

# M54534P/FP

6-UNIT 320mA TRANSISTOR ARRAY WITH CLAMP DIODE AND STROBE

## DESCRIPTION

M54534P and M54534FP are six-circuit transistor arrays. The circuits are made of NPN transistors. Both the semiconductor integrated circuits perform high-current driving with extremely low input-current supply.

## FEATURES

- Medium breakdown voltage ( $BV_{CEO} \geq 20V$ )
- High-current driving ( $I_{C(max)} = 320mA$ )
- With clamping diodes
- Wide input voltage range ( $V_I = -25$  to  $+20V$ )
- Wide operating temperature range ( $T_a = -20$  to  $+75^\circ C$ )
- With strobe input

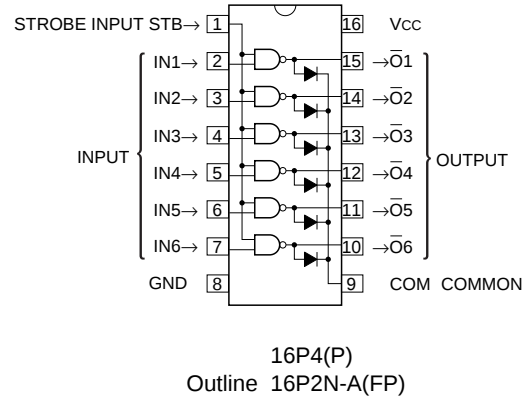
## APPLICATION

Drives of relays and printers, digit drives of indication elements (LEDs and lamps).

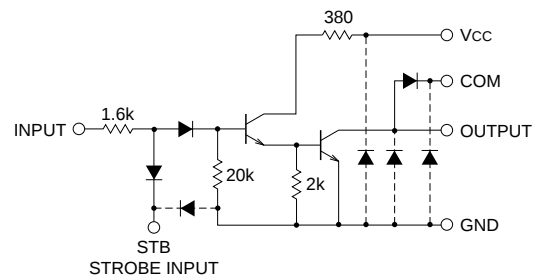
## FUNCTION

The M54534P and M54534FP each have six circuits consisting of NPN transistors. Each input has a diode and  $1.6k\Omega$  resistor in series. Each input is connected, and each output is connected spike-killer clamping diode, emitters of each transistor is connected to GND (pin 8), strobe input is connected to (pin 1), clamping diode is connected COM pin (pin 9) and  $V_{CC}$  is connected to the pin 16 in common. The collector current is 320mA maximum. Collector-emitter supply voltage is 20V maximum. M54534FP is enclosed in a molded small flat package, enabling space-saving design.

## PIN CONFIGURATION (TOP VIEW)



## CIRCUIT SCHEMATIC (EACH CIRCUIT)



The six circuits share the STB, COM,  $V_{CC}$ , GND.  
The diodes shown by broken line are parasite diodes and must not be use.

Unit :  $\Omega$

## ABSOLUTE MAXIMUM RATINGS (Unless otherwise noted, $T_a = -20 \sim +75^\circ C$ )

| Symbol      | Parameter                      | Conditions                                 | Ratings         | Unit       |
|-------------|--------------------------------|--------------------------------------------|-----------------|------------|
| $V_{CC}$    | Supply voltage                 |                                            | 10              | V          |
| $V_{CEO}$   | Collector-emitter voltage      | Output, H                                  | $-0.5 \sim +20$ | V          |
| $I_C$       | Collector current              | Current per circuit output, L              | 320             | mA         |
| $V_I$       | Input voltage                  |                                            | $-25 \sim +20$  | V          |
| $V_{(STB)}$ | Strobe input voltage           |                                            | $-0.5 \sim +20$ | V          |
| $I_F$       | Clamping diode forward current |                                            | 320             | mA         |
| $V_R$       | Clamping diode reverse voltage |                                            | 20              | V          |
| $P_d$       | Power dissipation              | $T_a = 25^\circ C$ , when mounted on board | 1.47/1.00       | W          |
| $T_{opr}$   | Operating temperature          |                                            | $-20 \sim +75$  | $^\circ C$ |
| $T_{stg}$   | Storage temperature            |                                            | $-55 \sim +125$ | $^\circ C$ |

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## 6-UNIT 320mA TRANSISTOR ARRAY WITH CLAMP DIODE AND STROBE

### FUNCTIONAL TABLE

| IN | STB | OUT |
|----|-----|-----|
| L  | L   | H   |
| H  | L   | H   |
| L  | H   | H   |
| H  | H   | L   |

### RECOMMENDED OPERATING CONDITIONS (Unless otherwise noted, Ta = -20 ~ +75°C)

| Symbol               | Parameter                        | Limits                                                                              |     |     | Unit |
|----------------------|----------------------------------|-------------------------------------------------------------------------------------|-----|-----|------|
|                      |                                  | min                                                                                 | typ | max |      |
| V <sub>CC</sub>      | Supply voltage                   | 3                                                                                   | —   | 8   | V    |
| V <sub>O</sub>       | Output voltage                   | 0                                                                                   | —   | 20  | V    |
| I <sub>C</sub>       | Collector current<br>Per channel | V <sub>CC</sub> = 6.5V, Duty Cycle<br>P : no more than 25%<br>FP : no more than 15% |     | 300 | mA   |
|                      |                                  | V <sub>CC</sub> = 6.5V, Duty Cycle<br>P : no more than 65%<br>FP : no more than 35% |     | 150 |      |
| V <sub>IH</sub>      | "H" Input voltage                | 3.2                                                                                 | —   | 18  | V    |
| V <sub>IL</sub>      | "L" Input voltage                | 0                                                                                   | —   | 0.7 | V    |
| V <sub>IH(STB)</sub> | "H" Input voltage (strobe input) | 2.4                                                                                 | —   | 18  | V    |
| V <sub>IL(STB)</sub> | "L" Input voltage (strobe input) | 0                                                                                   | —   | 0.2 | V    |

### ELECTRICAL CHARACTERISTICS (Unless otherwise noted, Ta = -20 ~ +75°C)

| Symbol                | Parameter                            | Test conditions                                                                                                | Limits |      |      | Unit |
|-----------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------|--------|------|------|------|
|                       |                                      |                                                                                                                | min    | typ* | max  |      |
| V (BR) CEO            | Collector-emitter breakdown voltage  | V <sub>CC</sub> = 8V, V <sub>I</sub> = 3.2V, V <sub>I(STB)</sub> = 0.2V, I <sub>CEO</sub> = 100μA              | 20     | —    | —    | V    |
| V <sub>CE (sat)</sub> | Collector-emitter saturation voltage | V <sub>I</sub> = 3.2V<br>V <sub>I(STB)</sub> = 2.4V                                                            | —      | 0.3  | 0.85 | V    |
|                       |                                      | V <sub>CC</sub> = 6.5V, I <sub>C</sub> = 250mA<br>V <sub>CC</sub> = 3V, I <sub>C</sub> = 120mA                 | —      | 0.15 | 0.5  |      |
| I <sub>I</sub>        | Input current                        | V <sub>CC</sub> = 8V, V <sub>I</sub> = 3.2V, V <sub>I(STB)</sub> = 2.4V                                        | —      | 0.5  | 1.4  | mA   |
| I <sub>IR</sub>       | Input reverse current                | V <sub>CC</sub> = 8V, V <sub>I</sub> = -25V                                                                    | —      | —    | -20  | μA   |
| I <sub>I(STB)</sub>   | Strobe input current                 | V <sub>CC</sub> = 8V, V <sub>I</sub> = 3.2V (all input), V <sub>I(STB)</sub> = 0.2V                            | —      | -7.9 | -20  | mA   |
| I <sub>R(STB)</sub>   | Strobe input reverse current         | V <sub>CC</sub> = 8V, V <sub>I</sub> = 0V, V <sub>I(STB)</sub> = 20V                                           | —      | —    | 20   | μA   |
| V <sub>F</sub>        | Clamping diode forward voltage       | I <sub>F</sub> = 320mA                                                                                         | —      | 1.4  | 2.4  | V    |
| I <sub>R</sub>        | Clamping diode reverse current       | V <sub>R</sub> = 20V                                                                                           | —      | —    | 100  | μA   |
| I <sub>CC</sub>       | Supply current                       | V <sub>CC</sub> = 8V, V <sub>I</sub> = 3.2V (all input), V <sub>I(STB)</sub> = 2.4V                            | —      | 120  | 200  | mA   |
| h <sub>FE</sub>       | DC amplification factor              | V <sub>CE</sub> = 4V, V <sub>CC</sub> = 6.5V, I <sub>C</sub> = 300mA, Ta = 25°C,<br>V <sub>I(STB)</sub> = 2.4V | 1000   | 3000 | —    | —    |

\* : The typical values are those measured under ambient temperature (Ta) of 25°C. There is no guarantee that these values are obtained under any conditions.

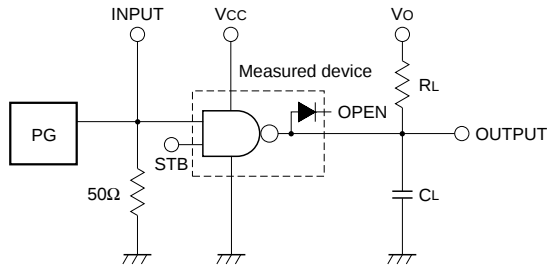
### SWITCHING CHARACTERISTICS (Unless otherwise noted, Ta = 25°C)

| Symbol           | Parameter     | Test conditions                | Limits |      |     | Unit |
|------------------|---------------|--------------------------------|--------|------|-----|------|
|                  |               |                                | min    | typ  | max |      |
| t <sub>on</sub>  | Turn-on time  | C <sub>L</sub> = 15pF (note 1) | —      | 22   | —   | ns   |
| t <sub>off</sub> | Turn-off time |                                | —      | 1200 | —   | ns   |

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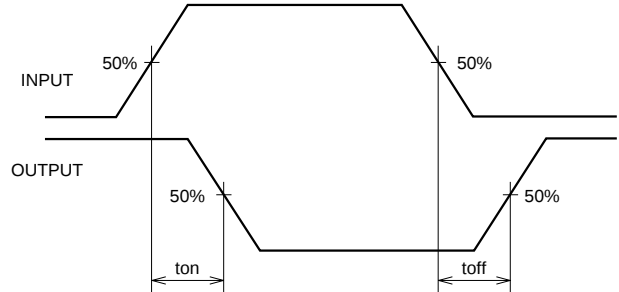
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### NOTE 1 TEST CIRCUIT

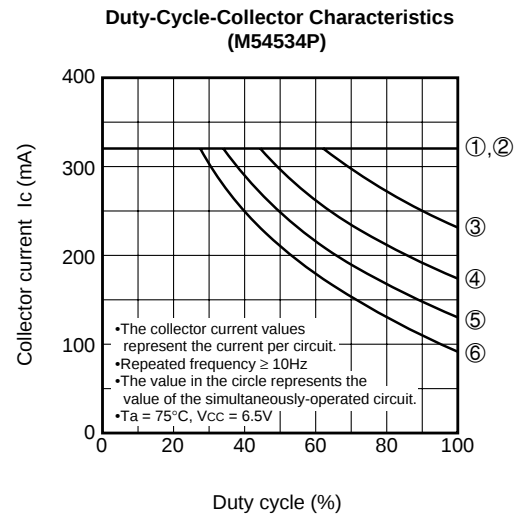
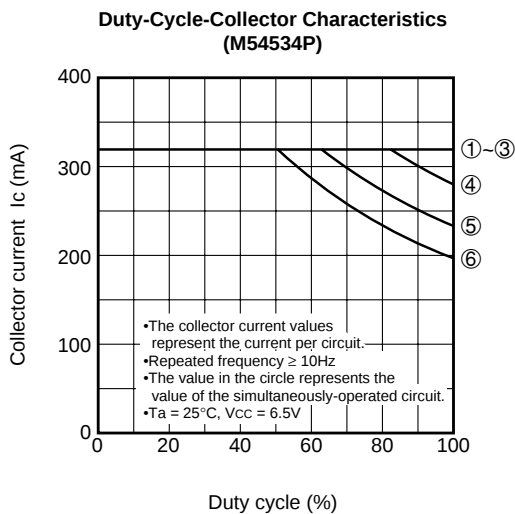
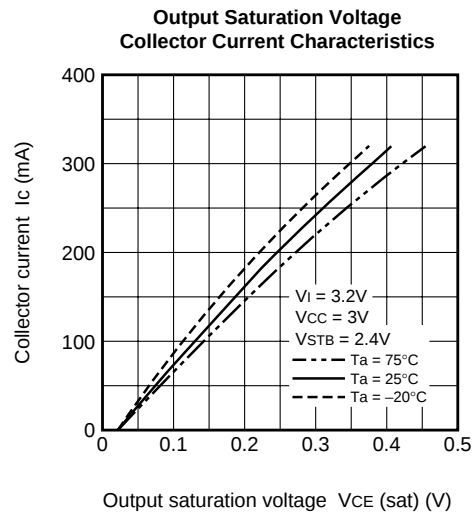
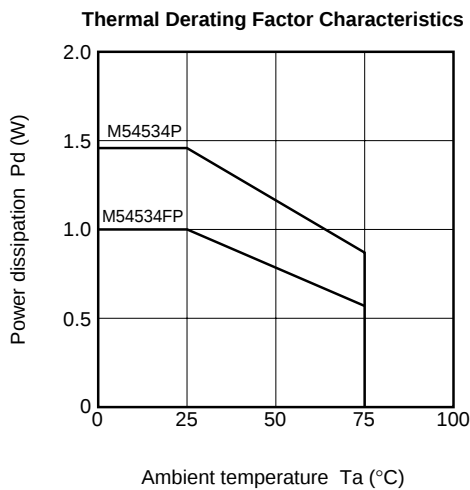


- (1) Pulse generator (PG) characteristics : PRR = 1kHz,  
tw = 10μs, tr = 6ns, tf = 6ns, Zo = 50Ω  
Vp = 3.2Vp-p
- (2) Input-output conditions : RL = 40Ω, Vo = 10V, Vcc = VSTB = 6.5V
- (3) Electrostatic capacity CL includes floating capacitance at connections and input capacitance at probes

### TIMING DIAGRAM



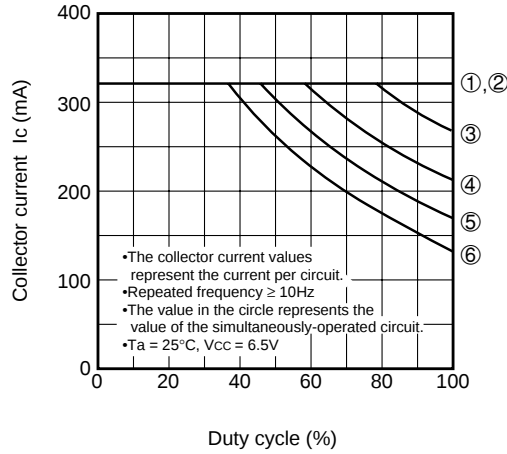
### TYPICAL CHARACTERISTICS



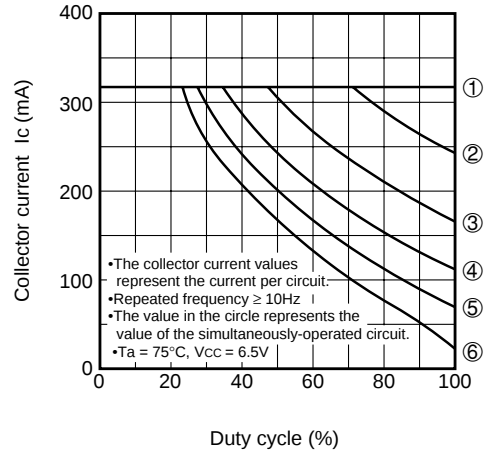
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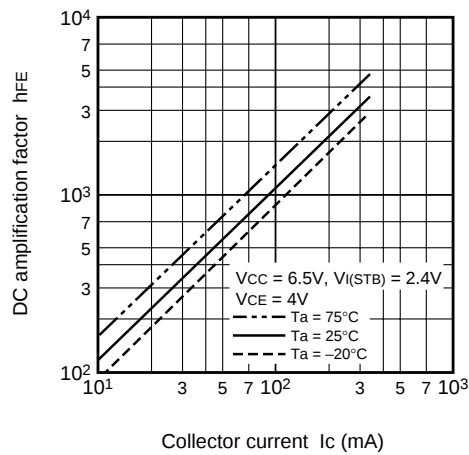
**Duty-Cycle-Collector Characteristics  
(M54534FP)**



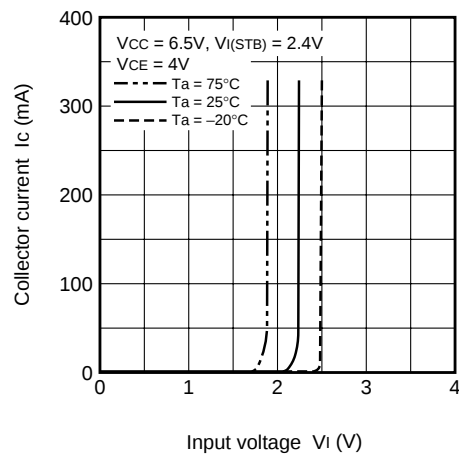
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(M54534FP)**



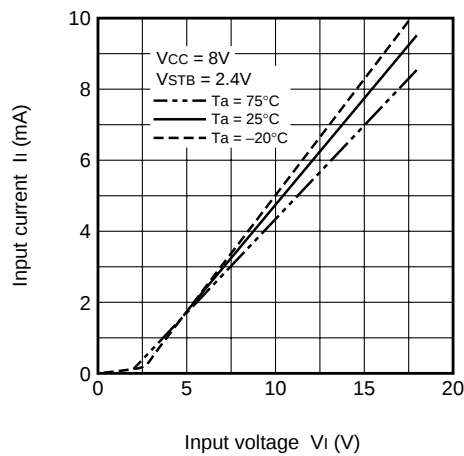
**DC Amplification Factor  
Collector Current Characteristics**



**Grounded Emitter Transfer Characteristics**



**Input Characteristics**



**Supply Current Characteristics (common)**

