

TOSHIBA Power Transistor Module Silicon Triple Diffused Type
(Four Darlingtons Power Transistors in One)

MP4507

High Power Switching Applications
Hammer Drive, Pulse Motor Drive and Inductive
Load Switching

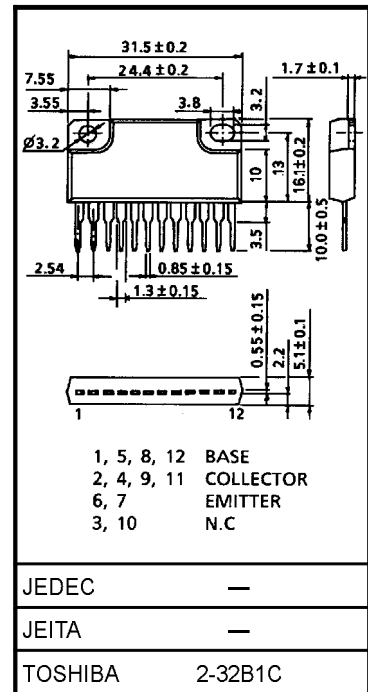
- Package with heat sink isolated to lead (SIP 12 pins)
- High collector power dissipation (4-device operation)
: $P_T = 5 \text{ W}$ ($T_a = 25^\circ\text{C}$)
- High collector current: I_C (DC) = $\pm 5 \text{ A}$ (max)
- High DC current gain: $h_{FE} = 1000$ (min) ($V_{CE} = \pm 3 \text{ V}$, $I_C = \pm 3 \text{ A}$)

Maximum Ratings ($T_a = 25^\circ\text{C}$)

| Characteristics | Symbol | Rating | | Unit |
|---|--------------------------|------------|------|------------------|
| | | NPN | PNP | |
| Collector-base voltage | V_{CB0} | 100 | -100 | V |
| Collector-emitter voltage | V_{CEO} | 100 | -100 | V |
| Emitter-base voltage | V_{EBO} | 5 | -5 | V |
| Collector current | DC | I_C | 5 | A |
| | Pulse | I_{CP} | 8 | |
| Continuous base current | I_B | 0.1 | -0.1 | A |
| Collector power dissipation (1-device operation) | P_C | 3.0 | | W |
| Collector power dissipation (4-device operation) | $T_a = 25^\circ\text{C}$ | 5.0 | | W |
| | $T_c = 25^\circ\text{C}$ | 25 | | |
| Isolation voltage | V_{isol} | 1000 | | V |
| Junction temperature | T_j | 150 | | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | -55 to 150 | | $^\circ\text{C}$ |

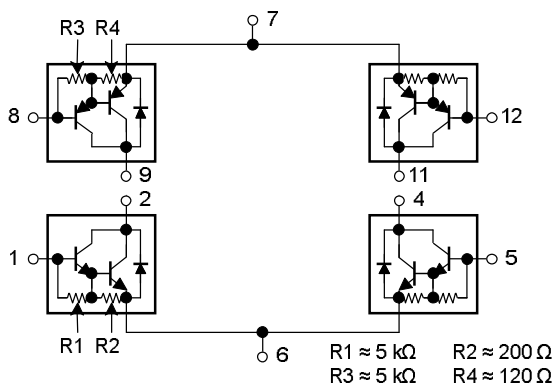
Industrial Applications

Unit: mm

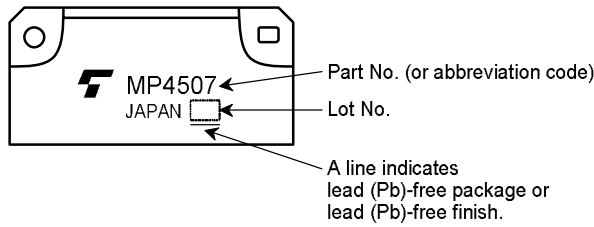


Weight: 6.0 g (typ.)

Array Configuration



Marking



Thermal Characteristics

| Characteristics | Symbol | Max | Unit |
|--|----------------------|-----|--------------------|
| Thermal resistance from channel to ambient (4 devices operation, $T_a = 25^\circ\text{C}$) | $\Sigma R_{th(j-a)}$ | 25 | $^\circ\text{C/W}$ |
| Thermal resistance from channel to case (4 devices operation, $T_c = 25^\circ\text{C}$) | $\Sigma R_{th(j-c)}$ | 5.0 | $^\circ\text{C/W}$ |
| Maximum lead temperature for soldering purposes (3.2 mm from case for 10 s) | T_L | 260 | $^\circ\text{C}$ |

Electrical Characteristics ($T_a = 25^\circ\text{C}$) (NPN transistor)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------------------|-------------------|---------------|--|------|------|-----|---------------|
| Collector cut-off current | | I_{CBO} | $V_{CB} = 100\text{ V}, I_E = 0\text{ A}$ | — | — | 10 | μA |
| Collector cut-off current | | I_{CEO} | $V_{CE} = 100\text{ V}, I_B = 0\text{ A}$ | — | — | 10 | μA |
| Emitter cut-off current | | I_{EBO} | $V_{EB} = 5\text{ V}, I_C = 0\text{ A}$ | 0.3 | — | 2.0 | mA |
| Collector-base breakdown voltage | | $V_{(BR)CBO}$ | $I_C = 1\text{ mA}, I_E = 0\text{ A}$ | 100 | — | — | V |
| Collector-emitter breakdown voltage | | $V_{(BR)CEO}$ | $I_C = 30\text{ mA}, I_B = 0\text{ A}$ | 100 | — | — | V |
| DC current gain | | $h_{FE(1)}$ | $V_{CE} = 3\text{ V}, I_C = 0.5\text{ A}$ | 1000 | — | — | — |
| | | $h_{FE(2)}$ | $V_{CE} = 3\text{ V}, I_C = 3\text{ A}$ | 1000 | — | — | — |
| Saturation voltage | Collector-emitter | $V_{CE(sat)}$ | $I_C = 3\text{ A}, I_B = 12\text{ mA}$ | — | — | 2.0 | V |
| | Base-emitter | $V_{BE(sat)}$ | $I_C = 3\text{ A}, I_B = 12\text{ mA}$ | — | — | 2.5 | |
| Transition frequency | | f_T | $V_{CE} = 3\text{ V}, I_C = 0.5\text{ A}$ | 3 | — | — | MHz |
| Collector output capacitance | | C_{ob} | $V_{CB} = 50\text{ V}, I_E = 0\text{ A}, f = 1\text{ MHz}$ | — | 40 | — | pF |
| Switching time | Turn-on time | t_{on} | | — | 0.5 | — | μs |
| | Storage time | t_{stg} | | — | 3.0 | — | |
| | Fall time | t_f | | — | 2.0 | — | |

Emitter-Collector Diode Ratings and Characteristics (Ta = 25°C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|-----------|---|-----|------|-----|---------------|
| Forward current | I_{FM} | — | — | — | 5 | A |
| Surge current | I_{FSM} | $t = 1 \text{ s}, 1 \text{ shot}$ | — | — | 8 | A |
| Forward voltage | V_F | $I_F = 1 \text{ A}, I_B = 0 \text{ A}$ | — | — | 2.0 | V |
| Reverse recovery time | t_{rr} | $I_F = 5 \text{ A}, V_{BE} = -3 \text{ V}, dI_F/dt = -50 \text{ A}/\mu\text{s}$ | — | 1.0 | — | μs |
| Reverse recovery charge | Q_{rr} | | — | 8 | — | μC |

Electrical Characteristics (Ta = 25°C) (PNP transistor)

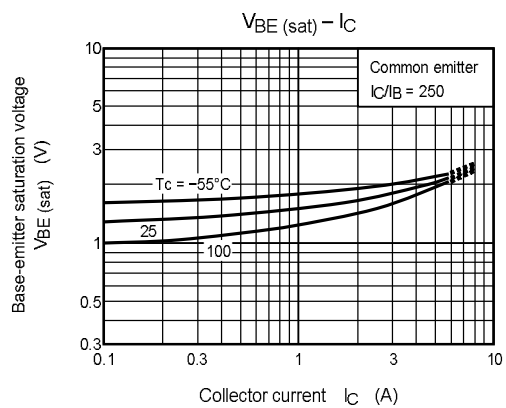
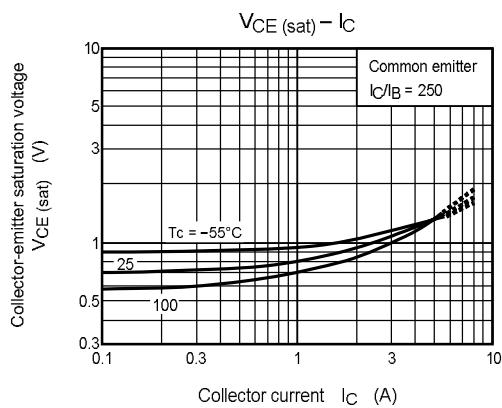
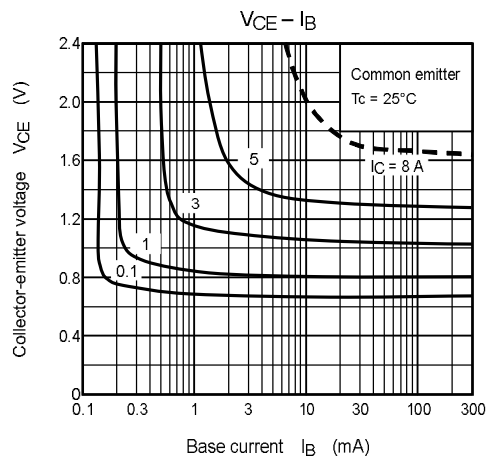
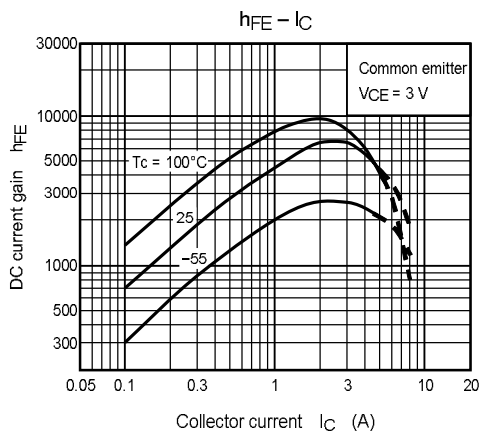
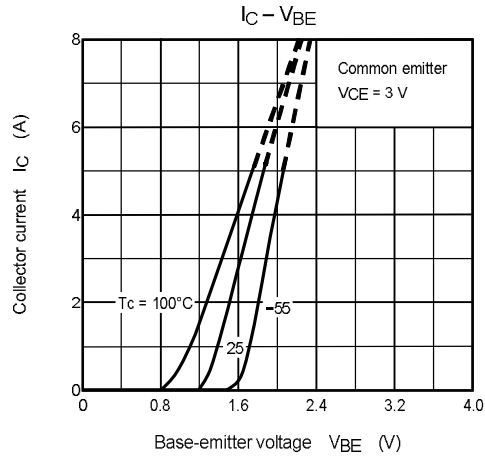
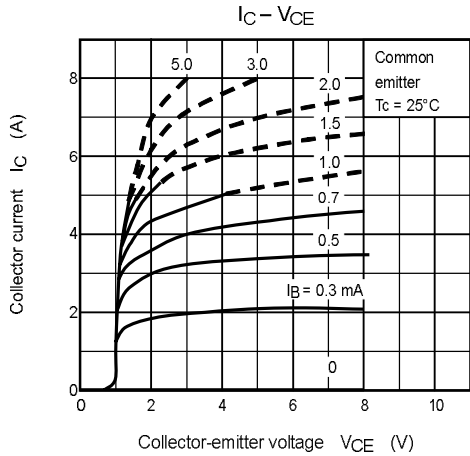
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit | |
|-------------------------------------|-------------------|--|--|------|------|---------------|---------------|
| Collector cut-off current | I_{CBO} | $V_{CB} = -100 \text{ V}, I_E = 0 \text{ A}$ | — | — | -10 | μA | |
| Collector cut-off current | I_{CEO} | $V_{CE} = -100 \text{ V}, I_B = 0 \text{ A}$ | — | — | -10 | μA | |
| Emitter cut-off current | I_{EBO} | $V_{EB} = -5 \text{ V}, I_C = 0 \text{ A}$ | -0.3 | — | -2.0 | mA | |
| Collector-base breakdown voltage | $V_{(BR)CBO}$ | $I_C = -1 \text{ mA}, I_E = 0 \text{ A}$ | -100 | — | — | V | |
| Collector-emitter breakdown voltage | $V_{(BR)CEO}$ | $I_C = -30 \text{ mA}, I_B = 0 \text{ A}$ | -100 | — | — | V | |
| DC current gain | $h_{FE(1)}$ | $V_{CE} = -3 \text{ V}, I_C = -0.5 \text{ A}$ | 1000 | — | — | — | |
| | $h_{FE(2)}$ | $V_{CE} = -3 \text{ V}, I_C = -3 \text{ A}$ | 1000 | — | — | | |
| Saturation voltage | Collector-emitter | $V_{CE(sat)}$ | $I_C = -3 \text{ A}, I_B = -12 \text{ mA}$ | — | — | -2.0 | V |
| | Base-emitter | $V_{BE(sat)}$ | $I_C = -3 \text{ A}, I_B = -12 \text{ mA}$ | — | — | -2.5 | |
| Transition frequency | f_T | $V_{CE} = -3 \text{ V}, I_C = -0.5 \text{ A}$ | 3 | — | — | MHz | |
| Collector output capacitance | C_{ob} | $V_{CB} = -50 \text{ V}, I_E = 0 \text{ A}, f = 1 \text{ MHz}$ | — | 40 | — | pF | |
| Switching time | Turn-on time | t_{on} | | — | 0.5 | — | μs |
| | Storage time | t_{stg} | | — | 3.0 | | |
| | Fall time | t_f | | — | 2.0 | | |

$-I_{B1} = I_{B2} = 12 \text{ mA}, \text{ duty cycle} \leq 1\%$

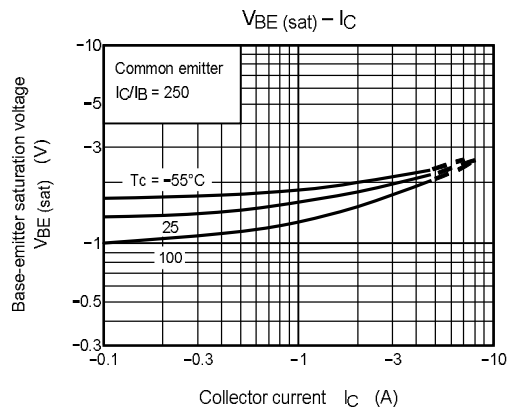
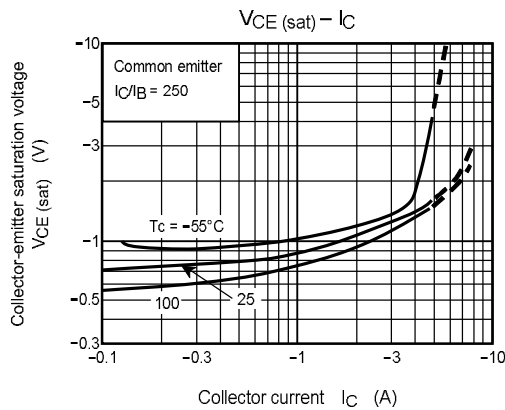
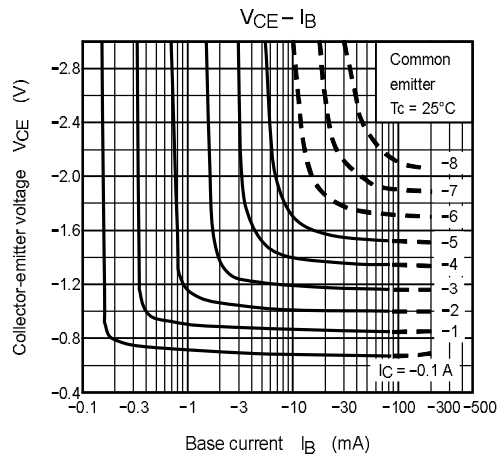
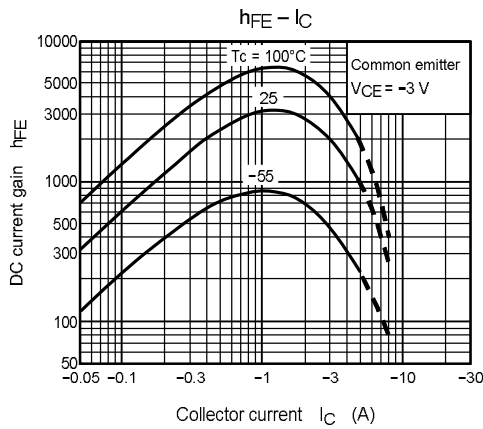
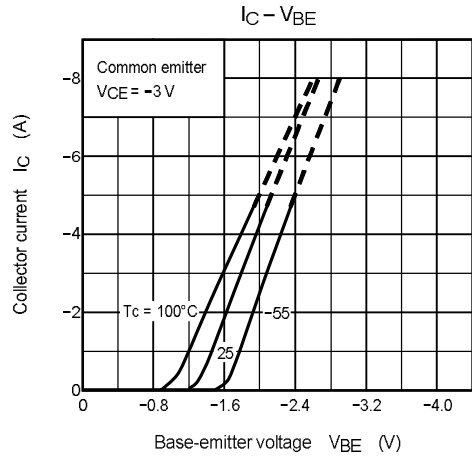
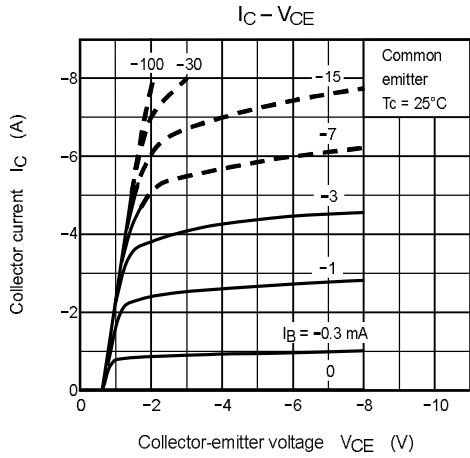
Emitter-Collector Diode Ratings and Characteristics (Ta = 25°C)

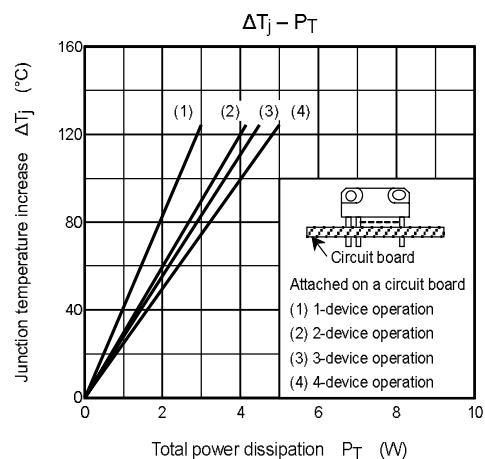
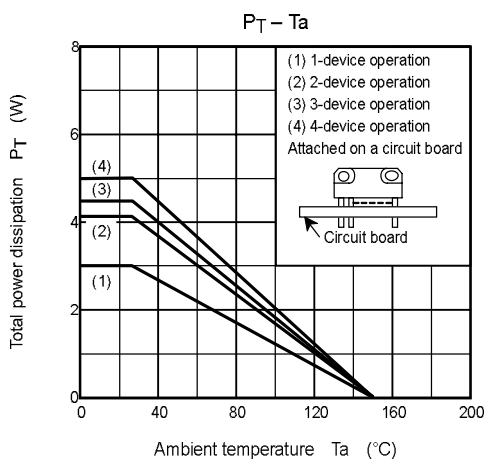
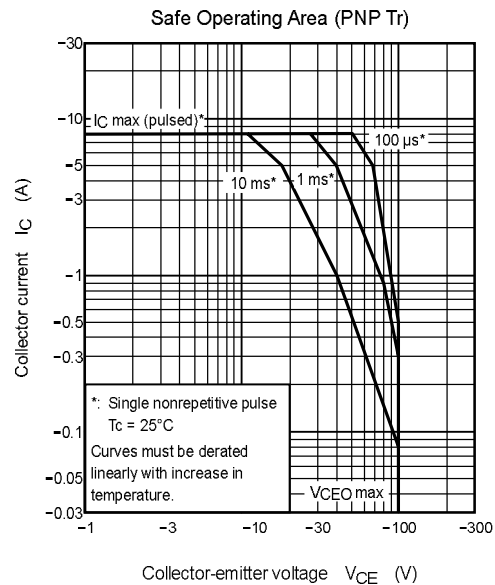
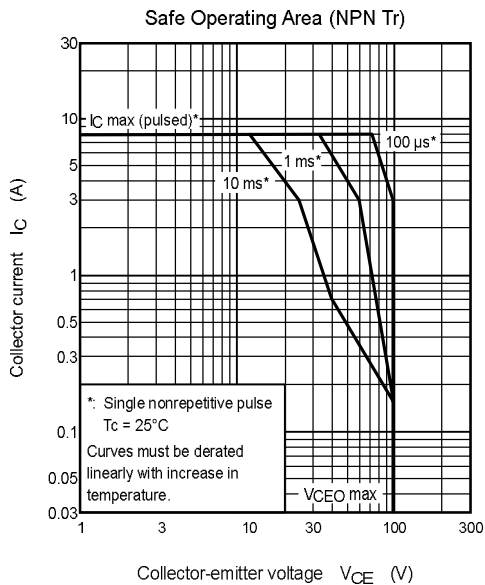
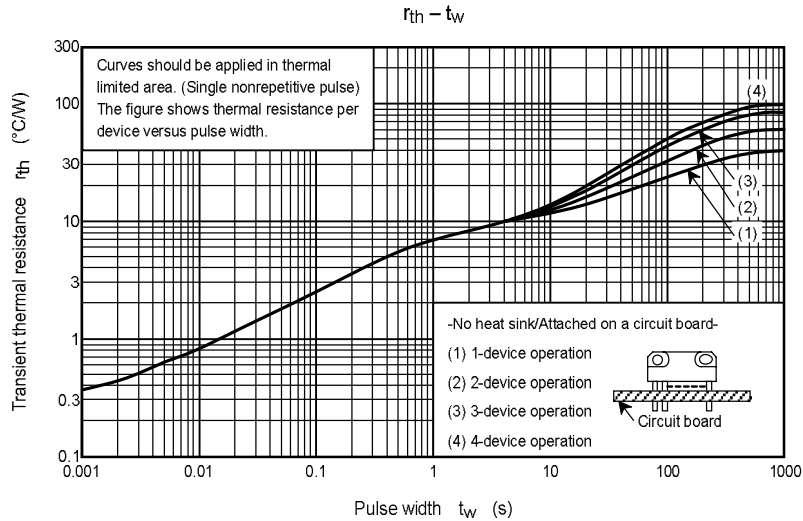
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|-----------|--|-----|------|-----|---------------|
| Forward current | I_{FM} | — | — | — | 5 | A |
| Surge current | I_{FSM} | $t = 1 \text{ s}, 1 \text{ shot}$ | — | — | 8 | A |
| Forward voltage | V_F | $I_F = 1 \text{ A}, I_B = 0 \text{ A}$ | — | — | 2.0 | V |
| Reverse recovery time | t_{rr} | $I_F = 5 \text{ A}, V_{BE} = 3 \text{ V}, dI_F/dt = -50 \text{ A}/\mu\text{s}$ | — | 1.0 | — | μs |
| Reverse recovery charge | Q_{rr} | | — | 8 | — | μC |

(NPN transistor)



(PNP transistor)





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