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MJD128T4G (PNP) Complementary Darlington Power Transistor

DPAK For Surface Mount Applications

Designed for general purpose amplifier and low speed switching applications.

Features

- Monolithic Construction With Built−in Base−Emitter Shunt Resistors
- High DC Current Gain: h_{FE} = 2500 (Typ) @ I_C = 4.0 Adc
- Epoxy Meets UL 94 V−0 @ 0.125 in.
- ESD Ratings:
  - Human Body Model, 3B > 8000 V
  - Machine Model, C > 400 V

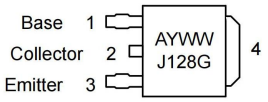
- These are Pb−Free Devices*

SILICON
POWER TRANSISTOR
8 AMPERES
120 VOLTS, 20 WATTS



DPAK
CASE 369C
STYLE 1

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
J128 = Device Code
G = Pb−Free Package

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector−Emitter Voltage	V_{CEO}	120	Vdc
Collector−Base Voltage	V_{CB}	120	Vdc
Emitter−Base Voltage	V_{EB}	5	Vdc
Collector Current Continuous Peak	I_C	 8 16	Adc
Base Current	I_B	120	mAdc
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	 20 0.16	W W/°C
Total Power Dissipation* @ T_A = 25°C Derate above 25°C	P_D	 1.75 0.014	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +150	°C

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.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	6.25	°C/W
Thermal Resistance, Junction−to−Ambient (Note 1)	$R_{\theta JA}$	71.4	°C/W

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector−Emitter Sustaining Voltage (I_C = 30 mAdc, I_B = 0)	$V_{CEO(sus)}$	120	–	Vdc
Collector Cutoff Current (V_{CE} = 120 Vdc, I_B = 0)	I_{CEO}	–	5	mA
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				
DC Current Gain (I_C = 4 Adc, V_{CE} = 4 Vdc) (I_C = 8 Adc, V_{CE} = 4 Vdc)	h_{FE}	1000 100	12,000 –	–
Collector−Emitter Saturation Voltage (I_C = 4 Adc, I_B = 16 mAdc) (I_C = 8 Adc, I_B = 80 mAdc)	$V_{CE(sat)}$	– –	2 4	Vdc
Base−Emitter Saturation Voltage (1) (I_C = 8 Adc, I_B = 80 mAdc)	$V_{BE(sat)}$	–	4.5	Vdc
Base−Emitter On Voltage (I_C = 4 Adc, V_{CE} = 4 Vdc)	$V_{BE(on)}$	–	2.8	Vdc
DYNAMIC CHARACTERISTICS				
Current−Gain−Bandwidth Product (I_C = 3 Adc, V_{CE} = 4 Vdc, f = 1 MHz)	$\|h_{fe}\|$	4	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	C_{ob}	–	300	pF
Small−Signal Current Gain (I_C = 3 Adc, V_{CE} = 4 Vdc, f = 1 kHz)	h_{fe}	300	–	–

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

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.

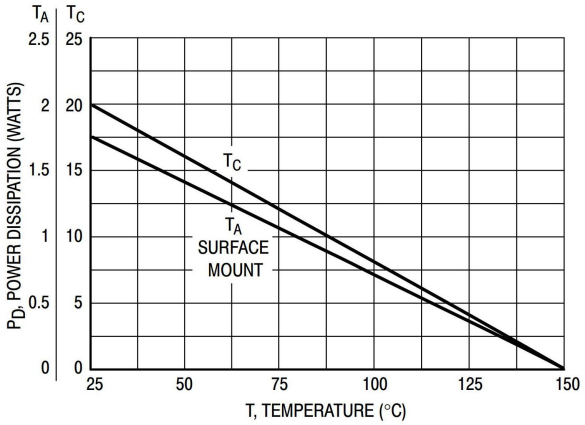

Figure 1. Power Derating

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TYPICAL ELECTRICAL CHARACTERISTICS

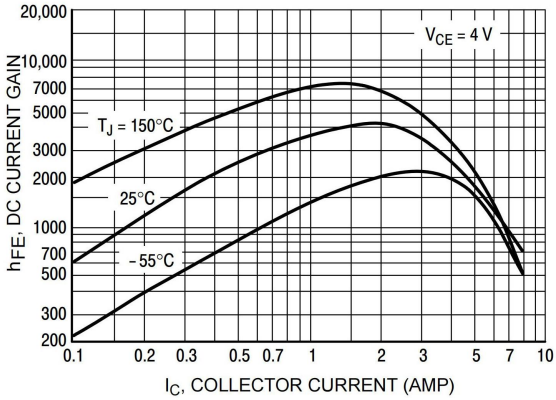

Figure 2. DC Current Gain

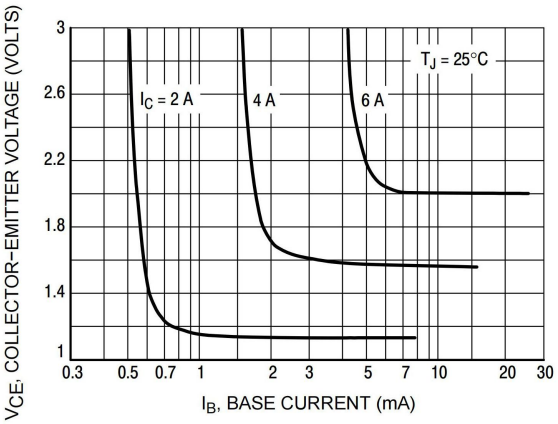

Figure 3. Collector Saturation Region

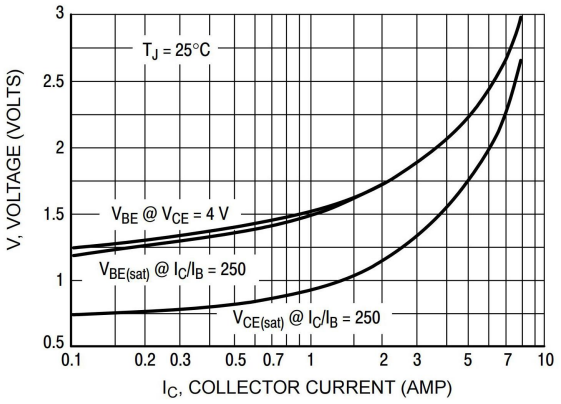

Figure 4. "On" Voltages

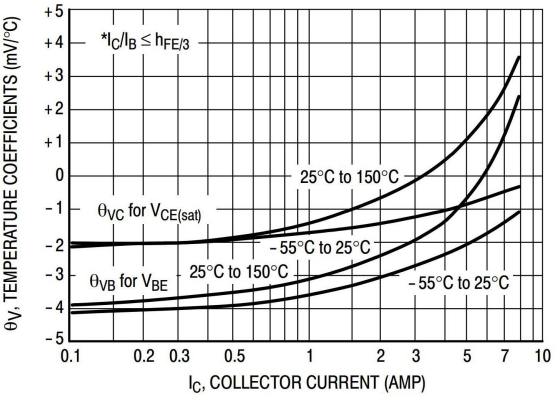

Figure 5. Temperature Coefficients

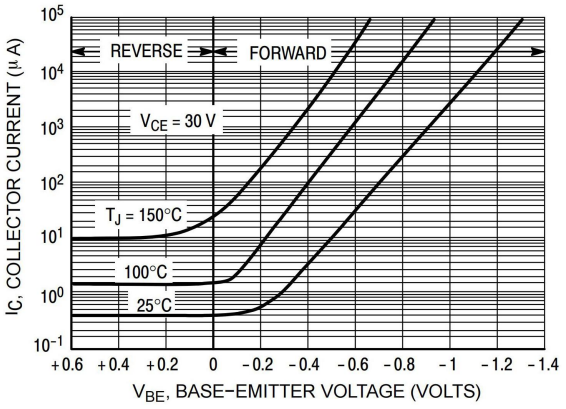

Figure 6. Collector Cut−Off Region

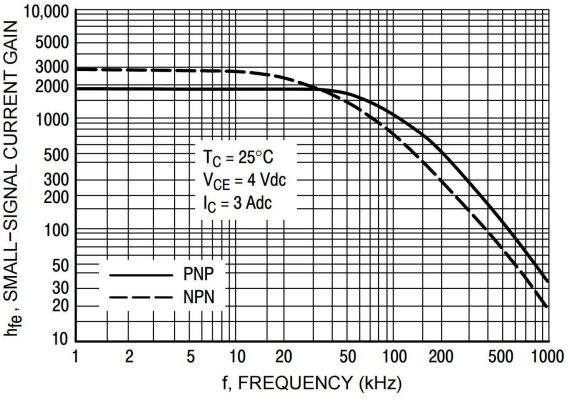

Figure 7. Small−Signal Current Gain

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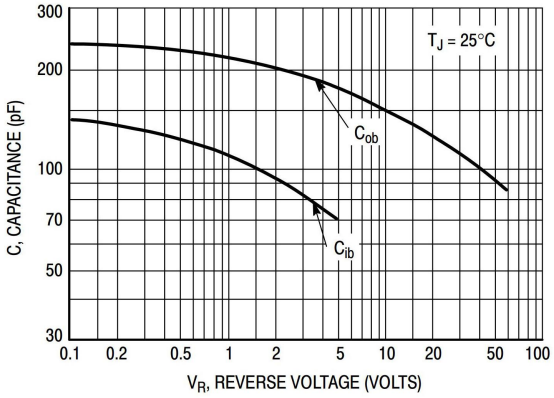

Figure 8. Capacitance

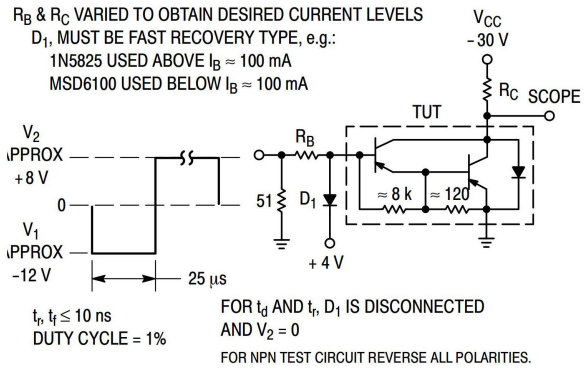

Figure 9. Switching Times Test Circuit

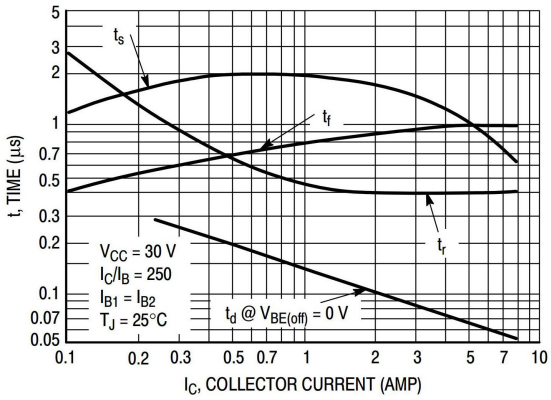

Figure 10. Switching Times

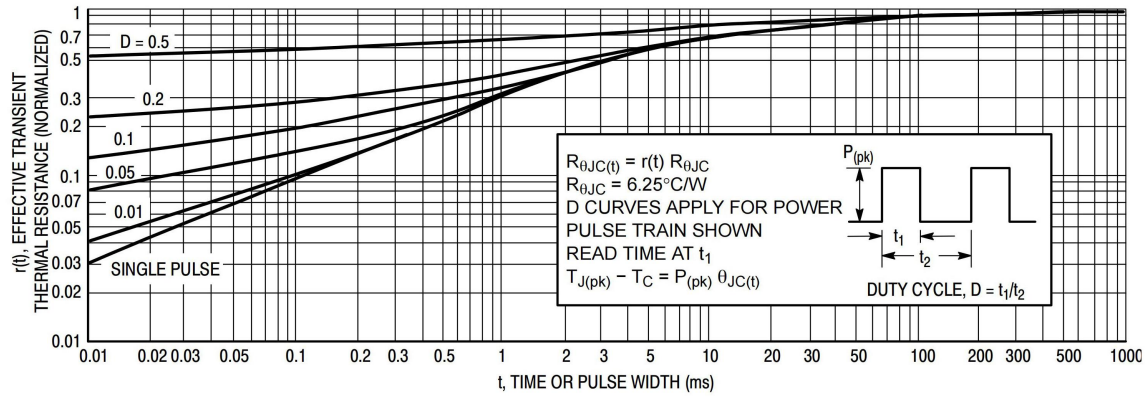

Figure 11. Thermal Response

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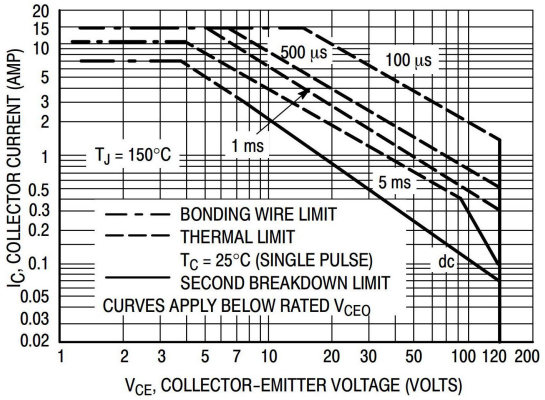

Figure 12. Maximum Forward Bias Safe Operating REA

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 12 is based on $T_{J(pk)}$ = 150°C; T_C is variable depending on conditions. Second 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 11. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

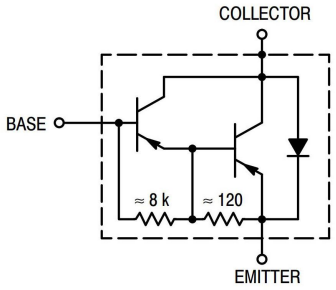

Figure 13. Darlington Schematic

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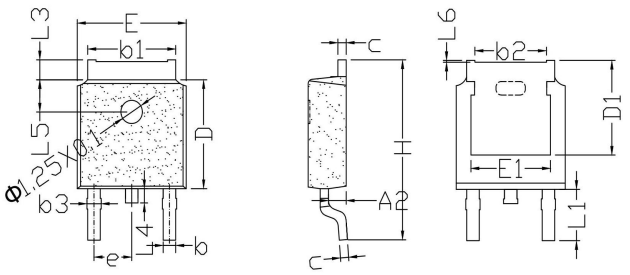
Ordering Information

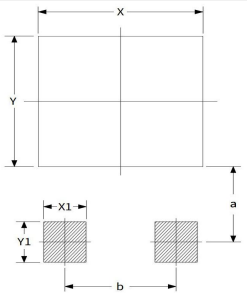
PACKAGE	PACKAGE CODE	UNIT WEIGHT(g)	REEL(pcs)	BOX(pcs)	CARTON(pcs)	DELIVERY MODE
TO-252	R3	0.305	2500	5000	25000	13''

Package Outline Dimensions (TO-252)



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A2	0.90	1.10	0.035	0.043
b	0.66	0.86	0.026	0.034
b1	5.10	5.46	0.201	0.215
b2	4.27	4.37	0.168	0.172
b3	0.78	0.90	0.031	0.035
c	0.45	0.55	0.018	0.022
D	5.90	6.30	0.232	0.248
D1	5.35 REF.		0.211REF.	
E	6.30	6.70	0.248	0.264
E1	4.83 REF.		0.190 REF.	
e	2.18	2.38	0.086	0.094
H	9.80	10.4	0.386	0.409
L1	2.70	3.10	0.106	0.122
L3	0.80	1.20	0.031	0.047
L4	0.60	1.00	0.024	0.039
L5	1.8 REF.		0.071 REF.	
L6	-	0.12	-	0.005

Suggested Pad Layout



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
a	3.70	-	0.146	-
b	4.37	-	0.172	-
X	-	5.80	-	0.228
X1	-	1.20	-	0.047
Y	-	5.85	-	0.230
Y1	-	2.00	-	0.079