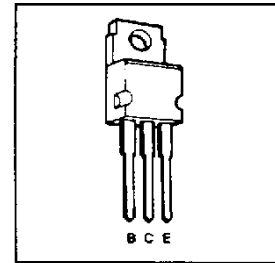


TIP120, TIP121, TIP122
NPN DARLINGTON - CONNECTED
SILICON POWER TRANSISTORS

SLPS054 Revised March 1990

- Designed for Complementary Use with TIP125, TIP126 and TIP127
- 65 W at 25°C Case Temperature
- 5 A Continuous Collector Current
- Min h_{FE} of 1000 at 3 V, 3 A
- Designed for Ignition Systems, Motor Control and Solenoid Driver Applications



PACKAGE: TO220

Absolute Maximum Ratings at 25°C Case Temperature (unless otherwise noted)

		TIP120	TIP121	TIP122
V_{CE0}	Collector - base voltage ($I_E = 0$)	60 V	80 V	100 V
V_{CE0}	Collector - emitter voltage ($I_B = 0$)	60 V	80 V	100 V
V_{EB0}	Base - emitter voltage		5 V	
I_C	Continuous collector current		5 A	
I_{CM}	Peak collector current (Note 1)		8 A	
I_B	Continuous base current		0.1 A	
P_{TOT}	Continuous device dissipation at (or below) 25°C case temperature (Note 2)		65 W	
P_{TOT}	Continuous device dissipation at (or below) 25°C free - air temperature (Note 3)		2 W	
$I_C^2 L/2$	Unclamped inductive load energy (Note 4)		50 mJ	
T_J & T_{STG}	Operating junction and storage temperature range	-65°C to +150°C		
T_L	Lead temperature 3.2 mm from case for 10 seconds	260°C		

NOTES: 1 This value applies for $t_w \leq 0.3$ ms, duty cycle $\leq 10\%$
 2 Derate linearly to 150°C case temperature at the rate of 0.52 W/°C
 3 Derate linearly to 150°C free - air - temperature at the rate of 16 mW/°C
 4 This rating is based on the capability of the transistors to operate safely in a circuit of: $L = 20$ mH, $R_{ESR} = 100 \Omega$, $V_{CE} = 0$ V, $R_{\theta} = 0.1 \Omega$, $V_{CC} = 20$ V Energy = $I_C^2 L/2$

Electrical Characteristics at 25°C Case Temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$	Collector - emitter sustaining voltage $I_C = 30$ mA $I_B = 0$ (Note 5)	TIP120 60 TIP121 80 TIP122 100			V
I_{CEO}	Collector - emitter cut - off current $V_{CE} = 30$ V $I_B = 0$ TIP120 $V_{CE} = 40$ V $I_B = 0$ TIP121 $V_{CE} = 50$ V $I_B = 0$ TIP122			0.5 0.5 0.5	mA
I_{CBO}	Collector cut - off current $V_{CB} = 60$ V $I_E = 0$ TIP120 $V_{CB} = 80$ V $I_E = 0$ TIP121 $V_{CB} = 100$ V $I_E = 0$ TIP122			0.2 0.2 0.2	mA
I_{EBO}	Emitter cut - off current $V_{EB} = 5$ V $I_C = 0$			2	mA
h_{FE}	Forward current transfer ratio $V_{CE} = 3$ V $I_C = 0.5$ A (Notes 5 & 6) $V_{CE} = 3$ V $I_C = 3$ A	1000 1000			
$V_{CE(sat)}$	Collector - emitter saturation voltage $I_B = 4$ mA $I_C = 3$ A (Notes 5 & 6) $I_B = 20$ mA $I_C = 5$ A			2 4	V
V_{BE}	Base - emitter voltage $V_{CE} = 3$ V $I_C = 3$ A (Notes 5 & 6)			2.5	V
V_F	Parallel diode forward voltage $I_F = -I_C = 5$ A $I_B = 0$ (Notes 5 & 6)			3.5	V

TIP120, TIP121, TIP122 NPN DARLINGTON - CONNECTED SILICON POWER TRANSISTORS

Thermal Characteristics

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction - to - case thermal resistance			1.92	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Junction - to - free - air thermal resistance			62.5	$^{\circ}\text{C}/\text{W}$

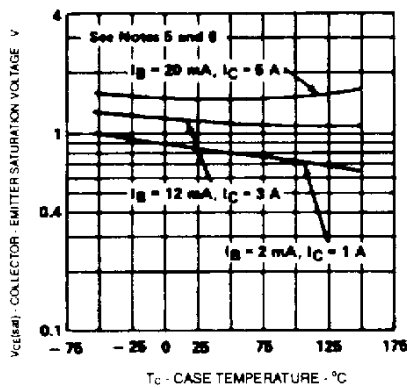
Resistive - Load - Switching Characteristics at 25 $^{\circ}\text{C}$ Case Temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS [†]			MIN	TYP	MAX	UNIT
t_{on}	Turn on time	$I_C = 3 \text{ A}$	$I_{B(on)} = 12 \text{ mA}$ $I_{B(off)} = -12 \text{ mA}$		15		μs
t_{off}	Turn off time	$V_{BE(off)} = -5 \text{ V}$	$R_L = 10 \Omega$		8.5		μs

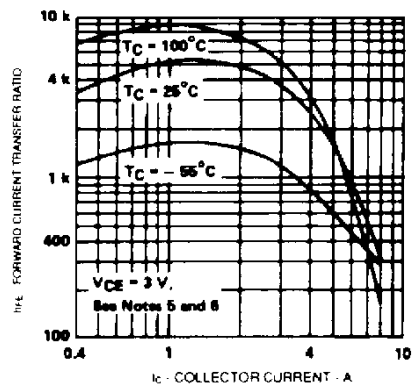
[†] Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.
 NOTES: 5. These parameters must be measured using pulse techniques, $t_w = 300 \mu\text{s}$, duty cycle $\leq 2\%$.
 6. These parameters must be measured using voltage sensing contacts separate from the current-carrying contacts.

TYPICAL CHARACTERISTICS

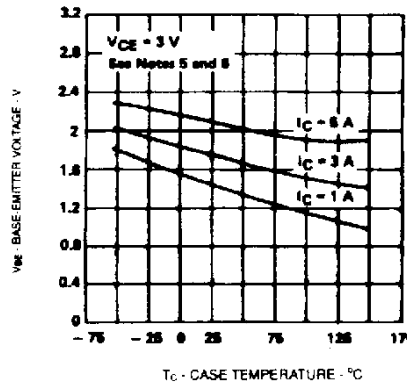
COLLECTOR - EMITTER SATURATION VOLTAGE
vs
CASE TEMPERATURE



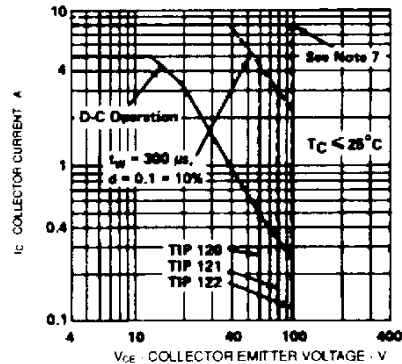
FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT



BASE-EMITTER VOLTAGE
vs
CASE TEMPERATURE



MAXIMUM FORWARD - BIAS
SAFE OPERATING AREA



NOTE: 7 This combination of maximum voltage and current may be achieved only when switching from saturation to cutoff with a damped inductive load.



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