

T-27-01

# 1 Transistors

| Applications    | Type No       |          | Electrical Characteristics (Ta=25°C) |                        |                        |                 |                          |                        |                        |                        |                          |                        |                        |            |                        |     | Package |     |     |          |          |        |
|-----------------|---------------|----------|--------------------------------------|------------------------|------------------------|-----------------|--------------------------|------------------------|------------------------|------------------------|--------------------------|------------------------|------------------------|------------|------------------------|-----|---------|-----|-----|----------|----------|--------|
|                 |               |          | Maximum Ratings                      |                        |                        |                 | V <sub>CE(sat)</sub> MAX |                        |                        |                        | f <sub>T</sub> (TYP) MIN |                        |                        |            | NF (TYP) MAX           |     |         |     |     |          |          |        |
|                 |               |          | V <sub>CEO</sub><br>(V)              | I <sub>C</sub><br>(mA) | P <sub>C</sub><br>(mW) | h <sub>FE</sub> | V <sub>CE</sub><br>(V)   | I <sub>C</sub><br>(mA) | I <sub>B</sub><br>(mA) | V <sub>CE</sub><br>(V) | I <sub>C</sub><br>(mA)   | V <sub>CE</sub><br>(V) | I <sub>C</sub><br>(mA) | f<br>(KHz) | R <sub>g</sub><br>(KΩ) | Fig |         |     |     |          |          |        |
| General Purpose | NPN           | 2SC387SS | 2SA1504S                             | 50                     | 150                    | 150             | 70~700                   | 6                      | 2                      | 0.25                   | 100                      | 10                     | 80                     | 1          | 10                     | 6   | 0.1     | 1   | 10  | SOT-23   | F1       |        |
|                 | PNP           | 2SC3201  | 2SA1269                              | 120                    | 100                    | 200             | 200~700                  | 6                      | 2                      | 0.3                    | 10                       | 1                      | (100)                  | 6          | 1                      | 10  | 6       | 0.1 | 1   | 10       | TO-92M   | F5     |
|                 | NPN           | 2SC3199  | 2SA1267                              | 50                     | 150                    | 200             | 70~700                   | 6                      | 2                      | 0.25                   | 100                      | 10                     | 80                     | 1          | 10                     | 6   | 0.1     | 1   | 10  | TO-92M   | F5       |        |
|                 | PNP           | 2SC3198A | —                                    | 40                     | 150                    | 300             | 70~700                   | 6                      | 2                      | 0.2                    | 100                      | 3                      | (250)                  | 10         | 10                     | 6   | 0.1     | 1   | 10  | TO-92(C) | F3       |        |
|                 | NPN           | 2SC3198  | 2SA1266                              | 50                     | 150                    | 400             | 70~700                   | 6                      | 2                      | 0.25                   | 100                      | 10                     | 80                     | 1          | 10                     | 6   | 0.1     | 1   | 10  | TO-92(C) | F3       |        |
|                 | PNP           | KTC100   | —                                    | 25                     | 50                     | 250             | 70~700                   | 6                      | 2                      | 0.5                    | 10                       | 1                      | 50                     | 6          | 1                      | —   | —       | —   | —   | —        | TO-92(C) | F3     |
|                 | NPN           | KTC9014  | KTC9015                              | 50                     | 150                    | 625             | 60~1000                  | 5                      | 1                      | 0.25                   | 100                      | 10                     | 60                     | 10         | 1                      | 10  | 6       | 0.1 | 1   | 10       | TO-92(B) | F3     |
|                 | NPN           | BCW31    | BCW29                                | 20                     | 100                    | 200             | 110~220                  | 5                      | 2                      | 0.25                   | 10                       | 0.5                    | (300)                  | 5          | 10                     | 10  | 5       | 0.2 | 1   | 2        | SOT-23   | F1     |
|                 | PNP           | BCW32    | BCW30                                | 20                     | 100                    | 200             | 200~450                  | 5                      | 2                      | 0.25                   | 10                       | 0.5                    | (300)                  | 5          | 10                     | 10  | 5       | 0.2 | 1   | 2        | SOT-23   | F1     |
|                 | NPN           | BCW33    | —                                    | 20                     | 100                    | 200             | 420~800                  | 5                      | 2                      | 0.25                   | 10                       | 0.5                    | (300)                  | 5          | 10                     | 10  | 5       | 0.2 | 1   | 2        | SOT-23   | F1     |
|                 | PNP           | BCW71    | BCW69                                | 45                     | 100                    | 200             | 110~220                  | 5                      | 2                      | 0.25                   | 10                       | 0.5                    | (300)                  | 5          | 10                     | 10  | 5       | 0.2 | 1   | 2        | SOT-23   | F1     |
|                 | NPN           | BCW72    | BCW70                                | 45                     | 100                    | 200             | 200~450                  | 5                      | 2                      | 0.25                   | 10                       | 0.5                    | (300)                  | 5          | 10                     | 10  | 5       | 0.2 | 1   | 2        | SOT-23   | F1     |
|                 | PNP           | BCW81    | —                                    | 45                     | 100                    | 200             | 420~800                  | 5                      | 2                      | 0.25                   | 10                       | 0.5                    | (300)                  | 5          | 10                     | 10  | 5       | 0.2 | 1   | 2        | SOT-23   | F1     |
|                 | NPN           | BCV71    | BCW89                                | 60                     | 100                    | 200             | 110~220                  | 5                      | 2                      | 0.25                   | 10                       | 0.5                    | (300)                  | 5          | 10                     | 10  | 5       | 0.2 | 1   | 2        | SOT-23   | F1     |
|                 | PNP           | BCV72    | —                                    | 60                     | 100                    | 200             | 200~450                  | 5                      | 2                      | 0.25                   | 10                       | 0.5                    | (300)                  | 5          | 10                     | 10  | 5       | 0.2 | 1   | 2        | SOT-23   | F1     |
|                 | NPN           | BSS64    | —                                    | 80                     | 100                    | 200             | 80(TYP)                  | 1                      | 10                     | 0.15                   | 4                        | 0.4                    | 60                     | 10         | 4                      | —   | —       | —   | —   | —        | SOT-23   | F1     |
|                 | PNP           | —        | BSS63                                | 100                    | 100                    | 200             | 30(MIN)                  | 1                      | 10                     | 0.25                   | 25                       | 2.5                    | 50                     | 5          | 25                     | —   | —       | —   | —   | —        | SOT-23   | F1     |
|                 | NPN           | BCX20    | —                                    | 25                     | 100                    | 310             | 100~600                  | 1                      | 100                    | 0.62                   | 500                      | 50                     | (200)                  | 5          | 10                     | —   | —       | —   | —   | —        | SOT-23   | F1     |
|                 | PNP           | BC238    | BC308                                | 20                     | 100                    | 300             | 120~800                  | 5                      | 2                      | 0.6                    | 100                      | 5                      | 50                     | 5          | 10                     | 10  | 6       | 0.1 | 1   | 10       | TO-92(B) | F3     |
|                 | NPN           | BC168    | BC258                                | 20                     | 100                    | 300             | 120~800                  | 5                      | 2                      | 0.6                    | 100                      | 5                      | 150                    | 5          | 10                     | 10  | 6       | 0.1 | 1   | 10       | TO-92(C) | F3     |
|                 | PNP           | BC167    | BC257                                | 45                     | 100                    | 300             | 120~460                  | 5                      | 2                      | 0.6                    | 100                      | 5                      | 150                    | 5          | 10                     | 10  | 6       | 0.1 | 1   | 10       | TO-92(C) | F3     |
|                 | NPN           | BC237    | BC307                                | 45                     | 100                    | 300             | 120~460                  | 5                      | 2                      | 0.6                    | 100                      | 5                      | 150                    | 5          | 10                     | 10  | 6       | 0.1 | 1   | 10       | TO-92(B) | F3     |
|                 | Low Noise Amp | NPN      | 2SC3277S                             | 2SA1506S               | 120                    | 400             | 150                      | 200~700                | 6                      | 2                      | 0.3                      | 10                     | 1                      | (100)      | 6                      | 1   | 3       | 6   | 0.1 | 1        | 10       | SOT-23 |
| PNP             |               | 2SC3199L | 2SA1267L                             | 50                     | 150                    | 200             | 70~700                   | 6                      | 2                      | 0.25                   | 100                      | 10                     | 80                     | 10         | 1                      | 3   | 6       | 0.1 | 1   | 10       | TO-92M   | F5     |
| NPN             |               | 2SC3200  | 2SA1268                              | 120                    | 100                    | 300             | 200~700                  | 6                      | 2                      | 0.3                    | 10                       | 1                      | (100)                  | 6          | 1                      | 2   | 6       | 0.1 | 1   | 10       | TO-92(C) | F3     |

\*1.f<sub>T</sub>

| Applications  | Type No                |                        | Maximum Ratings         |                        |                        | Electrical Characteristics (Ta = 25°C) |                        |                        |                        |                        |                        |                        |                         |                        |            |            |                        |      | Package |          |    |
|---------------|------------------------|------------------------|-------------------------|------------------------|------------------------|----------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|-------------------------|------------------------|------------|------------|------------------------|------|---------|----------|----|
|               |                        |                        | V <sub>CE0</sub><br>(V) | I <sub>C</sub><br>(mA) | P <sub>C</sub><br>(mW) | h <sub>FE</sub>                        | (MIN)                  |                        | V <sub>CE(sat)</sub>   |                        | MAX                    |                        | f <sub>T</sub><br>(MHz) | (TYP) MIN              |            | NF<br>(dB) | (TYP) MAX              |      |         |          |    |
|               | V <sub>CE</sub><br>(V) | I <sub>C</sub><br>(mA) |                         |                        |                        |                                        | V <sub>CE</sub><br>(V) | I <sub>C</sub><br>(mA) | I <sub>B</sub><br>(mA) | V <sub>CE</sub><br>(V) | I <sub>C</sub><br>(mA) | V <sub>CE</sub><br>(V) |                         | I <sub>C</sub><br>(mA) | f<br>(KHz) |            | R <sub>g</sub><br>(KΩ) |      |         |          |    |
|               | NPN                    | PNP                    |                         |                        |                        |                                        |                        |                        |                        |                        |                        |                        |                         |                        |            |            |                        |      |         | Fig      |    |
|               | 2SC3198L               | 2SA1266L               | 50                      | 150                    | 400                    | 70~700                                 | 6                      | 2                      | 0.3                    | 10                     | 1                      | 80                     | 6                       | * - 1                  | 3          | 6          | 0.1                    | 1    | 10      | TO-92(C) | F3 |
| Low Noise Amp | —                      | BCF29                  | 20                      | 100                    | 200                    | 120~260                                | 5                      | 2                      | 0.3                    | 10                     | 0.5                    | (150)                  | 5                       | 10                     | 4          | 5          | 0.2                    | 1    | 2       | SOT-23   | F1 |
|               | BCF32                  | BCF30                  | 20                      | 100                    | 200                    | (160)                                  | 5                      | 10μA                   | 0.25                   | 10                     | 5                      | (300)                  | 5                       | 5                      | 4          | 5          | 0.2                    | 1    | 2       | SOT-23   | F1 |
|               | BCF33                  | —                      | 20                      | 100                    | 200                    | (250)                                  | 5                      | 10μA                   | 0.25                   | 10                     | 5                      | (300)                  | 5                       | 5                      | 4          | 5          | 0.2                    | 1MHz | 2       | SOT-23   | F1 |
|               | —                      | BCF70                  | 45                      | 100                    | 200                    | 200~460                                | 5                      | 2                      | 0.3                    | 10                     | 0.5                    | (150)                  | 5                       | 10                     | 4          | 5          | 0.2                    | 1    | 2       | SOT-23   | F1 |
|               | BCF81                  | —                      | 45                      | 100                    | 200                    | (250)                                  | 5                      | 10μA                   | 0.25                   | 10                     | 5                      | (300)                  | 5                       | 5                      | 4          | 5          | 0.2                    | 1MHz | 2       | SOT-23   | F1 |
|               | BC169                  | BC259                  | 20                      | 50                     | 300                    | 180~800                                | 5                      | 2                      | 0.2                    | 10                     | 0.5                    | 150                    | 5                       | 10                     | 3          | 6          | 0.1                    | 1    | 10      | TO-92(C) | F3 |
|               | BC239                  | BC309                  | 20                      | 50                     | 300                    | 180~800                                | 5                      | 2                      | 0.2                    | 10                     | 0.5                    | 150                    | 5                       | 10                     | 3          | 6          | 0.1                    | 1    | 10      | TO-92(B) | F3 |
|               | BC549                  | BC559                  | 30                      | 100                    | 625                    | 110~800                                | 5                      | 2                      | 0.6                    | 100                    | 5                      | (300)                  | 5                       | 10                     | 4          | 5          | 0.2                    | 1    | 10      | TO-92(B) | F3 |
|               | BC550                  | BC560                  | 45                      | 100                    | 625                    | 110~800                                | 5                      | 2                      | 0.6                    | 100                    | 5                      | (300)                  | 5                       | 10                     | -          | -          | -                      | -    | -       | TO-92(B) | F3 |

| Applications           | Type No                |                        | Maximum Ratings         |                       |                       |                 | Electrical Characteristics (Ta = 25°C) |                        |                             |                        |                        |                        |                        |             |                        |            |   |           | Package |  |
|------------------------|------------------------|------------------------|-------------------------|-----------------------|-----------------------|-----------------|----------------------------------------|------------------------|-----------------------------|------------------------|------------------------|------------------------|------------------------|-------------|------------------------|------------|---|-----------|---------|--|
|                        |                        |                        | V <sub>CEO</sub><br>(V) | I <sub>C</sub><br>(A) | P <sub>C</sub><br>(W) | h <sub>FE</sub> | (MIN)                                  |                        | V <sub>CE(sat)</sub><br>(V) | MAX                    |                        | TYP                    |                        | Cob<br>(pF) | (TYP) MAX              |            |   |           |         |  |
|                        | V <sub>CE</sub><br>(V) | I <sub>C</sub><br>(mA) |                         |                       |                       |                 | I <sub>C</sub><br>(mA)                 | I <sub>B</sub><br>(mA) |                             | V <sub>CE</sub><br>(V) | I <sub>C</sub><br>(mA) | V <sub>CE</sub><br>(V) | I <sub>C</sub><br>(mA) |             | V <sub>CB</sub><br>(V) | f<br>(MHz) |   |           |         |  |
| AF Drive<br>and Output | NPN                    | PNP                    | 30                      | 0.5                   | 0.15                  | 70~240          | 1                                      | 100                    | 0.25                        | 100                    | 10                     | 300                    | 6                      | 20          | (7)                    | 6          | 1 | SOT-23    | F1      |  |
|                        | 2SC3204                | 2SA1272                | 30                      | 0.8                   | 0.3                   | 100~320         | 1                                      | 100                    | 0.5                         | 500                    | 20                     | 120                    | 5                      | 10          | (13)                   | 10         | 1 | TO-92M    | F5      |  |
|                        | 2SC3202                | 2SA1270                | 30                      | 0.5                   | 0.5                   | 70~240          | 1                                      | 100                    | 0.25                        | 100                    | 10                     | 300                    | 6                      | * - 20      | (7)                    | 6          | 1 | TO-92(C)  | F3      |  |
|                        | 2SC4372                | 2SA1660                | 150                     | 0.05                  | *0.8                  | 70~240          | 5                                      | 10                     | 0.5                         | 10                     | 1                      | 120                    | 30                     | 10          | 5                      | 10         | 1 | SOT-89    | F2      |  |
|                        | 2SC4374                | 2SA1662                | 80                      | 0.4                   | *1                    | 70~240          | 2                                      | 50                     | 0.4                         | 200                    | 20                     | 100                    | 10                     | 10          | (10)                   | 10         | 1 | SOT-89    | F2      |  |
|                        | 2SC4376                | 2SA1664                | 30                      | 0.8                   | *1                    | 100~320         | 1                                      | 100                    | 0.5                         | 500                    | 20                     | 120                    | 5                      | 10          | (13)                   | 10         | 1 | SOT-89    | F2      |  |
|                        | 2SC4373                | 2SA1661                | 120                     | 0.8                   | *1                    | 80~240          | 5                                      | 100                    | 1.0                         | 500                    | 50                     | 120                    | 5                      | 100         | 30                     | 10         | 1 | SOT-89    | F2      |  |
|                        | 2SC4375                | 2SA1663                | 30                      | 1.5                   | *1                    | 100~320         | 2                                      | 500                    | 2.0                         | 1.5A                   | 30                     | 120                    | 2                      | 500         | 40                     | 10         | 1 | SOT-89    | F2      |  |
|                        | 2SC3227                | 2SA1274                | 80                      | 0.4                   | 0.8                   | 70~240          | 2                                      | 50                     | 0.4                         | 200                    | 20                     | 100                    | 10                     | 10          | (10)                   | 10         | 1 | TO-92L    | F4      |  |
|                        | 2SC4370                | 2SA1659                | 160                     | 1.5                   | *20                   | 70~240          | 5                                      | 100                    | 1.5                         | 500                    | 50                     | 100                    | 10                     | 100         | (25)                   | 10         | 1 | TO-220(S) | F7      |  |

\*1: I<sub>E</sub>P<sub>C</sub>\* T<sub>C</sub> = 25°C P<sub>C</sub>\* mounted on ceramic substrate (250mm<sup>2</sup> × 0.8t)

| Applications           | Type No  |          | Maximum Ratings        |                       |                       | Electrical Characteristics (Ta = 25°C) |                             |                        |                        |                         |                        |                        |             |                                     |            | Package  |    |
|------------------------|----------|----------|------------------------|-----------------------|-----------------------|----------------------------------------|-----------------------------|------------------------|------------------------|-------------------------|------------------------|------------------------|-------------|-------------------------------------|------------|----------|----|
|                        |          |          |                        |                       |                       |                                        |                             |                        |                        |                         |                        |                        |             |                                     |            |          |    |
|                        | NPN      | PNP      | V <sub>CE</sub><br>(V) | I <sub>C</sub><br>(A) | P <sub>C</sub><br>(W) | h <sub>FE</sub>                        | V <sub>CE(sat)</sub><br>(V) | I <sub>C</sub><br>(mA) | I <sub>B</sub><br>(mA) | f <sub>T</sub><br>(MHz) | V <sub>CE</sub><br>(V) | I <sub>C</sub><br>(mA) | Cob<br>(pF) | (TYP) MAX<br>V <sub>CB</sub><br>(V) | f<br>(MHz) |          |    |
| AF Drive<br>and Output | 2SC4370A | 2SA1659A | 180                    | 1.5                   | *20                   | 70~240                                 | 5                           | 100                    | 50                     | (100)                   | 10                     | 100                    | (25)        | 10                                  | 1          | TO-220IS | F7 |
|                        | 2SD2060  | 2SB1368  | 80                     | 4                     | *25                   | 40~240                                 | 5                           | 0.5A                   | 0.3A                   | (8.0)                   | 5                      | 0.5A                   | (90)        | 10                                  | 1          | TO-220IS | F7 |
|                        | 2SD2059  | 2SB1367  | 100                    | 5                     | *30                   | 40~240                                 | 5                           | 1A                     | 0.4A                   | (12)                    | 5                      | 1A                     | (100)       | 10                                  | 1          | TO-220IS | F7 |
|                        | 2SD1352  | 2SB989   | 80                     | 4                     | *30                   | 40~240                                 | 5                           | 0.5A                   | 0.3A                   | (8.0)                   | 5                      | 0.5A                   | (90)        | 10                                  | 1          | TO-220AB | F6 |
|                        | KTC200   | KTA200   | 50                     | 0.5                   | 0.6                   | 70~240                                 | 2                           | 50                     | 10                     | (300)                   | 6                      | *-20                   | (7)         | 6                                   | 1          | TO-92(C) | F3 |
|                        | KTC2235  | KTA965   | 120                    | 0.8                   | 0.9                   | 80~240                                 | 5                           | 100                    | 50                     | (120)                   | 5                      | 100                    | 30          | 10                                  | 1          | TO-92L   | F4 |
|                        | KTC2238  | KTA968   | 160                    | 1.5                   | *25                   | 70~240                                 | 5                           | 100                    | 50                     | (100)                   | 10                     | 100                    | (25)        | 10                                  | 1          | TO-220AB | F6 |
|                        | KTC2238A | KTA968A  | 180                    | 1.5                   | *25                   | 70~240                                 | 5                           | 100                    | 50                     | (100)                   | 10                     | 100                    | (25)        | 10                                  | 1          | TO-220AB | F6 |
|                        | KTD525   | KTBS95   | 100                    | 5                     | *40                   | 40~240                                 | 5                           | 1A                     | 0.4A                   | (12)                    | 5                      | 1A                     | (100)       | 10                                  | 1          | TO-220AB | F6 |
|                        | KTD718   | KTBS88   | 120                    | 8                     | *80                   | 55~160                                 | 5                           | 1A                     | 0.5A                   | (12)                    | 5                      | 1A                     | (170)       | 10                                  | 1          | TO-3P(I) | F9 |
|                        | KTC9013  | KTC9012  | 30                     | 0.5                   | 0.625                 | 64~246                                 | 1                           | 50                     | 20                     | 140                     | 6                      | *-20                   | (7)         | 6                                   | 1          | TO-92(B) | F3 |
|                        | KN4400   | KN4402   | 40                     | 0.6                   | 0.31                  | 50~150                                 | 1                           | 50                     | 50                     | (200)                   | 10                     | *-20                   | (7)         | 10                                  | 1          | TO-92(B) | F3 |
|                        | KN4401   | KN4403   | 40                     | 0.6                   | 0.31                  | 100~300                                | 1                           | 150                    | 50                     | (200)                   | 10                     | *-20                   | (7)         | 10                                  | 1          | TO-92(B) | F3 |
|                        | BCX19    | —        | 45                     | 0.5                   | 0.31                  | 100~600                                | 1                           | 100                    | 50                     | (200)                   | 5                      | 10                     | (6)         | 10                                  | 1          | SOT-23   | F1 |
|                        | —        | BCW67    | 32                     | 0.8                   | 0.36                  | 100~630                                | 1                           | 100                    | 10                     | 100                     | 10                     | 80                     | 18          | 10                                  | 1          | SOT-23   | F1 |
|                        | —        | BCW68    | 45                     | 0.8                   | 0.36                  | 100~630                                | 1                           | 100                    | 50                     | 100                     | 10                     | 80                     | 18          | 10                                  | 1          | SOT-23   | F1 |
|                        | BC183    | BC213    | 30                     | 0.2                   | 0.3                   | 120~800                                | 5                           | 2                      | 5                      | 150                     | 5                      | 10                     | 5           | 10                                  | 1          | TO-92    | F3 |
|                        | BC184    | BC214    | 30                     | 0.2                   | 0.3                   | 250~800                                | 5                           | 2                      | 0.5                    | 150                     | 5                      | 10                     | 5           | 10                                  | 1          | TO-92    | F3 |
|                        | BC182    | BC212    | 50                     | 0.2                   | 0.3                   | 120~460                                | 5                           | 2                      | 5                      | 200                     | 5                      | 10                     | 5           | 10                                  | 1          | TO-92    | F3 |
|                        | BC548    | BC558    | 30                     | 0.1                   | 0.5                   | 75~800                                 | 5                           | 2                      | 5                      | (150)                   | 5                      | 10                     | 4.5         | 10                                  | 1          | TO-92(B) | F3 |
|                        | BC547    | BC557    | 45                     | 0.1                   | 0.5                   | 75~450                                 | 5                           | 2                      | 5                      | (150)                   | 5                      | 10                     | 4.5         | 10                                  | 1          | TO-92(B) | F3 |
|                        | BC546    | BC556    | 65                     | 0.1                   | 0.5                   | 75~450                                 | 5                           | 2                      | 5                      | (150)                   | 5                      | 10                     | 4.5         | 10                                  | 1          | TO-92(B) | F3 |
|                        | BC338    | BC328    | 25                     | 0.8                   | 0.625                 | 100~400                                | 1                           | 100                    | 50                     | (100)                   | 5                      | 10                     | (12)        | 10                                  | 1          | TO-92(B) | F3 |
|                        | BC337    | BC327    | 45                     | 0.8                   | 0.625                 | 100~400                                | 1                           | 100                    | 50                     | (100)                   | 5                      | 10                     | (12)        | 10                                  | 1          | TO-92(B) | F3 |

\*:I<sub>E</sub>P<sub>C</sub>\*, T<sub>C</sub> = 25°C