Plastic Medium-Power Complementary Silicon Transistors

Designed for general-purpose amplifier and low-speed switching applications.

Features

• High DC Current Gain -

$$h_{FE} = 2500 \text{ (Typ)} @ I_{C}$$

= 4.0 Adc

• Collector-Emitter Sustaining Voltage - @ 100 mAdc

• Low Collector-Emitter Saturation Voltage -

$$V_{CE(sat)} = 2.0 \text{ Vdc (Max)} @ I_C = 3.0 \text{ Adc}$$

= 4.0 Vdc (Max) @ $I_C = 5.0 \text{ Adc}$

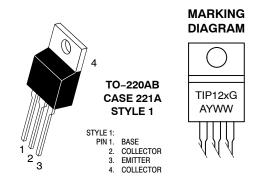
- Monolithic Construction with Built-In Base-Emitter Shunt Resistors
- Pb-Free Packages are Available*



ON Semiconductor®

www.onsemi.com

DARLINGTON 5 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 60-80-100 VOLTS, 65 WATTS



TIP12x = Device Code x = 0, 1, 2, 5, 6, or 7 A = Assembly Location Y = Year WW = Work Week G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

^{*}For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MAXIMUM RATINGS

Rating	Symbol	TIP120, TIP125	TIP121, TIP126	TIP122, TIP127	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		5.0 8.0		Adc
Base Current	I _B		120		mAdc
Total Power Dissipation @ T _C = 25°C Derate above 25°C	P _D	65 0.52		W W/°C	
Total Power Dissipation @ T _A = 25°C Derate above 25°C	P _D	2.0 0.016		W W/°C	
Unclamped Inductive Load Energy (Note 1)	E	50		mJ	
Operating and Storage Junction, Temperature Range	T _J , T _{stg}	-65 to +150			°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{ heta JC}$	1.92	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{ heta JA}$	62.5	°C/W

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected. 1. I_C = 1 A, L = 100 mH, P.R.F. = 10 Hz, V_{CC} = 20 V, R_{BE} = 100 Ω

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS			1	•	•
Collector-Emitter Sustaining Voltage (Note 2) $(I_C = 100 \text{ mAdc}, I_B = 0)$	TIP120, TIP125 TIP121, TIP126 TIP122, TIP127	V _{CEO(sus)}	60 80 100	- - -	Vdc
Collector Cutoff Current $(V_{CE} = 30 \text{ Vdc}, I_B = 0)$ $(V_{CE} = 40 \text{ Vdc}, I_B = 0)$ $(V_{CE} = 50 \text{ Vdc}, I_B = 0)$	TIP120, TIP125 TIP121, TIP126 TIP122, TIP127	ICEO	- - -	0.5 0.5 0.5	mAdc
Collector Cutoff Current $(V_{CB} = 60 \text{ Vdc}, I_E = 0)$ $(V_{CB} = 80 \text{ Vdc}, I_E = 0)$ $(V_{CB} = 100 \text{ Vdc}, I_E = 0)$	TIP120, TIP125 TIP121, TIP126 TIP122, TIP127	I _{CBO}	- - -	0.2 0.2 0.2	mAdc
Emitter Cutoff Current (V _{BE} = 5.0 Vdc, I _C = 0)		I _{EBO}	-	2.0	mAdc
ON CHARACTERISTICS (Note 2)					
DC Current Gain ($I_C = 0.5$ Adc, $V_{CE} = 3.0$ Vdc) ($I_C = 3.0$ Adc, $V_{CE} = 3.0$ Vdc)		h _{FE}	1000 1000	- -	-
Collector–Emitter Saturation Voltage ($I_C = 3.0$ Adc, $I_B = 12$ mAdc) ($I_C = 5.0$ Adc, $I_B = 20$ mAdc)		V _{CE(sat)}	_ 	2.0 4.0	Vdc
Base–Emitter On Voltage ($I_C = 3.0 \text{ Adc}$, $V_{CE} = 3.0 \text{ Vdc}$)		V _{BE(on)}	-	2.5	Vdc
DYNAMIC CHARACTERISTICS					
Small-Signal Current Gain (I _C = 3.0 Adc, V _{CE} = 4.0 Vdc, f	= 1.0 MHz)	h _{fe}	4.0	_	_
1 1 (0B) L)	TIP125, TIP126, TIP127 TIP120, TIP121, TIP122	C _{ob}	- -	300 200	pF

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions. 2. Pulse Test: Pulse Width \leq 300 μ s, Duty Cycle \leq 2%

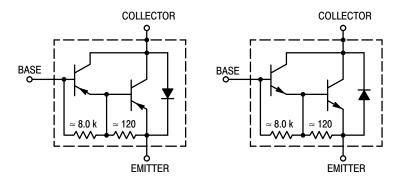


Figure 1. Darlington Circuit Schematic

ORDERING INFORMATION

Device	Package	Shipping		
TIP120	TO-220	50 Units / Rail		
TIP120G	TO-220 (Pb-Free)	50 Units / Rail		
TIP121	TO-220	50 Units / Rail		
TIP121G	TO-220 (Pb-Free)	50 Units / Rail		
TIP122	TO-220	50 Units / Rail		
TIP122G	TO-220 (Pb-Free)	50 Units / Rail		
TIP125	TO-220	50 Units / Rail		
TIP125G	TO-220 (Pb-Free)	50 Units / Rail		
TIP126	TO-220	50 Units / Rail		
TIP126G	TO-220 (Pb-Free)	50 Units / Rail		
TIP127	TO-220	50 Units / Rail		
TIP127G	TO-220 (Pb-Free)	50 Units / Rail		

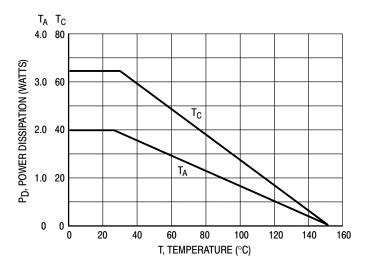


Figure 2. Power Derating

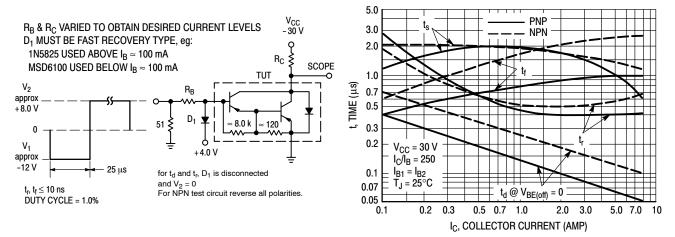


Figure 3. Switching Times Test Circuit

Figure 4. Switching Times

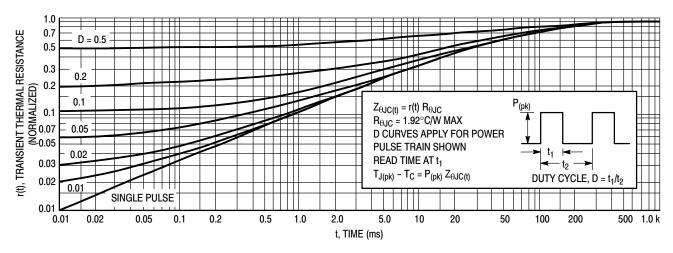


Figure 5. Thermal Response

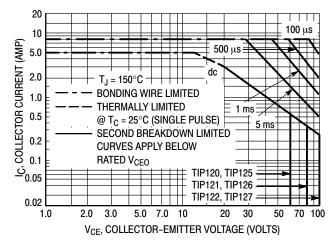


Figure 6. Active-Region Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation, i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 6 is based on $T_{J(pk)} = 150^{\circ}C$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150^{\circ}C$. $T_{J(pk)}$ may be calculated from the data in Figure 5. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown

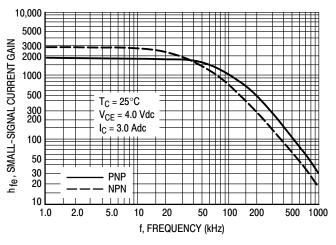


Figure 7. Small-Signal Current Gain

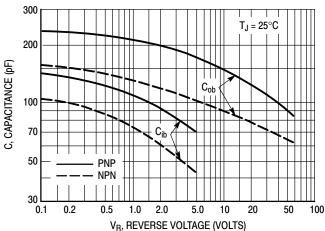


Figure 8. Capacitance

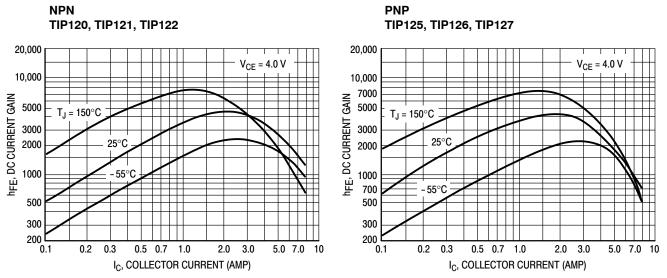


Figure 9. DC Current Gain

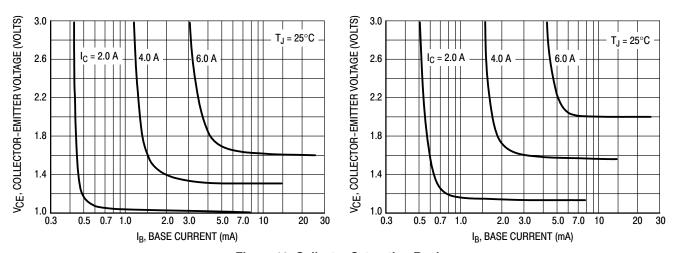


Figure 10. Collector Saturation Region

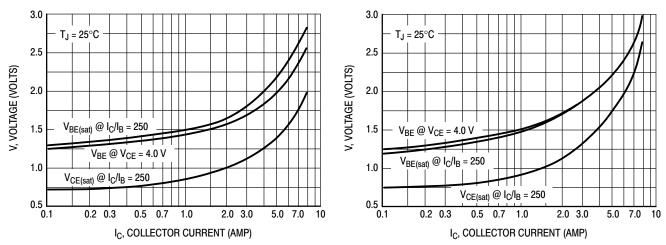


Figure 11. "On" Voltages

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