                             |                              |                          |                        |     |                          |                          |                                  |                                  |                            |                             |                             |                            |                              |                |                 | 19          |    |
| 2N4970   | TO-92 (92) | 50                                            | 30                          | 5                           |                              |                          | 100                    | 350 | 150                      | 10                       | 0.4                              | 0.6                              | 1.2                        | 150                         | 8                           | 200                        | 20                           |                |                 |             | 19 |
|          |            |                                               |                             |                             |                              |                          | 70                     |     | 10                       | 10                       |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 50                     |     | 150                      | 1                        |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
| 2N5128   | TO-92 (92) | Same as PN5128, see page 1-22 for explanation |                             |                             |                              |                          |                        |     |                          |                          |                                  |                                  |                            |                             |                             |                            |                              |                |                 | 19          |    |
| 2N5129   | TO-92 (92) | Same as PN5129, see page 1-22 for explanation |                             |                             |                              |                          |                        |     |                          |                          |                                  |                                  |                            |                             |                             |                            |                              |                |                 | 19          |    |
| 2N5135   | TO-92 (92) | Same as PN5135, see page 1-22 for explanation |                             |                             |                              |                          |                        |     |                          |                          |                                  |                                  |                            |                             |                             |                            |                              |                |                 | 19          |    |
| 2N5136   | TO-92 (92) | Same as PN5136, see page 1-22 for explanation |                             |                             |                              |                          |                        |     |                          |                          |                                  |                                  |                            |                             |                             |                            |                              |                |                 | 19          |    |
| 2N5137   | TO-92 (92) | Same as PN5137, see page 1-22 for explanation |                             |                             |                              |                          |                        |     |                          |                          |                                  |                                  |                            |                             |                             |                            |                              |                |                 | 19          |    |
| PN2221   | TO-92 (92) | 60                                            | 30                          | 5                           | 10                           | 50                       | 20                     |     | 500                      | 10                       | 0.4                              |                                  | 1.3                        | 150                         | 8                           | 250                        | 20                           |                |                 |             | 19 |
|          |            |                                               |                             |                             |                              |                          | 20                     |     | 150                      | 1                        |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 40                     | 120 | 150                      | 10                       | 1.6                              |                                  | 2.6                        | 500                         |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 35                     |     | 10                       | 10                       |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 25                     |     | 1                        | 10                       |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 20                     |     | 100 μA                   | 10                       |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
| PN2221A  | TO-92 (92) | 75                                            | 40                          | 6                           | 10                           | 60                       | 25                     |     | 500                      | 10                       | 0.3                              | 0.6                              | 1.2                        | 150                         | 8                           | 250                        | 20                           | 285            |                 | 2           | 19 |
|          |            |                                               |                             |                             |                              |                          | 20                     |     | 150                      | 1                        |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 40                     | 120 | 150                      | 10                       | 1.0                              |                                  | 2.0                        | 500                         |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 35                     |     | 10                       | 10                       |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 25                     |     | 1                        | 10                       |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 20                     |     | 100 μA                   | 10                       |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
| PN2222   | TO-92 (92) | 60                                            | 30                          | 5                           | 10                           | 50                       | 30                     |     | 500                      | 10                       | 0.4                              |                                  | 1.3                        | 150                         | 8                           | 250                        | 20                           |                |                 |             | 19 |
|          |            |                                               |                             |                             |                              |                          | 50                     |     | 150                      | 1                        |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 100                    | 300 | 150                      | 10                       | 1.6                              |                                  | 2.6                        | 500                         |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 75                     |     | 10                       | 1                        |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 50                     |     | 1                        | 1                        |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |
|          |            |                                               |                             |                             |                              |                          | 35                     |     | 100 μA                   | 1                        |                                  |                                  |                            |                             |                             |                            |                              |                |                 |             |    |

## TEST CONDITIONS:

(1)  $I_C = 300 \mu A$ ,  $V_{CE} = 10V$ ,  $f = 1 \text{ kHz}$ . (2)  $I_C = 150 \text{ mA}$ ,  $V_{CC} = 30V$ ,  $I_B^1 = I_B^2 = 15 \text{ mA}$ . (3)  $I_C = 100 \mu A$ ,  $V_{CE} = 10V$ ,  $f = 1 \text{ kHz}$ . (4)  $I_C = 300 \text{ mA}$ ,  $V_{CC} = 25V$ ,  $I_B^1 = I_B^2 = 30 \text{ mA}$ . (5)  $I_C = 100 \mu A$ ,  $V_{CE} = 4.5V$ ,  $f = 15.7 \text{ kHz}$ . (6)  $I_C = 10 \text{ mA}$ ,  $V_{CC} = 3V$ ,  $I_B^1 = I_B^2 = 1 \text{ mA}$ . (7)  $I_C = 100 \mu A$ ,  $V_{CE} = 5V$ ,  $f = 15.7 \text{ kHz}$ . (8)  $I_C = 250 \mu A$ ,  $V_{CE} = 5V$ ,  $f = 10 \text{ Hz}-15.7 \text{ kHz}$ . (9)  $I_C = 3 \text{ mA}$ ,  $V_{CE} = 10V$ ,  $f = 1 \text{ MHz}$ . (10)  $I_C = 10 \mu A$ ,  $V_{CE} = 5V$ ,  $f = 15.7 \text{ kHz}$ .

# Conversion of TO-105/TO-106 to TO-92 (Continued)

## Bipolar

| TO-105/106 | TO-92      | TO-105/106 | TO-92      | TO-105/106 | TO-92     |
|------------|------------|------------|------------|------------|-----------|
| EN2222     | PN2222-18  | 2N3692     | PN3692-18  | 2N4965     | 2N5086-18 |
| EN2369A    | PN2369A-18 | 2N3693     | MPS3693-18 | 2N4966     | 2N5209-18 |
| EN2484     | PN2484-18  | 2N3694     | PN3694-18  | 2N4967     | 2N5210-18 |
| 3N2907     | PN2907-18  | 2N4121     | PN4121-18  | 2N4968     | 2N5209-18 |
| EN918      | PN918-18   | 2N4122     | PN4122-18  | 2N4969     | PN2221-18 |
| EN930      | PN930-18   | 2N4140     | PN4140-18  | 2N4970     | PN2222-18 |
| SM3904     | 2N3904-18  | 2N4141     | PN4141-18  | 2N4971     | PN2906-18 |
| SM3906     | 2N3906-18  | 2N4142     | PN4142-18  | 2N4972     | PN2907-18 |
| 2N3563     | PN3563-18  | 2N4143     | PN4143-18  | 2N5127     | PN5127-18 |
| 2N3564     | PN3564-18  | 2N4248     | PN4248-18  | 2N5128     | PN5128-5  |
| 2N3565     | PN3565-18  | 2N4249     | PN4249-18  | 2N5129     | PN5129-18 |
| 2N3566     | PN3566-5   | 2N4250     | PN4250-18  | 2N5130     | PN5130-18 |
| 2N3567     | PN3567-5   | 2N4250A    | PN4250A-18 | 2N5131     | PN5131-18 |
| 2N3568     | PN3568-5   | 2N4258     | PN4258-18  | 2N5132     | PN5132-18 |
| 2N3569     | PN3569-5   | 2N4258A    | PN4258A-18 | 2N5133     | PN5133-18 |
| 2N3638     | PN3638-5   | 2N4274     | PN4274-18  | 2N5134     | PN5134-18 |
| 2N3638A    | PN3638A-5  | 2N4275     | PN4275-18  | 2N5135     | PN5135-18 |
| 2N3639     | PN3639-18  | 2N4354     | PN4354-5   | 2N5136     | PN5136-5  |
| 2N3640     | PN3640-18  | 2N4355     | PN4355-5   | 2N5137     | PN5137-18 |
| 2N3641     | PN3641-5   | 2N4356     | PN4356-5   | 2N5138     | PN5138-18 |
| 2N3642     | PN3642-5   | 2N4916     | PN4916-18  | 2N5139     | PN5139-18 |
| 2N3643     | PN3643-5   | 2N4917     | PN4917-18  | 2N5142     | PN5142-18 |
| 2N3644     | PN3644-5   | 2N4944     | PN2222A-18 | 2N5143     | PN5143-18 |
| 2N3645     | PN3645-5   | 2N4945     | PN2222A-18 | 2N5910     | PN5910-18 |
| 2N3646     | PN3646-18  | 2N4946     | PN2222A-18 |            |           |
| 2N3691     | PN3691-18  | 2N4964     | MPSA70-18  |            |           |

## FETs

| TO-106 | TO-92   | TO-106 | TO-92     | TO-106  | TO-92     |
|--------|---------|--------|-----------|---------|-----------|
| E100   | J203-18 | E300   | J300-18   | KE4393  | PN4393-18 |
| E101   | J201-18 | E304   | J304-18   | KE4416  | PN4416-18 |
| E102   | J202-18 | E305   | J305-18   | KE4857  | PN4857-18 |
| E103   | J203-18 | E308   | J308-18   | KE4858  | PN4858-18 |
| E108   | J108-18 | E309   | J309-18   | KE4859  | PN4859-18 |
| E109   | J109-18 | E310   | J310-18   | KE4860  | PN4860-18 |
| E110   | J110-18 | E311   | J309-18   | KE4861  | PN4861-18 |
| E111   | J111-18 | E312   | J310-18   | ITE4391 | PN4391-18 |
| E112   | J112-18 | KE3684 | PN3684-18 | ITE4392 | PN4392-18 |
| E113   | J113-18 | KE3685 | PN3685-18 | ITE4393 | PN4393-18 |
| E114   | J114-18 | KE3686 | PN3686-18 | P1086E  | P1086-18  |
| E174   | J174-18 | KE3687 | PN3687-18 | P1087E  | P1087-18  |
| E175   | J175-18 | KE4091 | PN4091-18 | U1897E  | U1897-18  |
| E176   | J176-18 | KE4092 | KE4092-18 | U1898E  | U1898-18  |
| E201   | J201-18 | KE4093 | PN4093-18 | U1899E  | U1899-18  |
| E202   | J202-18 | KE4220 | PN4220-18 | 2N4302  | PN4302-18 |
| E203   | J203-18 | KE4221 | PN4221-18 | 2N4303  | PN4303-18 |
| E210   | J210-18 | KE4222 | PN4222-18 | 2N4304  | PN4304-18 |
| E211   | J211-18 | KE4223 | PN4223-18 | 2N4342  | PN4342-18 |
| E212   | J212-18 | KE4224 | PN4224-18 | 2N4343  | PN4343-18 |
| E270   | J270-18 | KE4391 | PN4391-18 | 2N4360  | PN4360-18 |
| E271   | J271-18 | KE4392 | PN4392-18 | 2N5033  | PN5033-18 |
|        |         |        |           | 2N5163  | PN5163-18 |