SANYO SEMICONDUCTOR

NPN	PNP
TIP640	TIP645
TIP641	TIP646
TIP642	TIP647

DARLINGTON COMPLEMENTARY SILICON POWER TRANSISTORS

60-80-100 VOLTS, 10 AMPERE

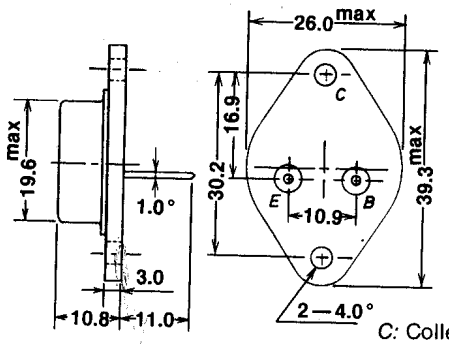
HIGH CURRENT GAIN h_{FE} = 4000 typ. @3V, 5A
LOW SATURATION VOLTAGE $V_{CE(SAT)}$ = 1.0V typ. @5A
MONOLITHIC CONSTRUCTION WITH BUILT-IN
(1) BASE-EMITTER RESISTORS AND
(2) COLLECTOR-EMITTER DIODE

ABSOLUTE MAXIMUM RATINGS @ Ta = 25°C

RATING	SYMBOL	TIP640, TIP645	TIP641, TIP646	TIP642, TIP647	UNIT
COLLECTOR-EMITTER VOLTAGE	V_{CEO}	60	80	100	Vdc
COLLECTOR-BASE VOLTAGE	V_{CB}	60	80	100	Vdc
EMITTER-BASE VOLTAGE	V_{EB}	← 5.0 →			Vdc
COLLECTOR CURRENT- CONTINUOUS PEAK	I_C	← 10 → ← 15 →			Adc
TOTAL POWER DISSIPATION @ T_C = 25°C	P_D	← 175 →			W
TOTAL POWER DISSIPATION @ T_A = 25°C	P_D	← 5 →			W
OPERATING AND STORAGE JUNCTION TEMPERATURE RANGE	T_J, T_{stg}	← − 55 to + 150 →			°C

OUTLINE DIMENSION

JEDEC: TO-3
UNIT: MM



C: Collector
E: Emitter
B: Base

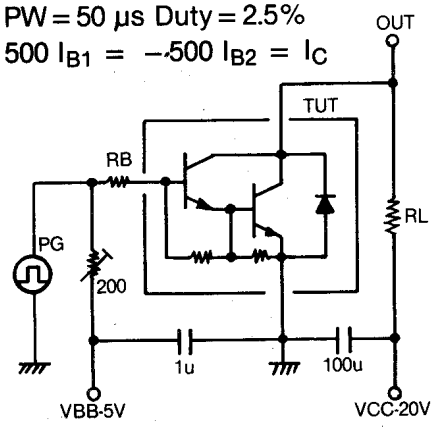
TEN FOUR LTD.
1535 Alps Road
WAYNE, NEW JERSEY 07470
(201) 696-3987 TWX 710-988-0703

ELECTRICAL CHARACTERISTICS @ Ta = 25°C

CHARACTERISTIC		SYMBOL	MIN	MAX	UNIT
COLLECTOR-EMITTER SUSTAINING VOLTAGE		$V_{CEO(SUS)}$			Vdc
(I_C = 30 mAdc, I_B = 0)	TIP640, TIP645		60	—	
	TIP641, TIP646		80	—	
	TIP642, TIP647		100	—	
COLLECTOR CUTOFF CURRENT		I_{CEO}			mAdc
(V_{CE} = 30 Vdc, I_B = 0)	TIP640, TIP645		—	2.0	
(V_{CE} = 40 Vdc, I_B = 0)	TIP641, TIP646		—	2.0	
(V_{CE} = 50 Vdc, I_B = 0)	TIP642, TIP647		—	2.0	
COLLECTOR CUTOFF CURRENT		I_{CBO}			mAdc
(V_{CB} = 60 Vdc, I_E = 0)	TIP640, TIP645		—	1.0	
(V_{CB} = 80 Vdc, I_E = 0)	TIP641, TIP646		—	1.0	
(V_{CB} = 100 Vdc, I_E = 0)	TIP642, TIP647		—	1.0	
EMITTER CUTOFF CURRENT		I_{EBO}			mAdc
(V_{BE} = 5.0 Vdc, I_C = 0)			—	2.0	mAdc
DC CURRENT GAIN		h_{FE}			—
(I_C = 5.0 Adc, V_{CE} = 4.0 Vdc)			1000	—	
(I_C = 10.0 Adc, V_{CE} = 4.0 Vdc)			500	—	
COLLECTOR-EMITTER SATURATION VOLTAGE		$V_{CE(SAT)}$			Vdc
(I_C = 5.0 Adc, I_B = 10 mAdc)			—	2.0	
(I_C = 10.0 Adc, I_B = 40 mAdc)			—	3.0	
BASE-EMITTER ON VOLTAGE		$V_{BE(ON)}$			Vdc
(I_C = 10.0 Adc, V_{CE} = 4.0 Vdc)			—	3.0	
GAIN BANDWIDTH PRODUCT		f_T	20 typ.		mHz
(I_C = 5.0 A, V_{CE} = 5.0V)					

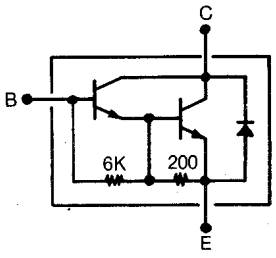
SWITCHING TIME TEST CIRCUIT

PW = 50 µs Duty = 2.5%
500 I_{B1} = −500 I_{B2} = I_C

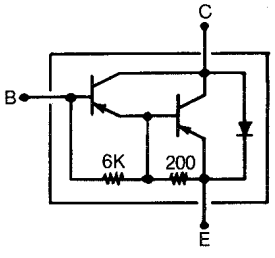


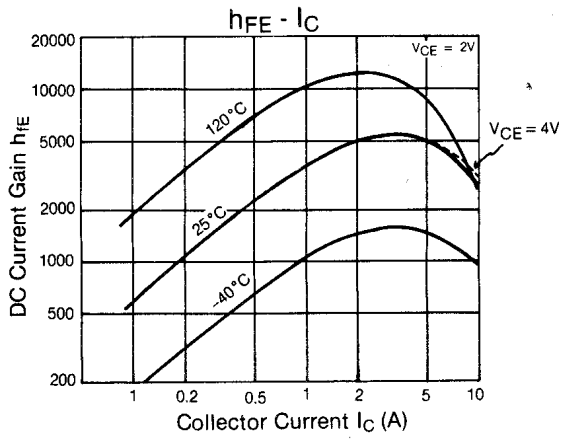
DARLINGTON SCHEMATIC

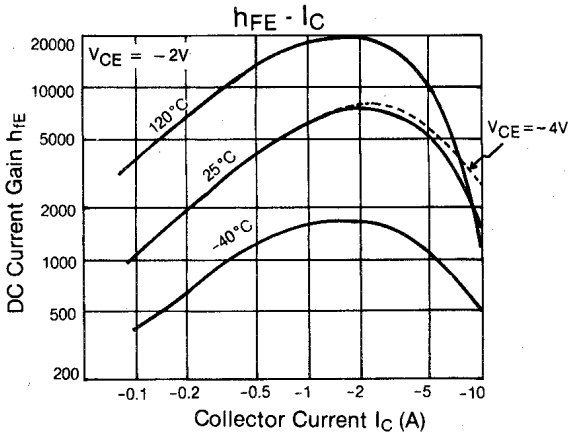
NPN
TIP640
TIP641
TIP642

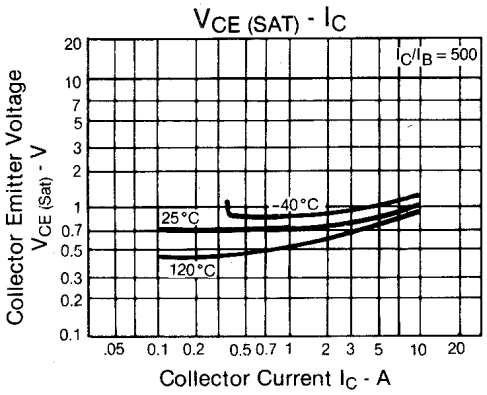


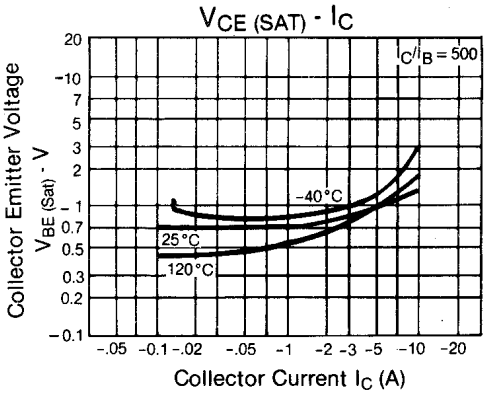
PNP
TIP645
TIP646
TIP647

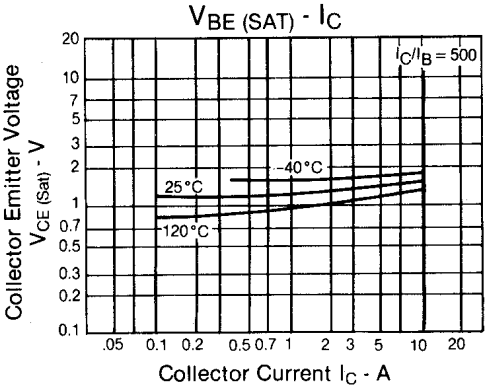


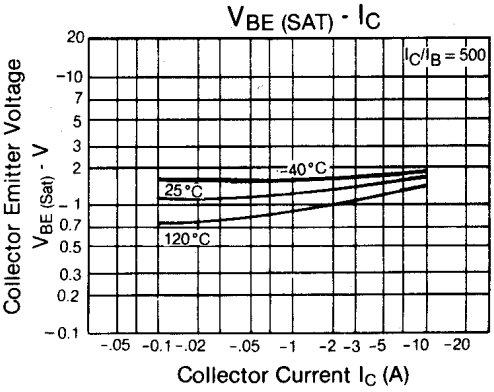

h_{FE} - I_C
V_{CE} = 2V
V_{CE} = 4V
120°C
25°C
-40°C
DC Current Gain h_{FE}
20000
10000
5000
2000
1000
500
200
1
0.2
0.5
1
2
5
10
Collector Current I_C (A)

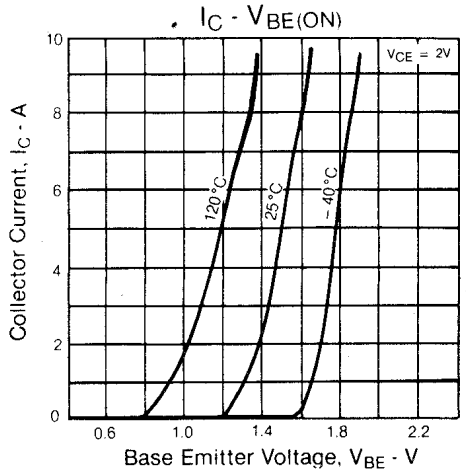

h_{FE} - I_C
V_{CE} = −2V
V_{CE} = −4V
120°C
25°C
-40°C
DC Current Gain h_{FE}
20000
10000
5000
2000
1000
500
200
-0.1
-0.2
-0.5
-1
-2
-5
-10
Collector Current I_C (A)

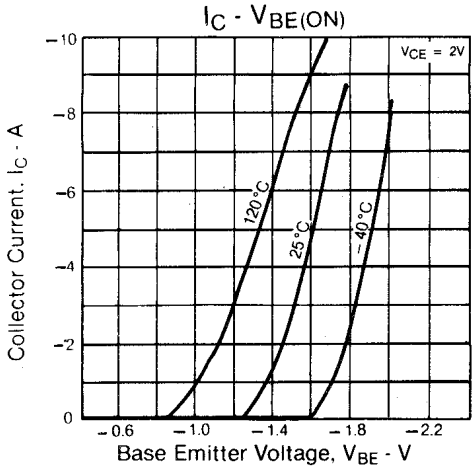

$V_{CE\ (SAT)}$ - I_C
I_C/I_B = 500
25°C
-40°C
120°C
Collector Emitter Voltage
$V_{CE\ (Sat)}$ - V
20
10
7
5
3
2
1
0.7
0.5
0.3
0.2
0.1
.05
0.1
0.2
0.5
0.7
1
2
3
5
10
20
Collector Current I_C - A


$V_{CE\ (SAT)}$ - I_C
I_C/I_B = 500
-40°C
25°C
120°C
Collector Emitter Voltage
$V_{BE\ (Sat)}$ - V
20
-10
7
5
3
2
-1
0.7
0.5
0.3
0.2
-0.1
-.05
-0.1
-.02
-.05
-1
-2
-3
-5
-10
-20
Collector Current I_C (A)


$V_{BE\ (SAT)}$ - I_C
I_C/I_B = 500
25°C
-40°C
120°C
Collector Emitter Voltage
$V_{CE\ (Sat)}$ - V
20
10
7
5
3
2
1
0.7
0.5
0.3
0.2
0.1
.05
0.1
0.2
0.5
0.7
1
2
3
5
10
20
Collector Current I_C - A


$V_{BE\ (SAT)}$ - I_C
I_C/I_B = 500
-40°C
25°C
120°C
Collector Emitter Voltage
$V_{BE\ (Sat)}$ - V
20
-10
7
5
3
2
-1
0.7
0.5
0.3
0.2
-0.1
-.05
-0.1
-.02
-.05
-1
-2
-3
-5
-10
-20
Collector Current I_C (A)

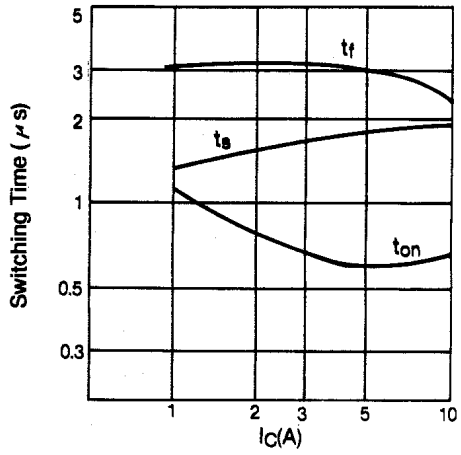

I_C - $V_{BE(ON)}$
V_{CE} = 2V
120°C
25°C
-40°C
Collector Current, I_C - A
10
8
6
4
2
0
0.6
1.0
1.4
1.8
2.2
Base Emitter Voltage, V_{BE} - V


I_C - $V_{BE(ON)}$
V_{CE} = 2V
120°C
25°C
-40°C
Collector Current, I_C - A
-10
-8
-6
-4
-2
0
-0.6
-1.0
-1.4
-1.8
-2.2
Base Emitter Voltage, V_{BE} - V

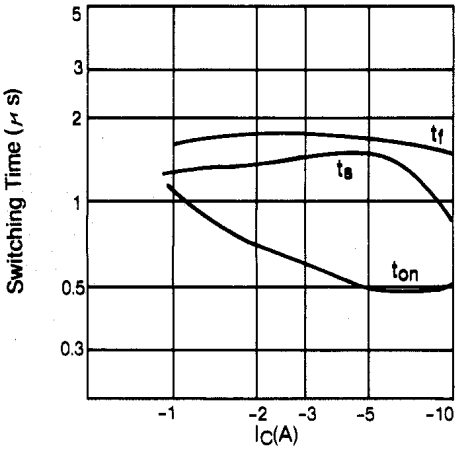
NPN
TIP 640, TIP 641, TIP 642

PNP
TIP 645, TIP 646, TIP 647

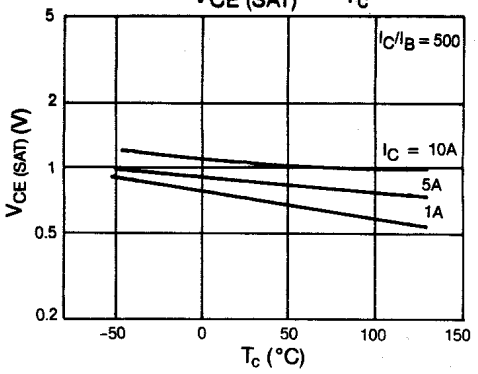
t_{on}, t_s, t_f – I_C



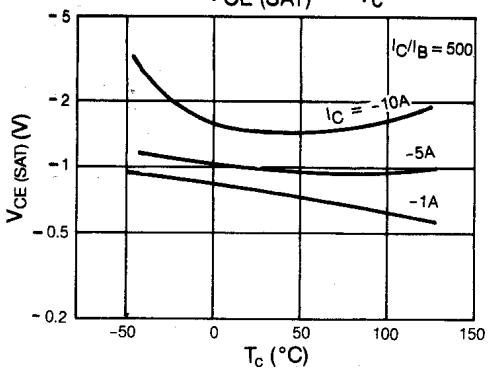
t_{on}, t_s, t_f – I_C



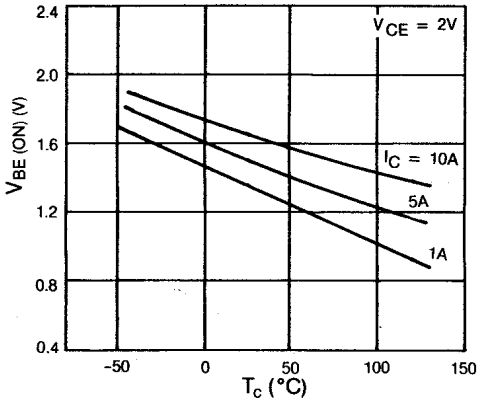
$V_{CE\ (SAT)}$ – T_C



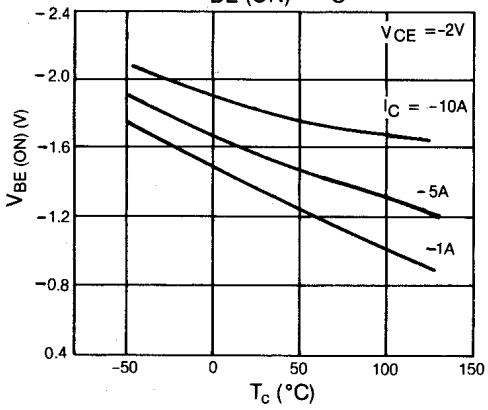
$V_{CE\ (SAT)}$ – T_C



$V_{BE\ (ON)}$ - T_C



$V_{BE\ (ON)}$ - T_C



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