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 (Ta = –20 to +75°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.

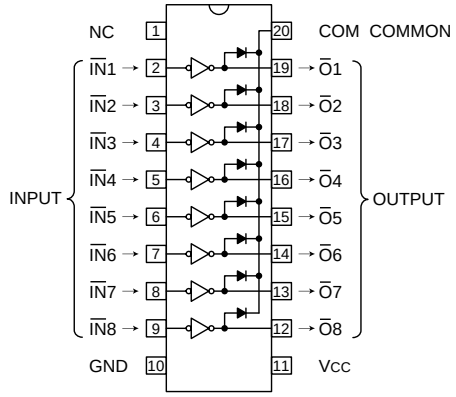
Resistance of 7kΩ and diode are provided in series between each input and PNP transistor base. The input diode is intended to prevent the flow of current from the input to the V_{CC}. Without this diode, the current flow from "H" input to the V_{CC} and the "L" input circuits is activated, in such case 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.

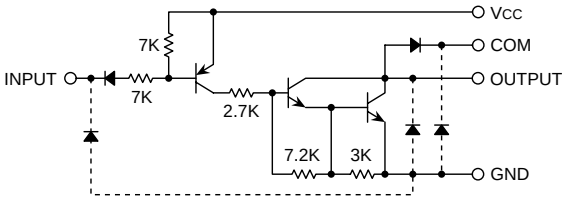
PIN CONFIGURATION



Package type 20P4(P) 20P2N-A(FP)

NC : No connection

CIRCUIT DIAGRAM (EACH CIRCUIT)



The eight circuits share the Vcc, COM and GND

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

Unit : Ω

MITSUBISHI ELECTRIC

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)

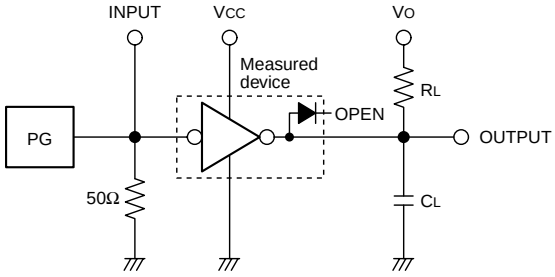
Symbol	Parameter	Test conditions		Limits			Unit
				min	typ*	max	
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	I_{CEO} = 100μA		50	—	—	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_I = V_{CC}–3.6V	I_C = 400mA	—	1.2	2.4	V
			I_C = 200mA	—	0.95	1.6	
I_I	Input current	V_I = V_{CC}–3.6V		—	–290	–600	μA
V_F	Clamping diode forward volltage	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)

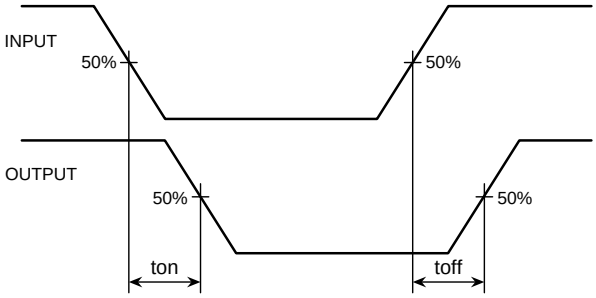
Symbol	Parameter	Test conditions	Limits			Unit
			min	typ	max	
t_{on}	Turn-on time	C_L = 15pF (note 1)	—	120	—	ns
t_{off}	Turn-off time		—	2400	—	ns

NOTE 1 TEST CIRCUIT



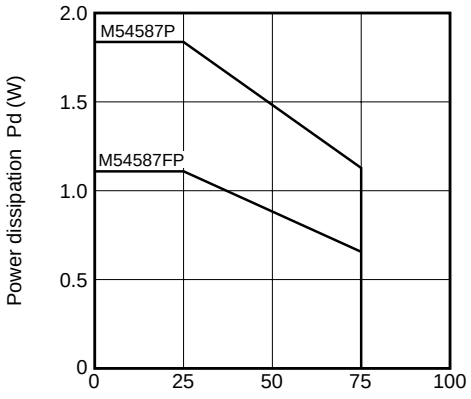
(1)Pulse generator (PG) characteristics : PRR=1kHz,
tw = 10µs, tr = 6ns, tf = 6ns, Zo = 50Ω
VI = 0.4 ~ 4V
(2)Input-output conditions : RL = 30Ω, Vo = 10V, Vcc = 4V
(3)Electrostatic capacity CL includes floating capacitance at connections and input capacitance at probes

TIMING DIAGRAM

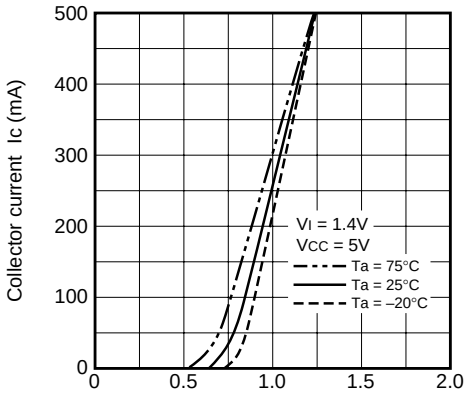


TYPICAL CHARACTERISTICS

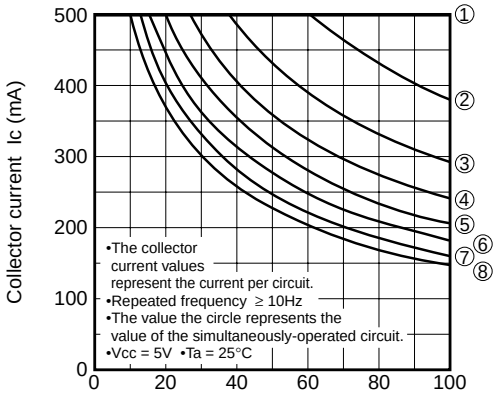
Thermal Derating Factor Characteristics



Output Saturation Voltage
Collector Current Characteristics



Duty Cycle-Collector Characteristics
(M54587P)



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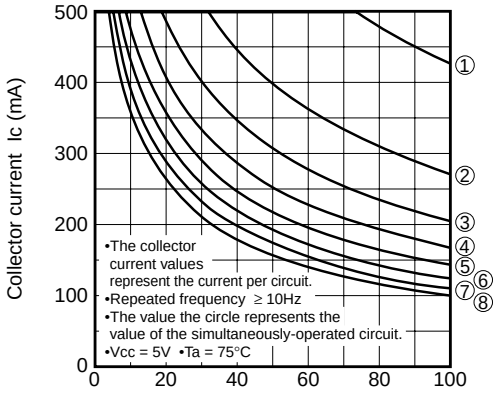
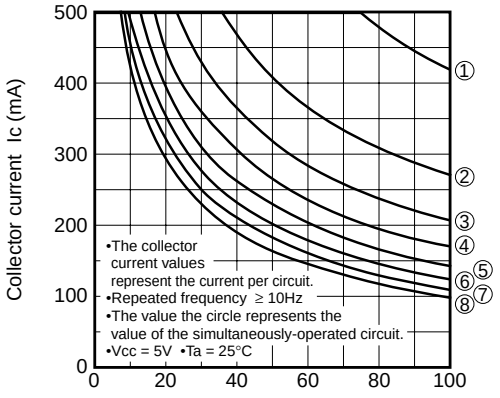
(M54587P)

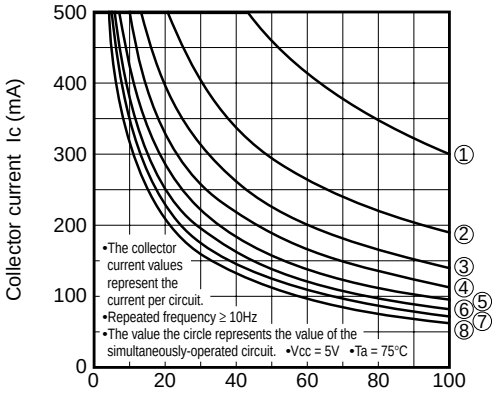


Duty Cycle-Collector Characteristics
(M54587FP)



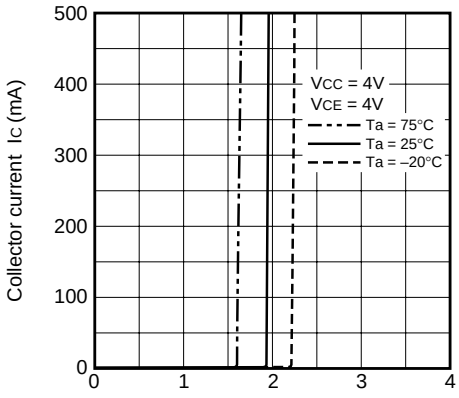
Duty cycle (%)

Duty Cycle-Collector Characteristics
(M54587FP)



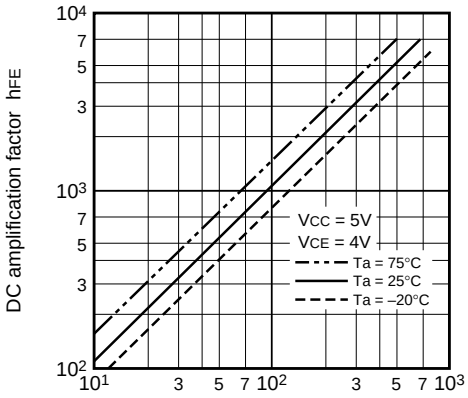
Duty cycle (%)

Output Current Characteristics



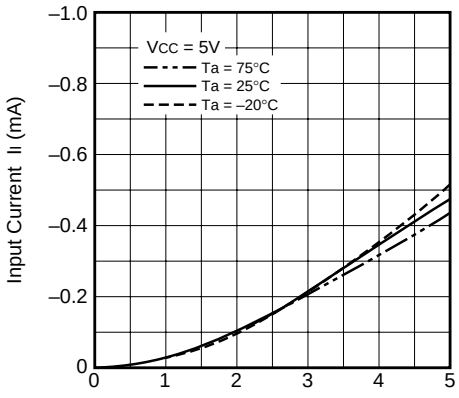
Input voltage Vcc-VI (V)

DC Amplification Factor
Collector Current Characteristics



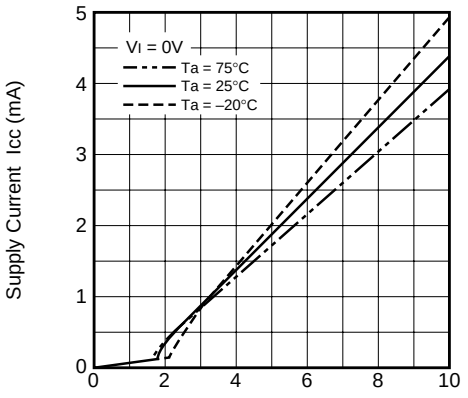
Collector current IC (mA)

Input Characteristics



IInput voltage Vcc-VI (V)

Driver Supply Characteristics



Supply voltage Vcc (V)

Clamping Diode Characteristics