Complementary Power Darlingtons

For Isolated Package Applications

COMPLEMENTARY SILICON POWER DARLINGTONS 5.0 A, 100 V, 30 W

Designed for general−purpose amplifiers and switching applications, where the mounting surface of the device is required to be electrically isolated from the heatsink or chassis.

Features

- Electrically Similar to the Popular TIP122 and TIP127
- 100 $V_{CEO(sus)}$
- 5.0 A Rated Collector Current
- No Isolating Washers Required
- Reduced System Cost
- High DC Current Gain − 2000 (Min) @ I_C = 3 Adc
- UL Recognized, File #E69369, to 3500 V_{RMS} Isolation
- Pb−Free Packages are Available*

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector−Emitter Voltage	V_{CEO}	100	Vdc
Collector−Base Voltage	V_{CB}	100	Vdc
Emitter−Base Voltage	V_{EB}	5	Vdc
RMS Isolation Voltage (Note 1) Test No. 1 Per Figure 14 (for 1 sec, R.H. < 30%, Test No. 2 Per Figure 15 T_A = 25°C) Test No. 3 Per Figure 16	V_{ISOL}	4500 3500 1500	V_{RMS}
Collector Current − Continuous Peak	I_C	5 8	Adc
Base Current	I_B	0.12	Adc
Total Power Dissipation (Note 2) @ T_C = 25°C Derate above 25°C	P_D	 30 0.24	 W W/°C
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	2 0.016	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +150	I_C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	62.5	°C/W
Thermal Resistance, Junction−to−Case (Note 2)	$R_{\theta JC}$	4.1	°C/W
Lead Temperature for Soldering Purpose	T_L	260	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Proper strike and creepage distance must be provided.
2. Measurement made with thermocouple contacting the bottom insulated mounting surface (in a location beneath the die), the device mounted on a heatsink with thermal grease and a mounting torque of ≥ 6 in. lbs.

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Sustaining Voltage (Note 3) (I_C = 100 mAdc, I_B = 0)		$V_{CEO(sus)}$	100	–	Vdc
Collector Cutoff Current (V_{CE} = 50 Vdc, I_B = 0)		I_{CEO}	–	10	μAdc
Collector Cutoff Current (V_{CB} = 100 Vdc, I_E = 0)		I_{CBO}	–	10	μAdc
Emitter Cutoff Current (V_{BE} = 5 Vdc, I_C = 0)		I_{EBO}	–	2	mAdc
ON CHARACTERISTICS (Note 3)					
DC Current Gain (I_C = 0.5 Adc, V_{CE} = 3 Vdc) (I_C = 3 Adc, V_{CE} = 3 Vdc)		h_{FE}	1000 2000	– –	–
Collector−Emitter Saturation Voltage (I_C = 3 Adc, I_B = 12 mAdc) (I_C = 5 Adc, I_B = 20 mAdc)		$V_{CE(sat)}$	– –	2 3.5	Vdc
Base−Emitter On Voltage (I_C = 3 Adc, V_{CE} = 3 Vdc)		$V_{BE(on)}$	–	2.5	Vdc
DYNAMIC CHARACTERISTICS					
Small−Signal Current Gain (I_C = 3 Adc, V_{CE} = 4 Vdc, f = 1 MHz)		h_{fe}	4	–	–
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	MJF127 MJF122	C_{ob}	– –	300 200	pF

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

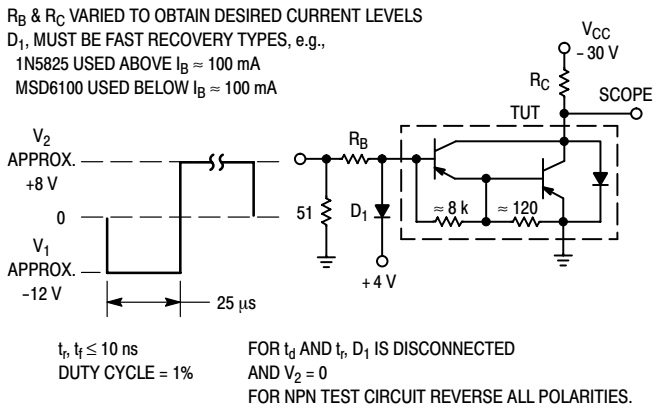


Figure 1. Switching Times Test Circuit

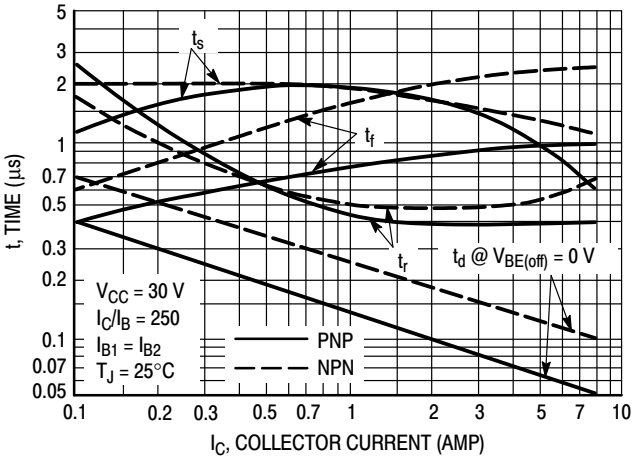


Figure 2. Typical Switching Times

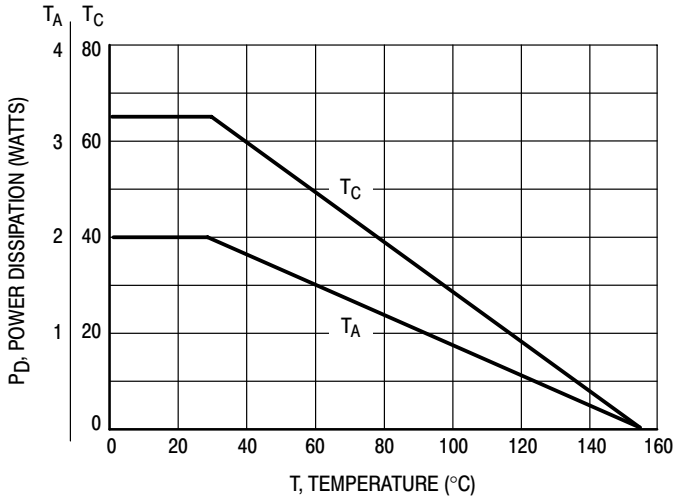


Figure 3. Maximum Power Derating

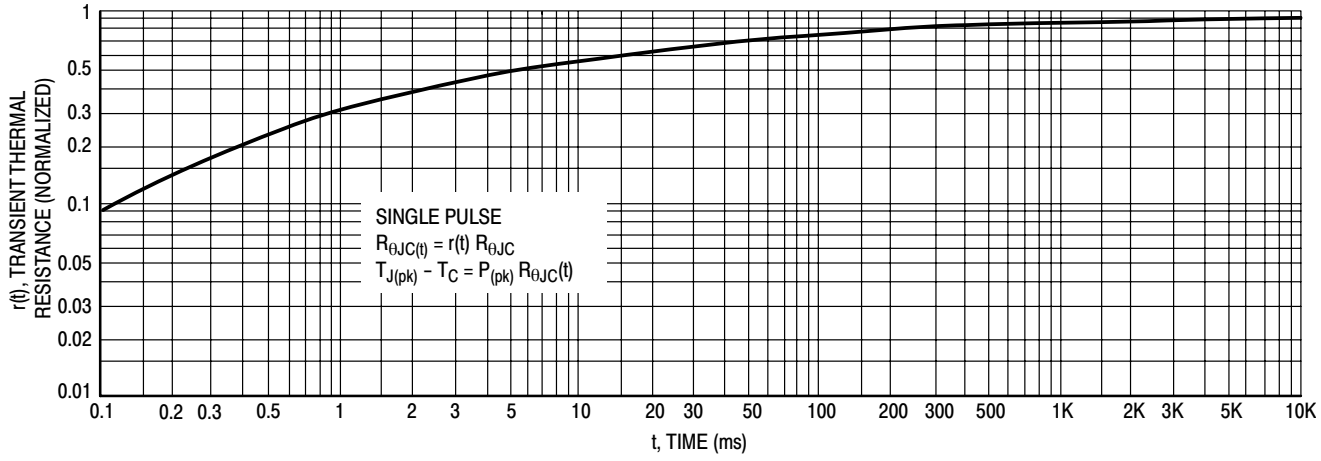


Figure 4. Thermal Response

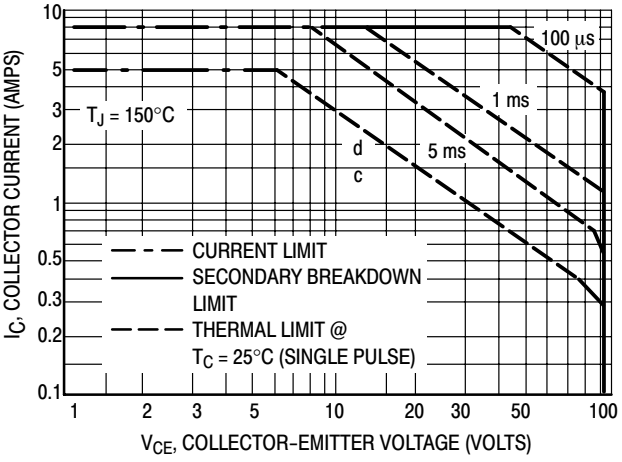


Figure 5. Maximum Forward Bias Safe Operating Area

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 5 is based on $T_{J(pk)} = 150°C$; T_C is variable depending on conditions. Secondary breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150°C$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown.

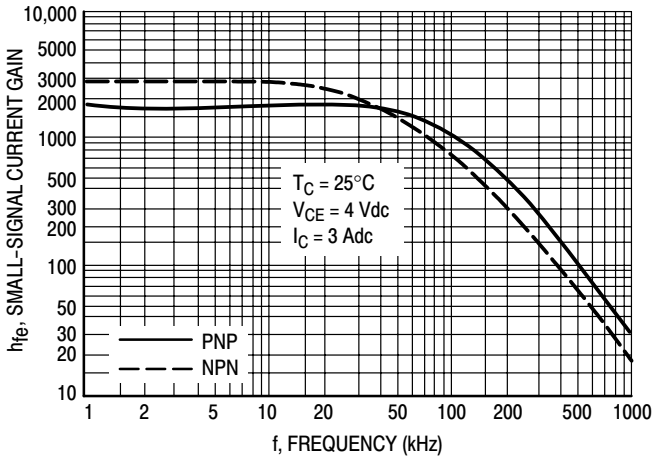


Figure 6. Typical Small−Signal Current Gain

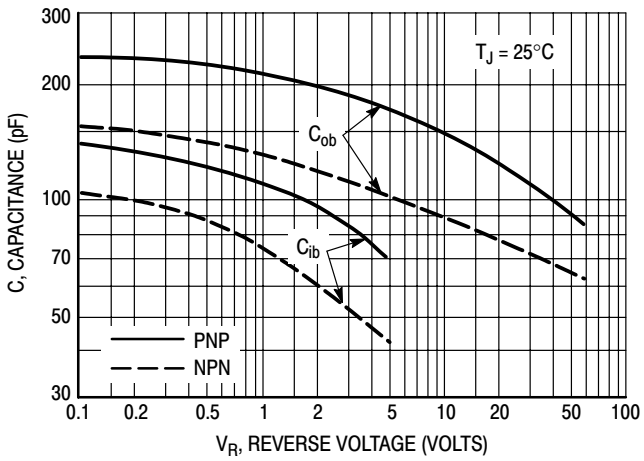
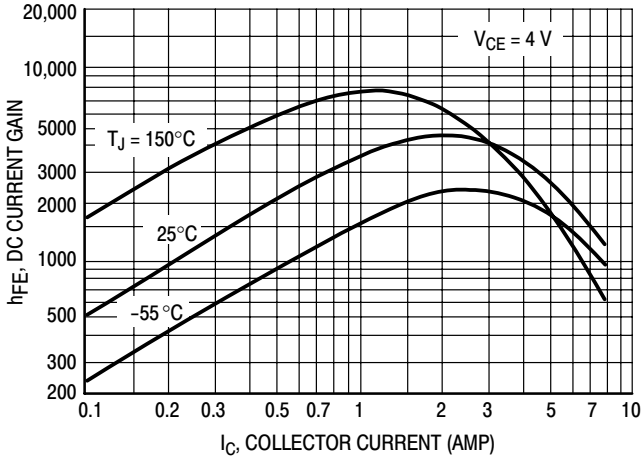


Figure 7. Typical Capacitance

NPN
MJF122



PNP
MJF127

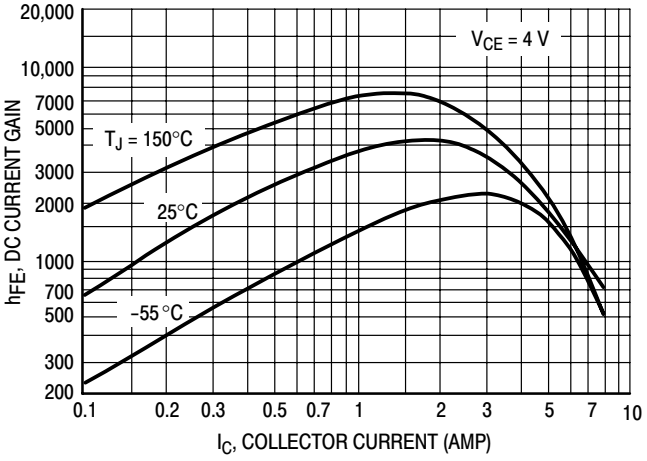
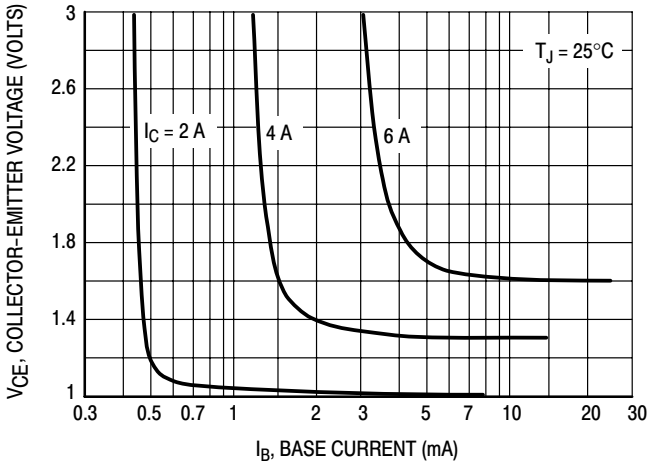


Figure 8. Typical DC Current Gain



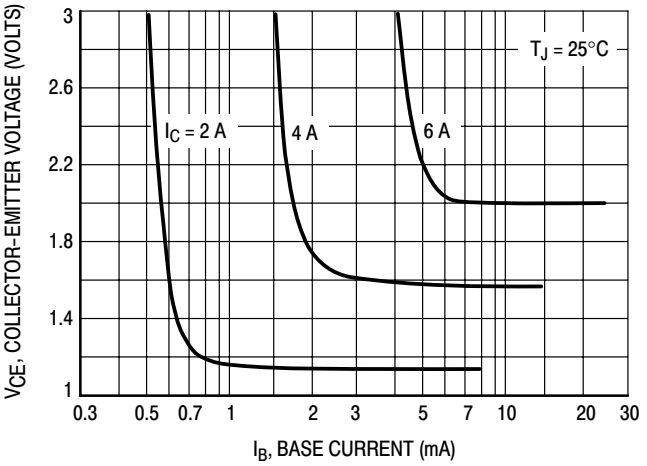
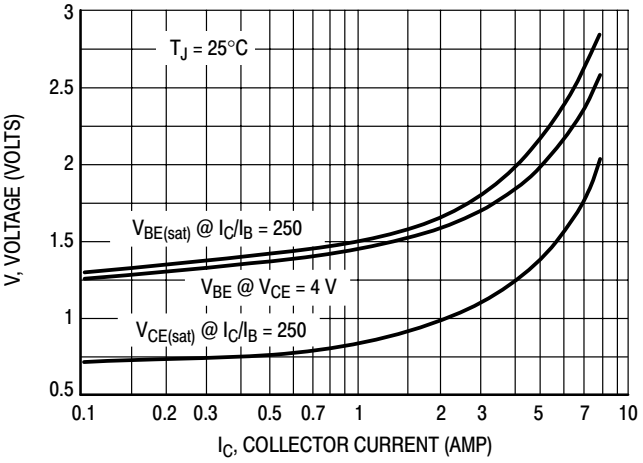


Figure 9. Typical Collector Saturation Region

NPN
MJF122



PNP
MJF127

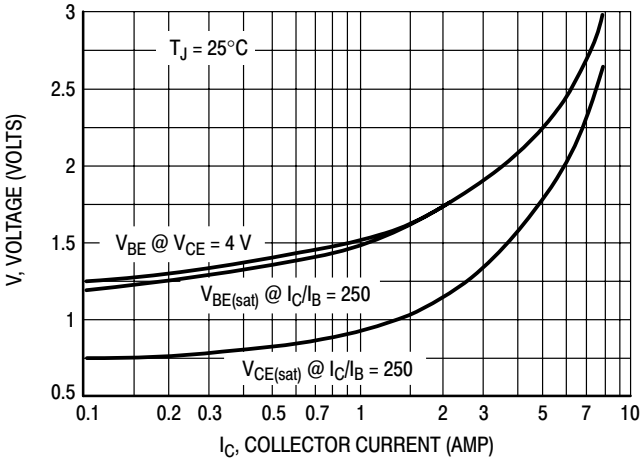
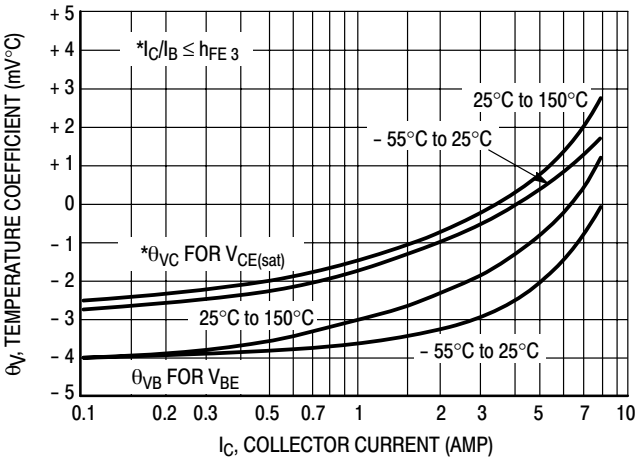


Figure 10. Typical “On” Voltages



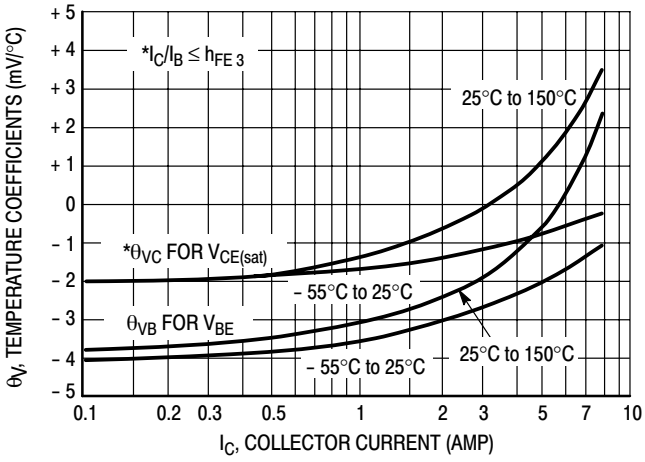
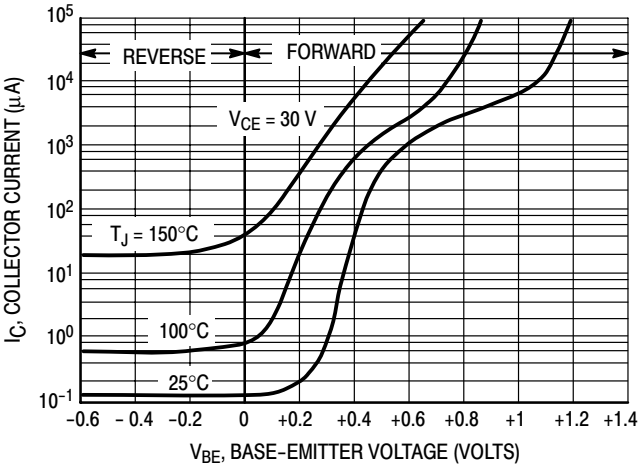


Figure 11. Typical Temperature Coefficients



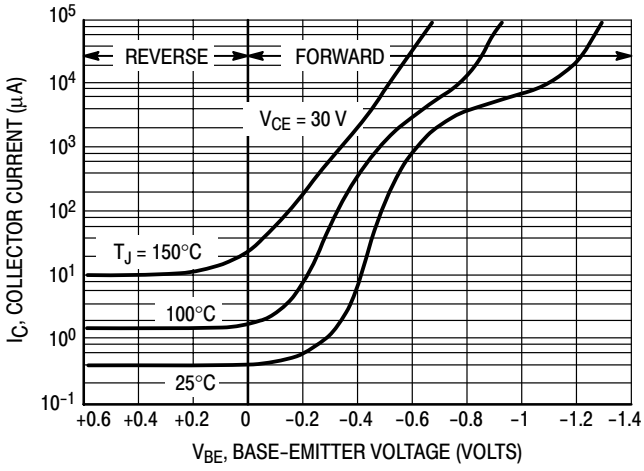


Figure 12. Typical Collector Cut–Off Region