

NPN General Purpose Transistor

UMT3904/SST3904/MMST3904/RXT3904/2N3904

●Features

- 1) $BV_{CE0} < 40V$ ($I_c = 1mA$)
- 2) Complements the UMT3906/SST3906/MMST3906/RXT3906/PN3906.

●Package, marking and packaging specifications

| Type | UMT3904 | SST3904 | MMST3904 | RXT3904 | 2N3904 |
|------------------------------|---------|---------|----------|---------|--------|
| Package | UMT3 | SST3 | SMT3 | MPT3 | TO-92 |
| Marking | R1A | R1A | R1A | CD* | — |
| Code | T106 | T116 | T146 | T100 | T93 |
| Basic ordering unit (pieces) | 3000 | 3000 | 3000 | 1000 | 3000 |

* Indicates lot number.

●Absolute maximum ratings ($T_a = 25^\circ C$)

| Parameter | Symbol | Limits | Unit |
|-----------------------------|----------------------------|---------|------------|
| Collector-base voltage | V_{CB0} | 60 | V |
| Collector-emitter voltage | V_{CE0} | 40 | V |
| Emitter-base voltage | V_{EB0} | 6 | V |
| Collector current | I_c | 0.2 | A |
| Collector power dissipation | UMT3904, SST3904, MMST3904 | 0.2 | W * |
| | SST3904, MMST3904 | 0.35 | |
| | RXT3904 | 0.5 | |
| | 2N3904 | 0.625 | |
| Junction temperature | T_j | 150 | $^\circ C$ |
| Storage temperature | T_{stg} | -55~150 | $^\circ C$ |

* On 7 x 5 x 0.8 mm ceramic board.

●External dimensions (Units : mm)

UMT3904

ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

SST3904

ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

MMST3904

ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

RXT3904

ROHM : MPT3
EIAJ : SC-62

(1) Base
(2) Collector
(3) Emitter

2N3904

ROHM : TO-92
EIAJ : SC-43

(1) Emitter
(2) Base
(3) Collector

●Electrical characteristics ($T_a = 25^\circ C$)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|--------------------------------------|---------------|------|------|------|------|---|
| Collector-base breakdown voltage | BV_{CB0} | 60 | — | — | V | $I_c = 10 \mu A$ |
| Collector-emitter breakdown voltage | BV_{CE0} | 40 | — | — | V | $I_c = 1mA$ |
| Emitter-base breakdown voltage | BV_{EB0} | 6 | — | — | V | $I_e = 10 \mu A$ |
| Collector cutoff current | I_{CES} | — | — | 50 | nA | $V_{CB} = 30V$ |
| Emitter cutoff current | I_{EBO} | — | — | 50 | nA | $V_{EB} = 3V$ |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | — | — | 0.2 | V | $I_c/I_B = 10mA/1mA$ |
| | | — | — | 0.3 | | $I_c/I_B = 50mA/5mA$ |
| Base-emitter saturation voltage | $V_{BE(sat)}$ | 0.65 | — | 0.65 | V | $I_c/I_B = 10mA/1mA$ |
| | | — | — | 0.95 | | $I_c/I_B = 50mA/5mA$ |
| DC current transfer ratio | h_{FE} | 40 | — | — | — | $V_{CE} = 1V, I_c = 0.1mA$ |
| | | 70 | — | — | | $V_{CE} = 1V, I_c = 1mA$ |
| | | 100 | — | 300 | | $V_{CE} = 1V, I_c = 10mA$ |
| | | 60 | — | — | | $V_{CE} = 1V, I_c = 50mA$ |
| | | 30 | — | — | | $V_{CE} = 1V, I_c = 100mA$ |
| Transition frequency | f_T | 300 | — | — | MHz | $V_{CE} = 20V, I_c = -10mA, f = 100MHz$ |
| Output capacitance | C_{ob} | — | — | 4 | pF | $V_{CB} = 10V, f = 100kHz$ |
| Emitter input capacitance | C_{ib} | — | — | 8 | pF | $V_{CB} = 0.5V, f = 100kHz$ |
| Delay time | t_d | — | — | 35 | ns | $V_{CC} = 3V, V_{BE(OFF)} = 0.5V, I_c = 10mA, I_{B1} = 1mA$ |
| Rise time | t_r | — | — | 35 | ns | $V_{CC} = 3V, V_{BE(OFF)} = 0.5V, I_c = 10mA, I_{B1} = 1mA$ |
| Storage time | t_{stg} | — | — | 200 | ns | $V_{CC} = 3V, I_c = 10mA, I_{B1} = -I_{B2} = 1mA$ |
| Fall time | t_f | — | — | 50 | ns | $V_{CC} = 3V, I_c = 10mA, I_{B1} = -I_{B2} = 1mA$ |

(SPEC-C37)

● Electrical characteristic curves

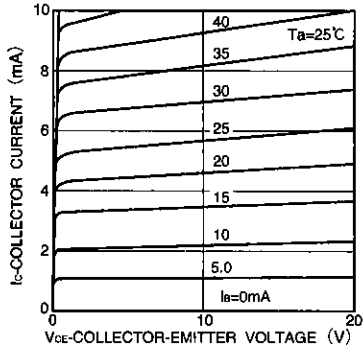


Fig.1 Grounded emitter output characteristics

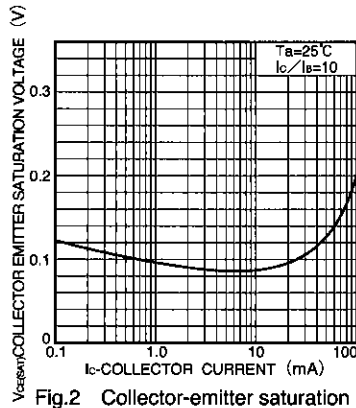


Fig.2 Collector-emitter saturation voltage vs. collector current

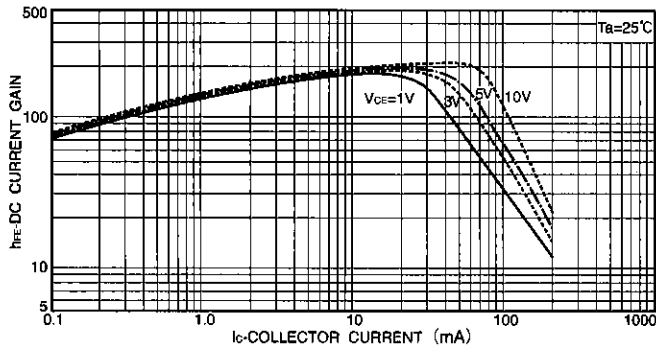


Fig.3 DC current gain vs. collector current (I)

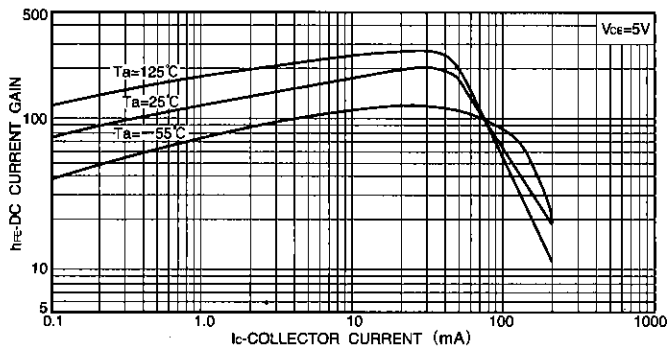


Fig.4 DC current gain vs. collector current (I)

USA & European specification models

●Electrical characteristic curves

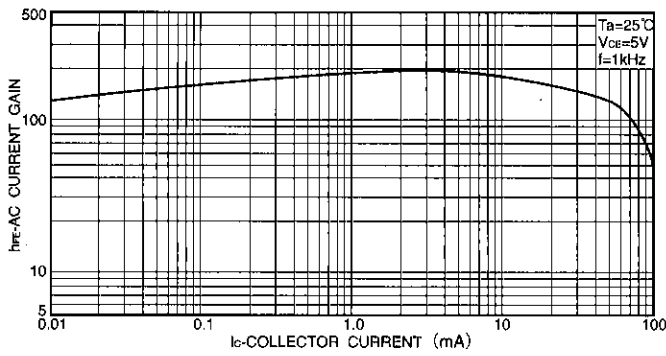


Fig.5 AC current gain vs. collector current

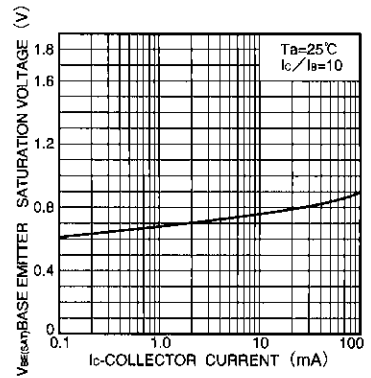


Fig.6 Base-emitter saturation voltage vs. collector current

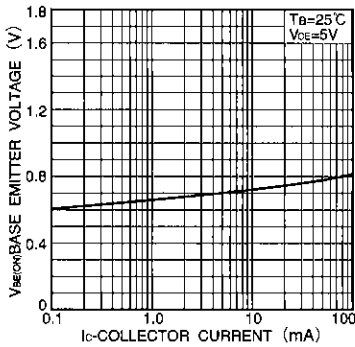


Fig.7 Grounded emitter propagation characteristics

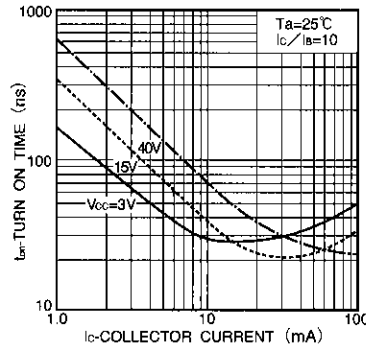


Fig.8 Turn-on time vs. collector current

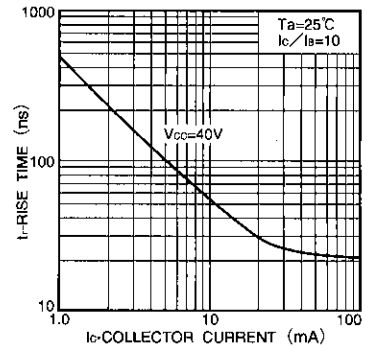


Fig.9 Rise time vs. collector current

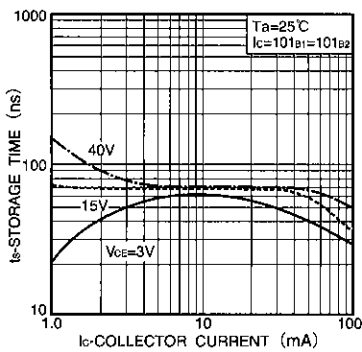


Fig.10 Storage time vs. collector current

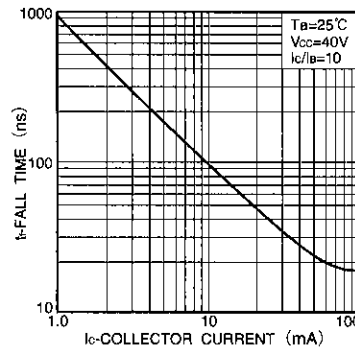


Fig.11 Fall time vs. collector current

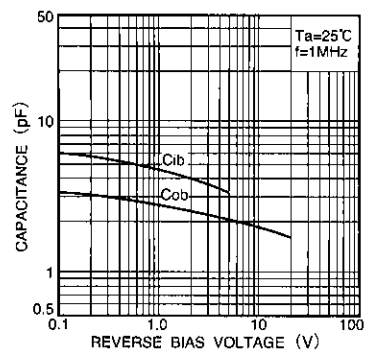


Fig.12 Input/output capacitance vs. voltage

● Electrical characteristic curves

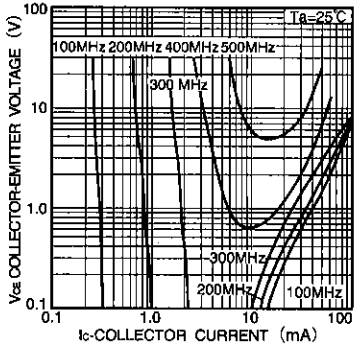


Fig. 13 Gain bandwidth product

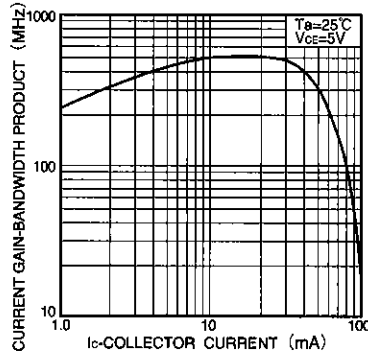


Fig. 14 Gain bandwidth product vs. collector current

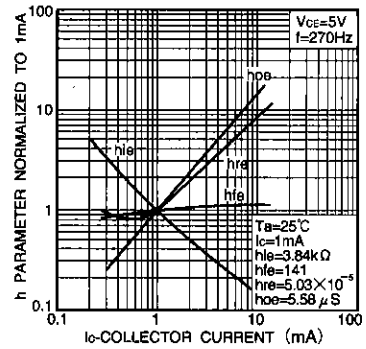


Fig. 15 h value vs. collector current

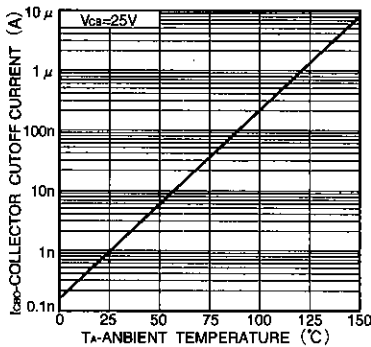


Fig. 16 Noise characteristics (I)

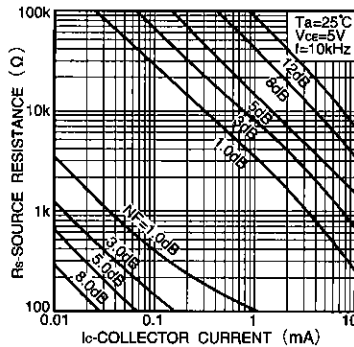


Fig. 17 Noise characteristics (II)

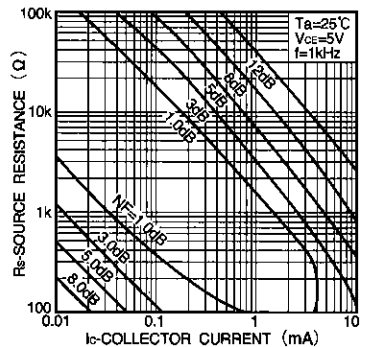


Fig. 19 Noise characteristics (III)

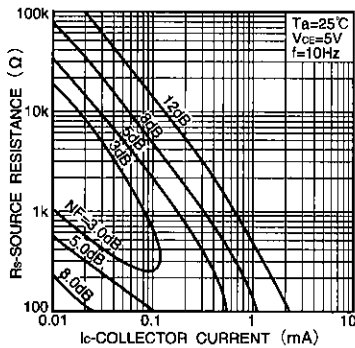


Fig. 20 Noise characteristics (IV)

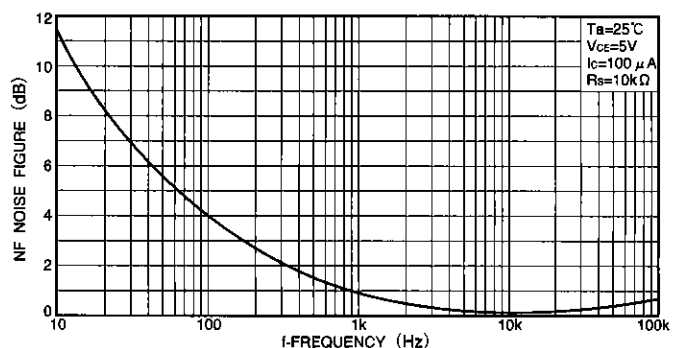


Fig. 18 Noise vs. collector current

USA & European specification models

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