

# Transistors

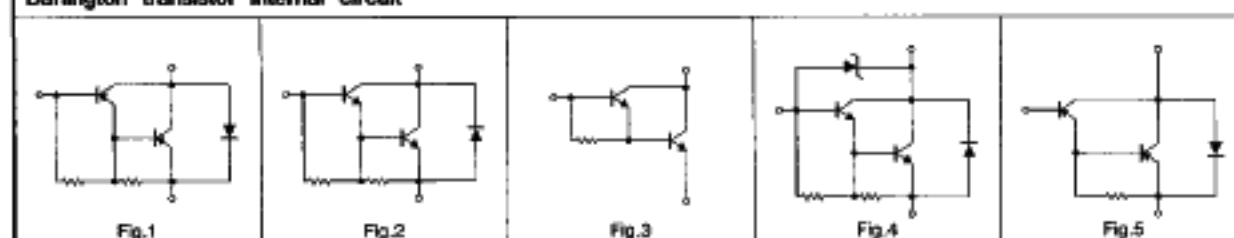
## TO-220 • TO-220FP • TO-220FN • HRT

TO-220FP is a TO-220 with mold coated fin for easier mounting and higher PC, 2W. TO-220FN is a low profile (by 2mm) version of TO-220FP without fin support pin, for higher mounting density. HRT is a taped power transistor package for use with an automatic placement machine.

| Application              | Part No. |          |          |          | V <sub>CEO</sub><br>(V)          | I <sub>C</sub><br>(A) | P <sub>C</sub> (W)   |          |                      |     | h <sub>FE</sub> | h <sub>FE</sub><br>Ranking code | V <sub>CE</sub> (V) | I <sub>C</sub> (A) | Internal<br>circuit |
|--------------------------|----------|----------|----------|----------|----------------------------------|-----------------------|----------------------|----------|----------------------|-----|-----------------|---------------------------------|---------------------|--------------------|---------------------|
|                          | TO-220   | TO-220FP | TO-220FN | HRT      |                                  |                       | T <sub>a</sub> =25°C |          | T <sub>a</sub> =25°C |     |                 |                                 |                     |                    |                     |
|                          |          |          |          |          |                                  |                       | TO-220               | TO-220FP | TO-220FN             | HRT |                 |                                 |                     |                    |                     |
| Driver                   | 2SA1634  | 2SA1635  | —        | —        | -60                              | -4                    | 40                   | 30       | —                    | —   | 60~320          | D E F                           | -4                  | -1                 | —                   |
|                          | 2SB1369  | 2SB1370  | 2SB1565  | 2SB1496  | -60                              | -3                    | 40                   | 30       | 25                   | 1.8 | 60~320          | D E F                           | -5                  | -0.5               | —                   |
|                          | 2SB1064  | 2SB1185  | 2SB1566  | 2SB1357  | -50                              | -3                    | 30                   | 25       | 25                   | 1.8 | 60~320          | D E F                           | -3                  | -0.5               | —                   |
|                          | 2SB1085  | 2SB1186  | 2SB1569  | 2SB1353  | -120                             | -1.5                  | 20                   | 20       | 20                   | 1.8 | 60~320          | D E F                           | -5                  | -0.1               | —                   |
|                          | 2SB1085A | 2SB1186A | 2SB1569A | 2SB1353A | -160                             | -1.5                  | 20                   | 20       | 20                   | 1.8 | 60~200          | D E                             | -5                  | -0.1               | —                   |
|                          | 2SB1289  | 2SB1290  | —        | 2SB1356  | -80                              | -7                    | 40                   | 30       | —                    | 1.8 | 60~320          | D E F                           | -5                  | -1                 | —                   |
|                          | 2SB1291  | 2SB1292  | —        | 2SB1358  | -80                              | -5                    | 40                   | 30       | —                    | 1.8 | 60~320          | D E F                           | -5                  | -1                 | —                   |
|                          | 2SB1293  | 2SB1294  | —        | 2SB1360  | -100                             | -5                    | 40                   | 30       | —                    | 1.8 | 60~320          | D E F                           | -5                  | -1                 | —                   |
|                          | 2SB1334  | 2SB1335  | —        | 2SB1355  | -80                              | -4                    | 40                   | 30       | —                    | 1.8 | 60~320          | D E F                           | -5                  | -1                 | —                   |
|                          | 2SB1334A | 2SB1335A | —        | —        | -80                              | -4                    | 40                   | 30       | —                    | —   | 60~320          | D E F                           | -5                  | -1                 | —                   |
|                          | 2SC4007  | 2SC4008  | —        | 2SC4355  | 80                               | 4                     | 40                   | 30       | —                    | 1.8 | 60~500          | D E F G                         | 4                   | 1                  | —                   |
|                          | 2SD2023  | 2SD2061  | 2SD2394  | 2SD2096  | 60                               | 3                     | 40                   | 30       | 25                   | 1.8 | 60~320          | D E F                           | 5                   | 0.5                | —                   |
|                          | 2SD1505  | 2SD1762  | 2SD2395  | 2SD2037  | 50                               | 3                     | 30                   | 25       | 25                   | 1.8 | 60~320          | D E F                           | 3                   | 0.5                | —                   |
|                          | 2SD1562  | 2SD1763  | 2SD2400  | 2SD2033  | 120                              | 1.5                   | 20                   | 20       | 20                   | 1.8 | 60~320          | D E F                           | 5                   | 0.1                | —                   |
|                          | 2SD1562A | 2SD1763A | 2SD2400A | 2SD2033A | 160                              | 1.5                   | 20                   | 20       | 20                   | 1.8 | 60~200          | D E                             | 5                   | 0.1                | —                   |
|                          | 2SD1580  | 2SD1833  | —        | 2SD2036  | 80                               | 7                     | 40                   | 30       | —                    | 1.8 | 60~320          | D E F                           | 5                   | 1                  | —                   |
|                          | 2SD1720  | 2SD1832  | —        | 2SD2038  | 60                               | 5                     | 40                   | 30       | —                    | 1.8 | 60~320          | D E F                           | 5                   | 1                  | —                   |
|                          | 2SD1778  | 2SD1855  | —        | 2SD2035  | 60                               | 4                     | 40                   | 30       | —                    | 1.8 | 60~320          | D E F                           | 5                   | 1                  | —                   |
|                          | 2SD1778A | 2SD1855A | —        | —        | 80                               | 4                     | 40                   | 30       | —                    | —   | 60~320          | D E F                           | 5                   | 1                  | —                   |
|                          | 2SD1896  | 2SD1897  | —        | 2SD2040  | 100                              | 5                     | 40                   | 30       | —                    | 1.8 | 60~320          | D E F                           | 5                   | 1                  | —                   |
|                          | 2SD1966  | 2SD1967  | —        | —        | 120                              | 7                     | 40                   | 30       | —                    | —   | 100~500         | E F G                           | 5                   | 1                  | —                   |
| Low V <sub>CE(sat)</sub> | —        | 2SA1757  | —        | —        | -60                              | -5                    | —                    | 25       | —                    | —   | 60~320          | D E F                           | -2                  | -1                 | —                   |
|                          | —        | 2SA1758  | —        | —        | -60                              | -12                   | —                    | 30       | —                    | —   | 60~320          | D E F                           | -2                  | -2                 | —                   |
|                          | —        | 2SC4595  | —        | —        | 60                               | 12                    | —                    | 30       | —                    | —   | 60~320          | D E F                           | 2                   | 2                  | —                   |
|                          | —        | 2SC4596  | —        | —        | 60                               | 5                     | —                    | 25       | —                    | —   | 60~320          | D E F                           | 2                   | 1                  | —                   |
|                          | 2SC4845  | 2SC4846  | —        | —        | 120                              | 5                     | 40                   | 30       | —                    | —   | 60~200          | D E                             | 5                   | 3                  | —                   |
|                          | 2SC4848  | 2SC4849  | —        | —        | 120                              | 7                     | 40                   | 30       | —                    | —   | 60~200          | D E                             | 5                   | 3                  | —                   |
| Chroma                   | —        | —        | 2SC5147  | 2SC4506  | 300                              | 0.1                   | —                    | —        | 10                   | 1.5 | 40~200          | C D E                           | 10                  | 0.01               | —                   |
| High h <sub>FE</sub>     | 2SD1943  | 2SD1944  | 2SD2396  | 2SD2044  | 60                               | 3                     | 40                   | 30       | 30                   | 1.8 | 400~2k          | H J K                           | 4                   | 0.5                | —                   |
| High Voltage SW          | 2SC3968  | 2SC3969  | —        | 2SC4354  | 400                              | 2                     | 20                   | 20       | —                    | 1.8 | 15~50           | A B                             | 5                   | 0.1                | —                   |
|                          | 2SC4205  | 2SC4129  | —        | —        | 400                              | 5                     | 40                   | 30       | —                    | —   | 15~32           | A                               | 6                   | 3                  | —                   |
|                          | 2SC5112  | 2SC5113  | —        | —        | 500                              | 5                     | 40                   | 35       | —                    | —   | 10~60           | —                               | 5                   | 2.5                | —                   |
|                          | 2SC5116  | 2SC5117  | —        | —        | 550                              | 4                     | 40                   | 35       | —                    | —   | 10~50           | —                               | 5                   | 2                  | —                   |
| Darlington               | 2SB1286  | 2SB1287  | 2SB1567  | 2SB1359  | -100                             | -2                    | 25                   | 20       | 20                   | 1.8 | 1k~10k          | —                               | -2                  | -1                 | Fig.1               |
|                          | 2SB1339  | 2SB1340  | —        | 2SB1513  | -120                             | -6                    | 40                   | 30       | —                    | 1.8 | 2k~20k          | —                               | -3                  | -2                 | Fig.1               |
|                          | 2SB1341  | 2SB1342  | 2SB1568  | 2SB1512  | -80                              | -4                    | 35                   | 30       | 30                   | 1.8 | 1k~10k          | —                               | -3                  | -2                 | Fig.1               |
|                          | 2SB1343  | 2SB1344  | —        | 2SB1514  | -100                             | -8                    | 40                   | 30       | —                    | 1.8 | 1k~20k          | —                               | -3                  | -2                 | Fig.1               |
|                          | 2SB1550  | 2SB1551  | —        | 2SB1549  | -80                              | -10                   | 40                   | 30       | —                    | 1.8 | 1k~20k          | —                               | -3                  | -5                 | Fig.1               |
|                          | —        | 2SB1616  | —        | —        | -80                              | -4                    | —                    | 30       | —                    | —   | 1K~10K          | —                               | -3                  | -2                 | Fig.5               |
|                          | 2SC4573  | 2SC4574  | —        | 2SC4575  | 60±10                            | 4                     | 35                   | 30       | —                    | 1.8 | 2k~10k          | —                               | 5                   | 1.5                | Fig.4               |
|                          | —        | 2SC4895  | —        | —        | 100                              | 3                     | —                    | 30       | —                    | —   | 2k~10k          | —                               | 2                   | 1.5                | Fig.2               |
|                          | 2SD1646  | 2SD1765  | 2SD2398  | 2SD2039  | 100                              | 2                     | 25                   | 20       | 20                   | 1.8 | 1k~10k          | —                               | 2                   | 1                  | Fig.2               |
|                          | 2SD1647  | 2SD1764  | 2SD2397  | 2SD2041  | 60±10                            | 2                     | 25                   | 20       | 20                   | 1.8 | 1k~10k          | —                               | 2                   | 1                  | Fig.4               |
|                          | —        | 2SD2091  | —        | 2SD2263  | 90 <sup>+20</sup> <sub>-10</sub> | 2                     | —                    | 20       | —                    | 1.8 | 1k~10k          | —                               | 2                   | 1                  | Fig.4               |
|                          | 2SD1783  | 2SD1856  | —        | 2SD2042  | 60±10                            | 5                     | 30                   | 25       | —                    | 1.8 | 2k~30k          | —                               | 3                   | 2                  | Fig.4               |
|                          | 2SD1888  | 2SD1889  | —        | 2SD2043  | 120                              | 6                     | 40                   | 30       | —                    | 1.8 | 2k~20k          | —                               | 3                   | 2                  | Fig.2               |
|                          | 2SD1932  | 2SD1933  | 2SD2399  | 2SD2032  | 80                               | 4                     | 35                   | 30       | 30                   | 1.8 | 1k~10k          | —                               | 3                   | 2                  | Fig.2               |
|                          | 2SD1986  | 2SD1987  | —        | 2SD2306  | 60                               | 4                     | 35                   | 30       | —                    | 1.8 | 1k~10k          | —                               | 3                   | 2                  | Fig.3               |
|                          | 2SD2024  | 2SD2025  | —        | 2SD2307  | 100                              | 8                     | 40                   | 30       | —                    | 1.8 | 1k~20k          | —                               | 3                   | 2                  | Fig.2               |

Note: n Under development

Darlington transistor internal circuit



# ●Product Designation

- When ordering, specify the type.
- Check each code against the tables shown below.
- Fill a space with the next character.

2 S D 2 3 9 5

Part No.

Special code

- Omit for standard product.
- Factory assigned for custom product.

Packaging

| Package   | Code | Package specification | Quantity/Package (pcs) |
|-----------|------|-----------------------|------------------------|
| TO-220*   | None | Bulk                  | 500                    |
|           | C7   | Tube                  | 1,000<br>(50pcs X 20)  |
| TO-220FP* | None | Bulk                  | 500                    |
|           | C7   | Tube                  | 1,000<br>(50pcs X 20)  |
| TO-220FN  | None | Bulk                  | 500                    |
|           | C7   | Tube                  | 1,000<br>(50pcs X 20)  |
| HRT       | T114 | Ammo box              | 1,000                  |

Note: Available in various lead configurations (forming, cut leads).  
For further information, contact our sales representatives.

h<sub>FE</sub> Ranking code

Input h<sub>FE</sub> rank signal display

One rank preferred ☒ D ☐

Multiple rank preferred ☒ D ☐ F

(Min, Max. is displayed)

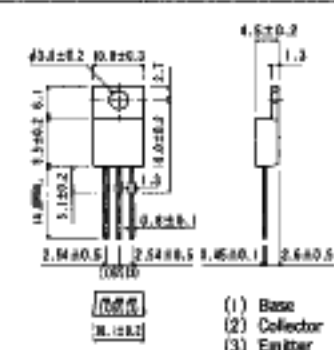
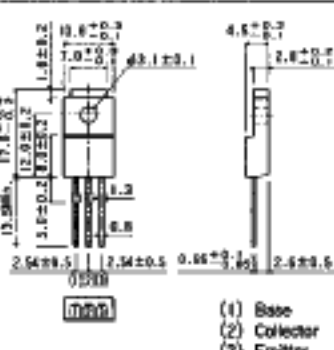
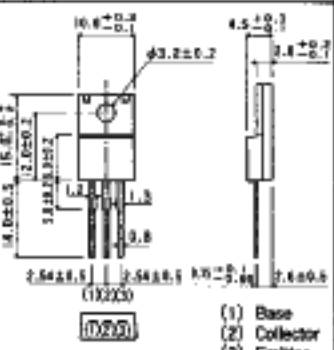
| Code | h <sub>FE</sub> Range |
|------|-----------------------|
| A    | 10~32                 |
| B    | 25~50                 |
| C    | 40~80                 |
| D    | 60~120                |
| E    | 100~200               |
| F    | 160~320               |
| G    | 250~500               |
| H    | 400~800               |
| J    | 600~1200              |
| K    | 1000~2000             |

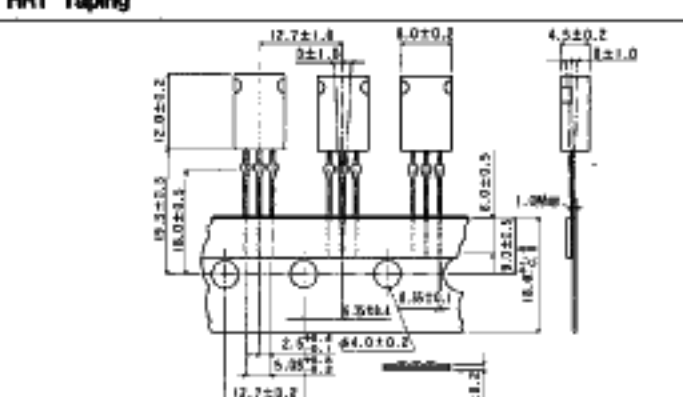
Transistors

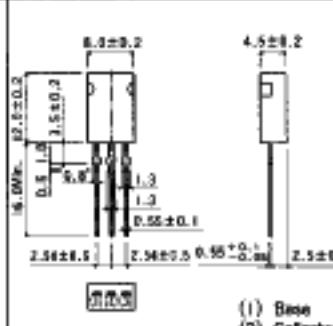
TRANSISTORS

The Order and Sales website  
http://www.rohm.co.jp  
Product Inquiry Site

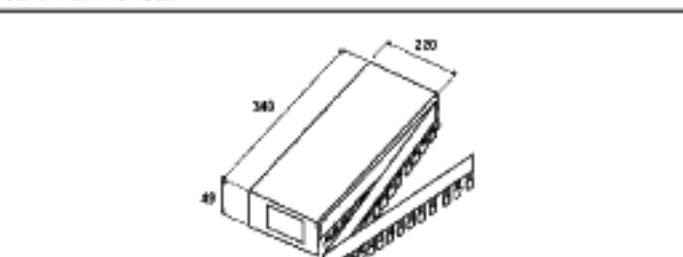
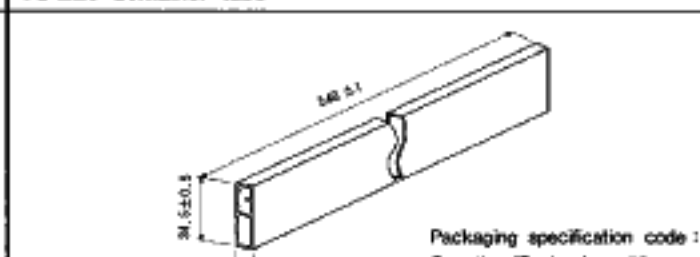
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| <p><b>TO-220</b></p>   <p>(1) Base<br/>(2) Collector<br/>(3) Emitter</p> | <p><b>TO-220FP</b></p>   <p>(1) Base<br/>(2) Collector<br/>(3) Emitter</p> | <p><b>TO-220FN</b></p>   <p>(1) Base<br/>(2) Collector<br/>(3) Emitter</p> |
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|                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|
| <p><b>HRT Taping</b></p>  |
|--------------------------------------------------------------------------------------------------------------|

|                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>HRT</b></p>   <p>(1) Base<br/>(2) Collector<br/>(3) Emitter</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

(Unit: mm)

|                                                                                                                |                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>HRT Ammo box</b></p>  | <p><b>TO-220 Container tube</b></p>  <p>Packaging specification code: C7<br/>Quantity/Package: 50 pcs</p> |
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