# M54530P/FP

7-UNIT 400mA DARLINGTON TRANSISTOR ARRAY WITH CLAMP DIODE

## DESCRIPTION

M54530P and M54530FP are seven-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 ($BV_{CEO} \geq 40V$)
- High-current driving (Ic(max) = 400mA)
- With clamping diodes
- Driving available with PMOS IC output
- Wide operating temperature range (Ta = –20 to +75°C)

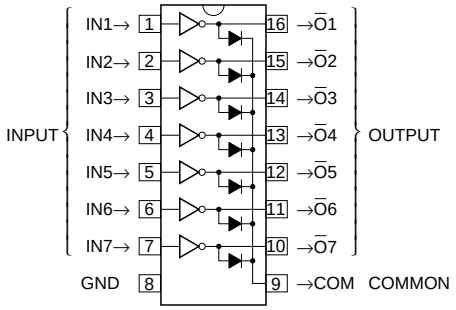
## APPLICATION

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

## FUNCTION

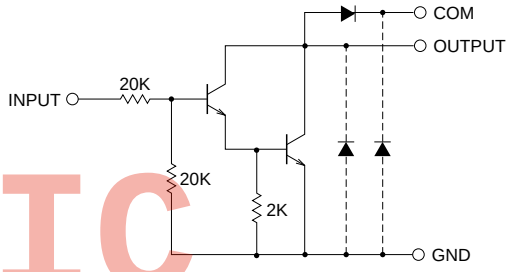
The M54530P and M54530FP each have seven circuits consisting of NPN Darlington transistors. These ICs have resistance of 20kΩ between input transistor bases and input pins. A spike-killer clamping diode is provided between each output pin (collector) and COM pin (pin 9). The output transistor emitters are all connected to the GND pin (pin 8).
The collector current is 400mA maximum. Collector-emitter supply voltage is 40V maximum.
The M54530FP is enclosed in a molded small flat package, enabling space-saving design.

## PIN CONFIGURATION




16P4(P)
Package type 16P2N-A(FP)

## CIRCUIT DIAGRAM




The seven circuits share the COM and GND.
The diode, indicated with the dotted line, is parasitic, and cannot be used.

Unit : Ω



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

| Symbol | Parameter | Conditions | Ratings | Unit |
|---|---|---|---|---|
| $V_{CEO}$ | Collector-emitter voltage | Output, H | –0.5 ~ +40 | V |
| $I_C$ | Collector current | Current per circuit output, L | 400 | mA |
| $V_I$ | Input voltage | | –0.5 ~ +40 | V |
| $I_F$ | Clamping diode forward current | | 400 | mA |
| $V_R$ | Clamping diode reverse voltage | | 40 | V |
| Pd | Power dissipation | Ta = 25°C, when mounted on board | 1.47(P)/1.00(FP) | W |
| Topr | Operating temperature | | –20 ~ +75 | °C |
| Tstg | Storage temperature | | –55 ~ +125 | °C |



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

| Symbol | Parameter | | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| $V_O$ | Output voltage | | 0 | — | 40 | V |
| $I_C$ | Collector current (Current per 1 circuit when 7 circuits are coming on simultaneously) | Duty Cycle P : no more than 8% FP : no more than 6% | 0 | — | 400 | mA |
| | | Duty Cycle P : no more thn 30% FP : no more than 25% | 0 | — | 200 | |
| $V_{IH}$ | "H" input voltage | $I_C \leq 400mA$ | 8 | — | 35 | V |
| | | $I_C \leq 200mA$ | 5 | — | | |
| $V_{IL}$ | "L" input voltage | | 0 | — | 0.5 | 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 | $I_{CEO}$ = 100μA | 40 | — | — | V |
| $V_{CE(sat)}$ | Collector-emitter saturation voltage | $V_I$ = 8V, $I_C$ = 400mA | — | 1.3 | 2.4 | V |
| | | $V_I$ = 5V, $I_C$ = 200mA | — | 1.0 | 1.6 | |
| $I_I$ | Input current | $V_I$ = 17V | — | 0.85 | 1.8 | mA |
| | | $V_I$ = 35V | — | 2.0 | 3.8 | |
| $V_F$ | Clamping diode forward voltage | $I_F$ = 400mA | — | 1.5 | 2.4 | V |
| $I_R$ | Clamping diode reverse current | $V_R$ = 40V | — | — | 100 | μA |
| $h_{FE}$ | DC amplification factor | $V_{CE}$ = 4V, $I_C$ = 300mA, Ta = 25°C | 1000 | 3500 | — | — |

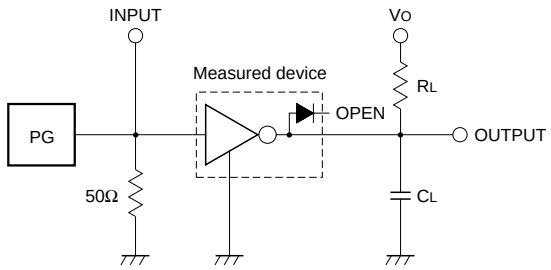
∗ : The typical values are those measured under ambient temperature (Ta) of 25°C. There is no guarantee that these values are obtained under any conditions.



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

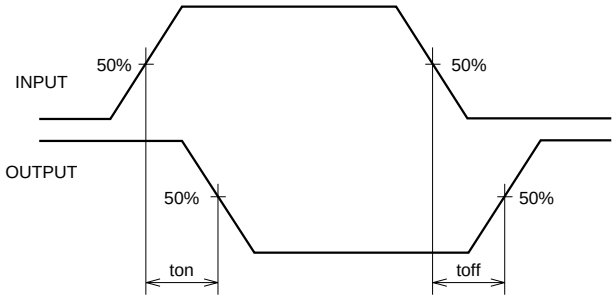
| Symbol | Parameter | Test conditions | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| $t_{on}$ | Turn-on time | $C_L$ = 15pF (note 1) | — | 35 | — | ns |
| $t_{off}$ | Turn-off time | | — | 760 | — | ns |

## NOTE 1 TEST CIRCUIT



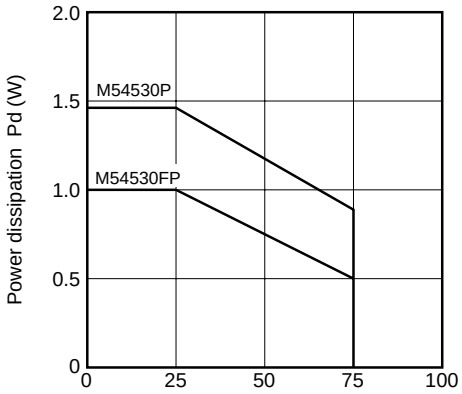

(1) Pulse generator (PG) characteristics : PRR = 1kHz, tw = 10μs, tr = 6ns, tf = 6ns, $Z_O$ = 50Ω
$V_P$ = 8$V_{P-P}$
(2) Input-output conditions : $R_L$ = 25Ω, $V_O$ = 10V
(3) Electrostatic capacity $C_L$ includes floating capacitance at connections and input capacitance at probes

## TIMING DIAGRAM

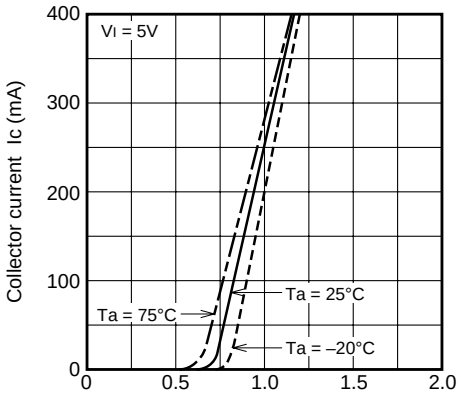


## TYPICAL CHARACTERISTICS

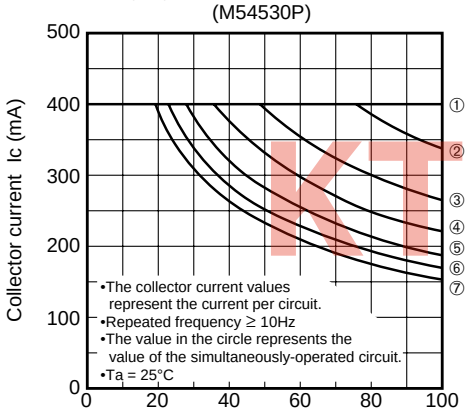
Thermal Derating Factor Characteristics



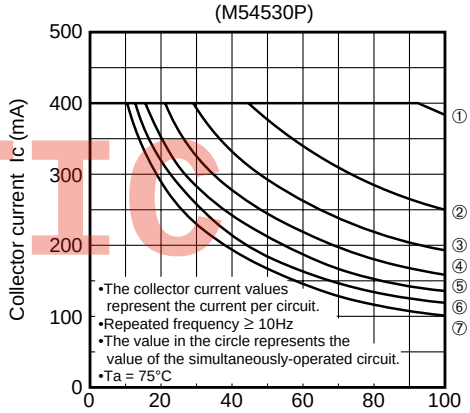

Output Saturation Voltage
Collector Current Characteristics



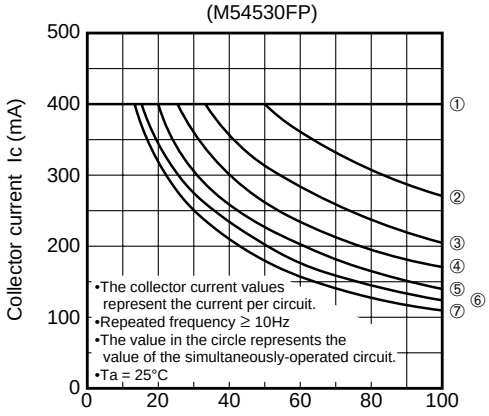

Duty-Cycle-Collector Characteristics
(M54530P)



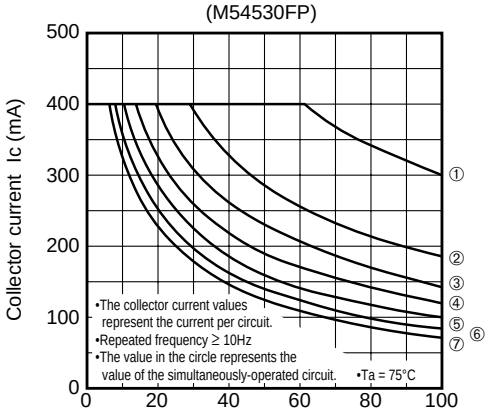

Duty-Cycle-Collector Characteristics
(M54530P)




Duty-Cycle-Collector Characteristics
(M54530FP)




Duty-Cycle-Collector Characteristics
(M54530FP)



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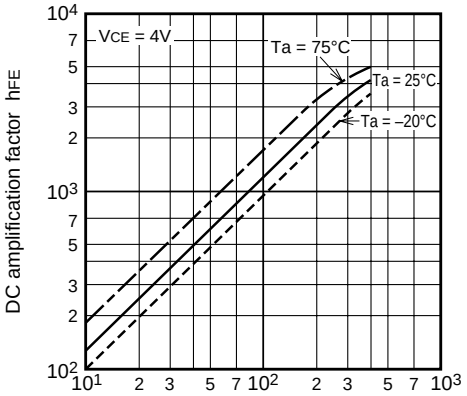
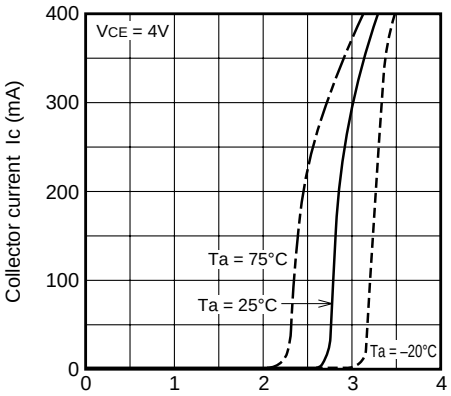
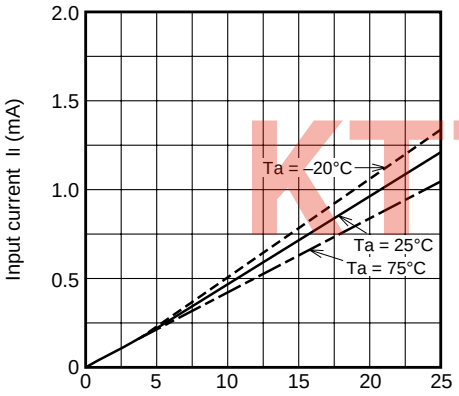
DC Amplification Factor
Collector Current Characteristics




Grounded Emitter Transfer Characteristics




Input Characteristics




Clamping Diode Characteristics