

# M54585P/FP

8-UNIT 500mA DARLINGTON TRANSISTOR ARRAY WITH CLAMP DIODE

## DESCRIPTION

M54585P and M54585FP are eight-circuit Darlington transistor arrays with clamping diodes. The circuits are made of NPN transistors. Both the semiconductor integrated circuits perform high-current driving with extremely low input-current supply.

## FEATURES

- High breakdown voltage ( $BV_{CEO} \geq 50V$ )
- High-current driving ( $I_{C(max)} = 500mA$ )
- With clamping diodes
- Driving available with TTL output or with PMOS IC output
- Wide operating temperature range ( $T_a = -20$  to  $+75^\circ C$ )

## APPLICATION

Drives of relays and printers, digit drives of indication elements such as LEDs and lamps, and MOS-bipolar logic IC interfaces

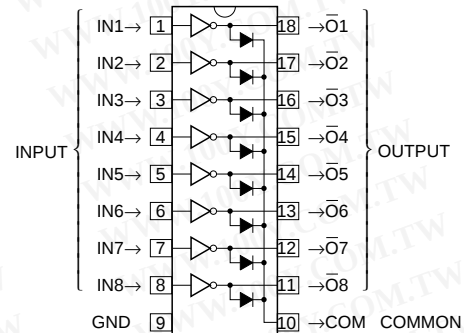
## FUNCTION

The M54585P and M54585FP each have eight circuits, which are NPN Darlington transistors. Input transistors have resistance of  $2.7k\Omega$  between the base and input pin. A spike-killer clamping diode is provided between each output pin and GND. Output transistor emitters are all connected to the GND pin.

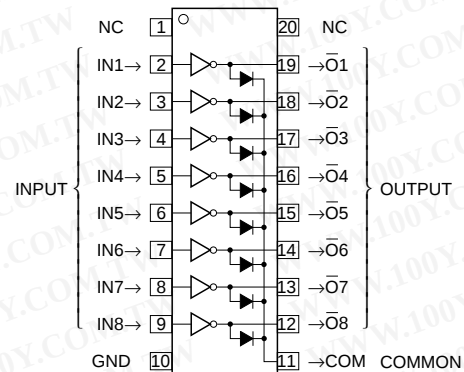
Collector current is 500mA maximum. The maximum collector-emitter voltage is 50V.

The M54585FP is enclosed in a molded small flat package, enabling space-saving design.

## PIN CONFIGURATION



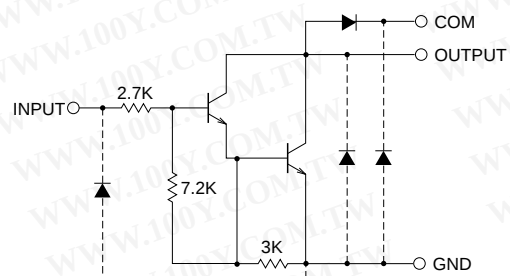
Package type 18P4G(P)



Package type 20P2N-A(FP)

NC : No connection

## CIRCUIT DIAGRAM



The eight circuits share the COM and GND.

The diode, indicated with the dotted line, is parasitic, and cannot be used.

Unit :  $\Omega$

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#### ABSOLUTE MAXIMUM RATINGS (Unless otherwise noted, Ta = -20 ~ +75°C)

| Symbol           | Parameter                      | Conditions                       | Ratings          | Unit |
|------------------|--------------------------------|----------------------------------|------------------|------|
| V <sub>CEO</sub> | Collector-emitter voltage      | Output, H                        | -0.5 ~ +50       | V    |
| I <sub>C</sub>   | Collector current              | Current per circuit output, L    | 500              | mA   |
| V <sub>I</sub>   | Input voltage                  |                                  | -0.5 ~ +30       | V    |
| I <sub>F</sub>   | Clamping diode forward current |                                  | 500              | mA   |
| V <sub>R</sub>   | Clamping diode reverse voltage |                                  | 50               | V    |
| P <sub>d</sub>   | Power dissipation              | Ta = 25°C, when mounted on board | 1.79(P)/1.10(FP) | W    |
| T <sub>opr</sub> | Operating temperature          |                                  | -20 ~ +75        | °C   |
| T <sub>stg</sub> | Storage temperature            |                                  | -55 ~ +125       | °C   |

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

| Symbol | Parameter                                                                                 |                                                             | Limits |     |     | Unit |
|--------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------|-----|-----|------|
|        |                                                                                           |                                                             | min    | typ | max |      |
| Vo     | Output voltage                                                                            |                                                             | 0      | —   | 50  | V    |
| Ic     | Collector current<br>(Current per 1 circuit when 8 circuits are coming on simultaneously) | Duty Cycle<br>P : no more than 6%<br>FP : no more than 4%   | 0      | —   | 400 | mA   |
|        |                                                                                           | Duty Cycle<br>P : no more than 34%<br>FP : no more than 20% | 0      | —   | 200 |      |
| VIH    | “H” input voltage                                                                         | Ic ≤ 400mA                                                  | 3.85   | —   | 30  | V    |
|        |                                                                                           | Ic ≤ 200mA                                                  | 3.4    | —   |     |      |
| VIL    | “L” input voltage                                                                         |                                                             | 0      | —   | 0.6 | 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  | I <sub>CEO</sub> = 100μA                                | 50     | —    | —   | V    |
| V <sub>CE</sub> (sat) | Collector-emitter saturation voltage | V <sub>I</sub> = 3.85V, I <sub>C</sub> = 400mA          | —      | 1.3  | 2.4 | V    |
|                       |                                      | V <sub>I</sub> = 3.4V, I <sub>C</sub> = 200mA           | —      | 1.0  | 1.6 |      |
| I <sub>I</sub>        | Input current                        | V <sub>I</sub> = 3.85V                                  | —      | 0.95 | 1.8 | mA   |
|                       |                                      | V <sub>I</sub> = 25V                                    | —      | 8.7  | 18  |      |
| V <sub>F</sub>        | Clamping diode forward voltage       | I <sub>F</sub> = 400mA                                  | —      | 1.5  | 2.4 | V    |
| I <sub>R</sub>        | Clamping diode reverse current       | V <sub>R</sub> = 50V                                    | —      | —    | 100 | μA   |
| h <sub>FE</sub>       | DC amplification factor              | V <sub>CE</sub> = 4V, I <sub>C</sub> = 350mA, Ta = 25°C | 1000   | 2500 | —   | —    |

\* : 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.

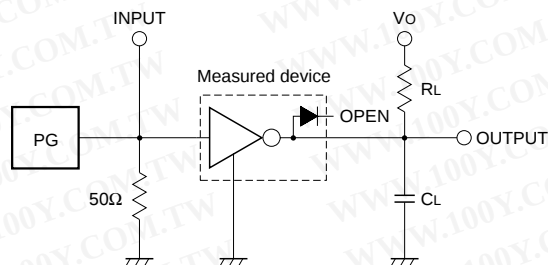
#### SWITCHING CHARACTERISTICS (Unless otherwise noted, Ta = 25°C)

| Symbol           | Parameter     | Test conditions                | Limits |     |     | Unit |
|------------------|---------------|--------------------------------|--------|-----|-----|------|
|                  |               |                                | min    | typ | max |      |
| t <sub>on</sub>  | Turn-on time  | C <sub>L</sub> = 15pF (note 1) | —      | 12  | —   | ns   |
| t <sub>off</sub> | Turn-off time |                                | —      | 240 | —   | ns   |

# M54585P/FP

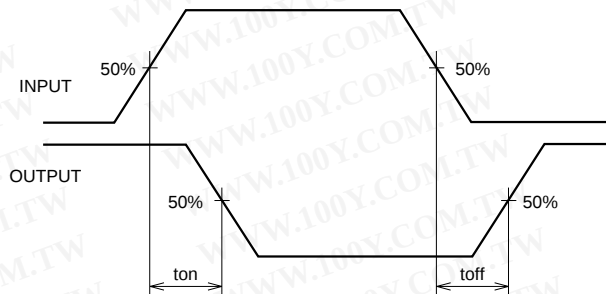
## 8-UNIT 500mA DARLINGTON TRANSISTOR ARRAY WITH CLAMP DIODE

### NOTE 1 TEST CIRCUIT



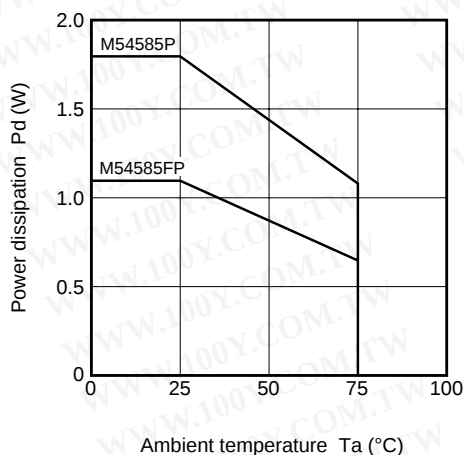
- (1) Pulse generator (PG) characteristics : PRR = 1kHz,  $t_w = 10\mu s$ ,  $t_r = 6ns$ ,  $t_f = 6ns$ ,  $Z_o = 50\Omega$ ,  $V_i = 3.85V$
- (2) Input-output conditions :  $R_L = 25\Omega$ ,  $V_o = 10V$
- (3) Electrostatic capacity  $C_L$  includes floating capacitance at connections and input capacitance at probes

### TIMING DIAGRAM

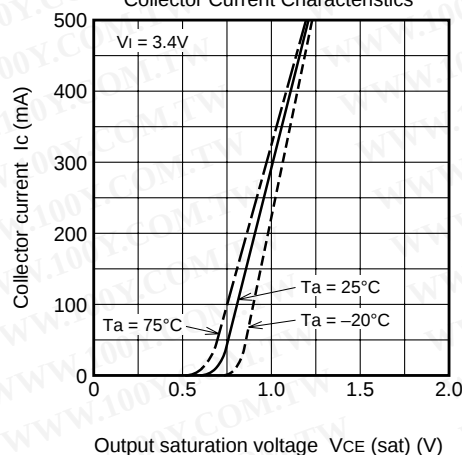


### TYPICAL CHARACTERISTICS

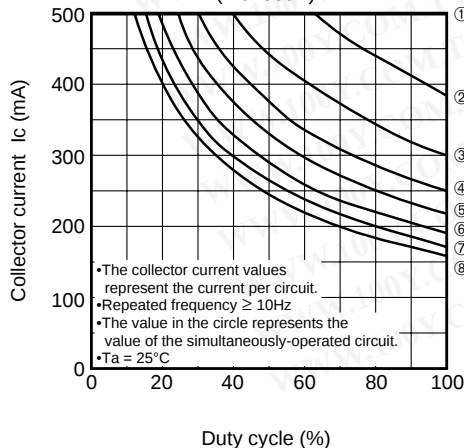
Thermal Derating Factor Characteristics



Output Saturation Voltage  
Collector Current Characteristics



Duty-Cycle-Collector Characteristics  
(M54585P)



Duty-Cycle-Collector Characteristics  
(M54585P)

