

M54587P/FP

8-UNIT 500mA DARLINGTON TRANSISTOR ARRAY WITH CLAMP DIODE

DESCRIPTION

M54587P and M54587FP are eight-circuit collector-current-synchronized Darlington transistor arrays. The circuits are made of PNP and 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 ($I_{C(max)} = 500mA$)
- "L" active level input
- With input diode
- With clamping diodes
- Wide operating temperature range ($T_a = -20$ to $+75^\circ C$)

APPLICATION

Interfaces between microcomputers and high-voltage, high-current drive systems, drives of relays and MOS-bipolar logic IC interfaces

FUNCTION

The M54587 is produced by adding PNP transistors to M54585 inputs. Eight circuits having active L-level inputs are provided.

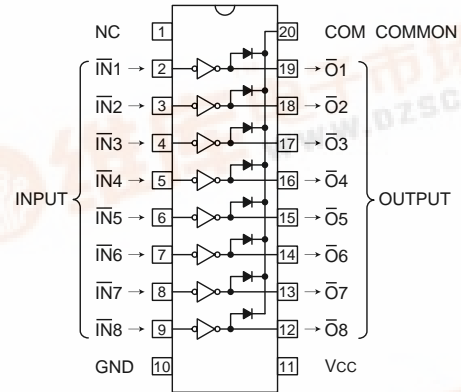
Resistance of $7k\Omega$ and diode are provided in series between each input and PNP transistor base. The input diode is intended to prevent the flow of current from the input to the V_{cc} . Without this diode, the current flow from "H" input to the V_{cc} and the "L" input circuits is activated, in such case where one of the inputs of the 8 circuits is "H" and the others are "L" to save power consumption. The diode is inserted to prevent such misoperation.

This device is most suitable for a driver using NMOS IC output especially for the driver of current sink.

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

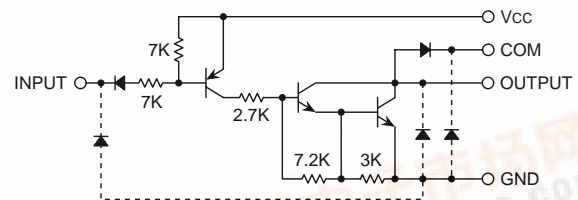
The M54587FP is enclosed in a molded small flat package, enabling space saving design.

PIN CONFIGURATION



Package type 20P4(P) 20P2N-A(FP) NC : No connection

CIRCUIT DIAGRAM (EACH CIRCUIT)



The eight circuits share the V_{cc} , COM and GND
The diode, indicated with the dotted line, is parasitic, and cannot be used.

Unit : Ω

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

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		10	V
V _{CEO}	Collector-emitter voltage	Output, H	-0.5 ~ +50	V
V _I	Input voltage		-0.5 ~ V _{CC}	V
I _C	Collector current	Current per circuit output, L	500	mA
I _F	Clamping diode forward current		500	mA
V _R	Clamping diode reverse voltage		50	V
P _d	Power dissipation	Ta = 25°C, when mounted on board	1.79/1.1	W
T _{opr}	Operating temperature		-20 ~ +75	°C
T _{stg}	Storage temperature		-55 ~ +125	°C

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

Symbol	Parameter	Limits			Unit	
		min	typ	max		
V _{CC}	Supply voltage	4	5	8	V	
I _C	Collector current Per channel	V _{CC} = 5V, Duty Cycle P : no more than 6% FP : no more than 5%	0	—	400	mA
		V _{CC} = 5V, Duty Cycle P : no more than 34% FP : no more than 15%	0	—	200	
V _{IH}	"H" input voltage	V _{CC} -0.7	—	V _{CC}	V	
V _{IL}	"L" input voltage	0	—	V _{CC} -3.6	V	

ELECTRICAL CHARACTERISTICS (Unless otherwise noted, Ta = -40 ~ +85°C)

Symbol	Parameter	Test conditions	Limits			Unit	
			min	typ*	max		
V (BR) CEO	Collector-emitter breakdown voltage	I _{CEO} = 100μA	50	—	—	V	
V _{CE(sat)}	Collector-emitter saturation voltage	V _I = V _{CC} -3.6V	I _C = 400mA	—	1.2	2.4	V
			I _C = 200mA	—	0.95	1.6	
I _I	Input current	V _I = V _{CC} -3.6V	—	-290	-600	μA	
V _F	Clamping diode forward voltage	I _F = 400mA	—	1.4	2.4	V	
I _R	Clamping diode reverse current	V _R = 50V	—	0.1	100	μA	
I _{CC}	Supply current (AN only Input)	V _{CC} = 5V, V _I = V _{CC} -3.5V	—	1.9	3	mA	
h _{FE}	DC amplification factor	V _{CC} = 5V, V _{CE} = 4V, I _C = 350mA, Ta = 25°C	2000	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.

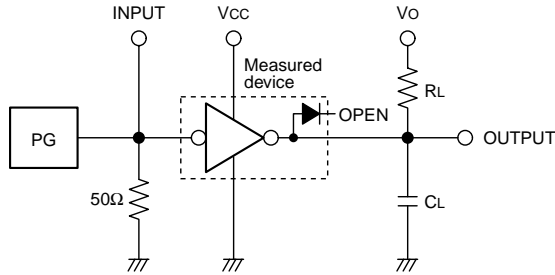
SWITCHING CHARACTERISTICS (Unless otherwise noted, Ta = 25°C)

Symbol	Parameter	Test conditions	Limits			Unit
			min	typ	max	
t _{on}	Turn-on time	C _L = 15pF (note 1)	—	120	—	ns
t _{off}	Turn-off time		—	2400	—	ns

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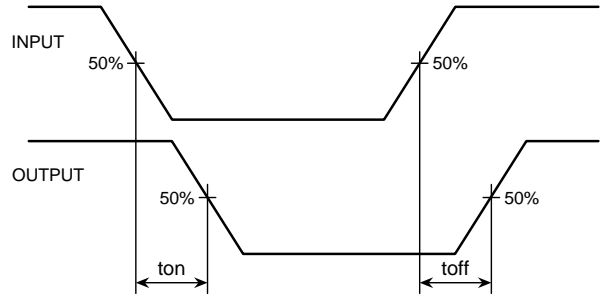
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NOTE 1 TEST CIRCUIT

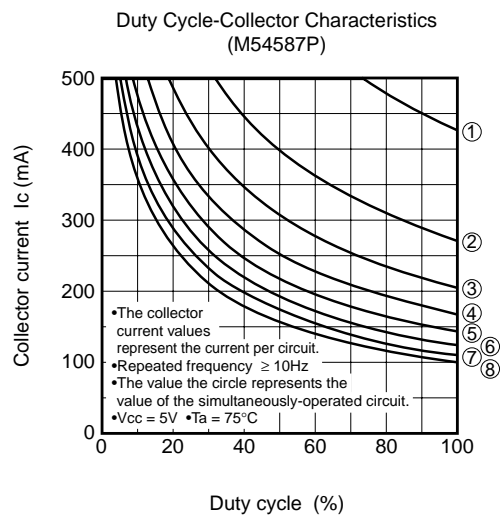
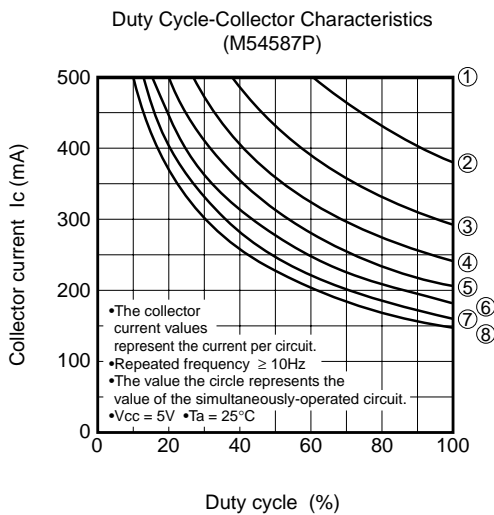
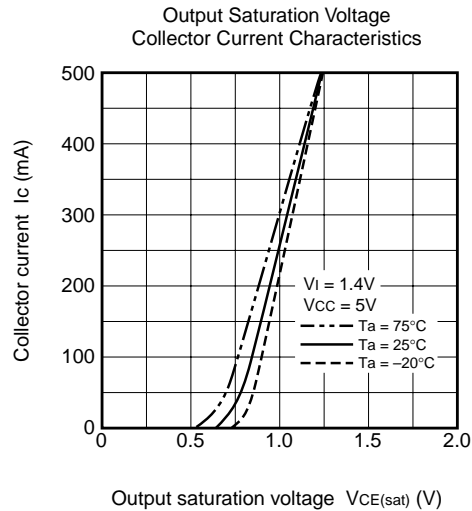
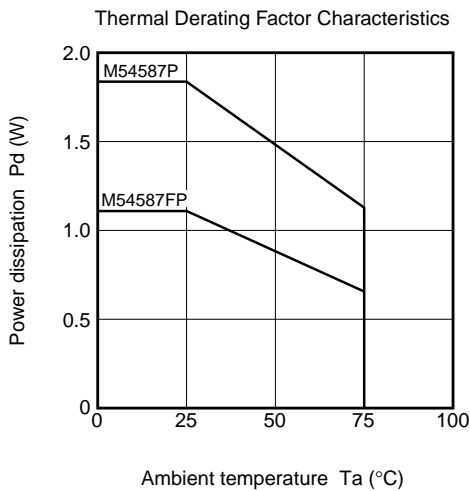


- (1) Pulse generator (PG) characteristics : PRR=1kHz, $t_w = 10\mu s$, $t_r = 6ns$, $t_f = 6ns$, $Z_o = 50\Omega$
 $V_i = 0.4 \sim 4V$
- (2) Input-output conditions : $R_L = 30\Omega$, $V_o = 10V$, $V_{cc} = 4V$
- (3) Electrostatic capacity C_L includes floating capacitance at connections and input capacitance at probes

TIMING DIAGRAM



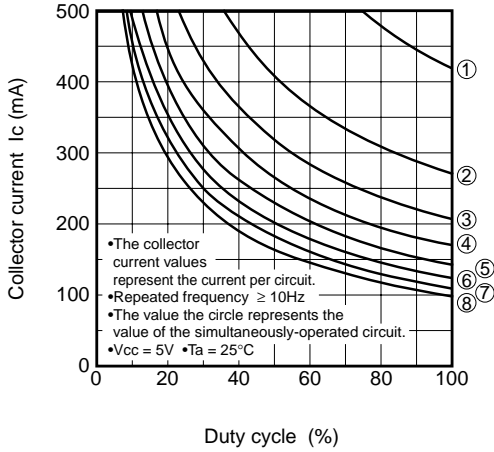
TYPICAL CHARACTERISTICS



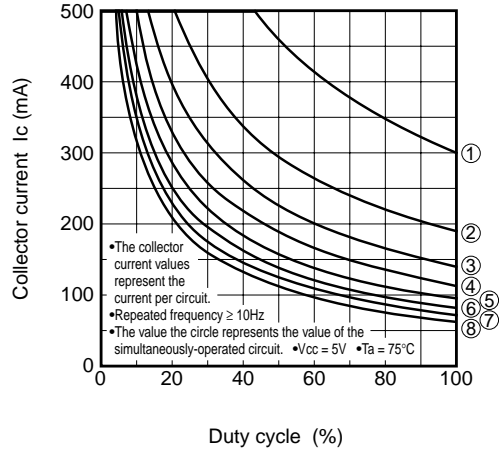
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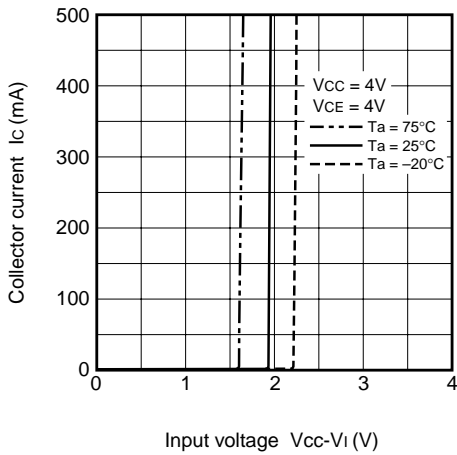
Duty Cycle-Collector Characteristics (M54587FP)



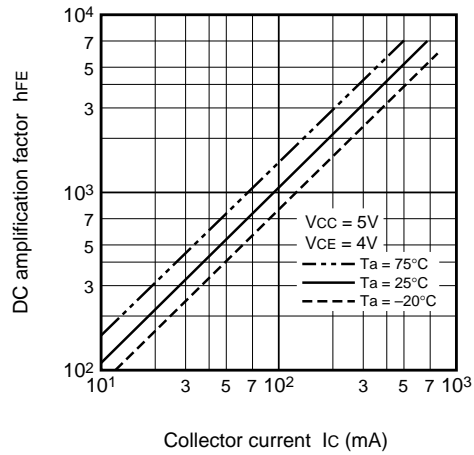
Duty Cycle-Collector Characteristics (M54587FP)



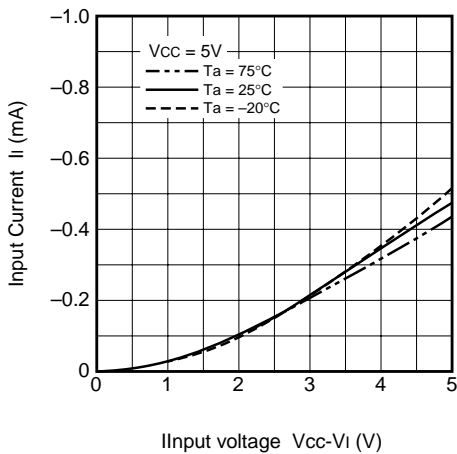
Output Current Characteristics



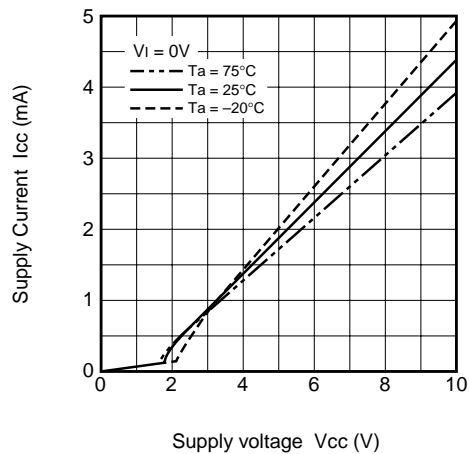
DC Amplification Factor Collector Current Characteristics



Input Characteristics



Driver Supply Characteristics



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