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MJD112T4G (NPN),
MJD117T4G (PNP)
Complementary Darlington Power Transistors

DPAK For Surface Mount Applications

SILICON
POWER TRANSISTORS
2 AMPERES
100 VOLTS, 20 WATTS

Designed for general purpose power and switching such as output or driver stages in applications such as switching regulators, converters, and power amplifiers.



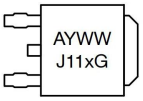
DPAK
CASE 369C

Features

- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves ("−1" Suffix)
- Electrically Similar to Popular TIP31 and TIP32 Series

- These Devices are Pb−Free and are RoHS Compliant*

MARKING DIAGRAMS



DPA

A = Assembly Location
Y = Year
WW = Work Week
x = 2 or 7
G = Pb−Free Package

MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Collector−Emitter Voltage	V_{CEO}	100	Vdc
Collector−Base Voltage	V_{CB}	100	Vdc
Emitter−Base Voltage	V_{EB}	5	Vdc
Collector Current Continuous Peak	I_C	 2 4	Adc
Base Current	I_B	50	mAdc
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	 20 0.16	W W/°C
Total Power Dissipation (Note1) @ 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 Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

1. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage (Note 2) (I_C = 30 mAdc, I_B = 0)	$V_{CEO(sus)}$	100	–	Vdc
Collector Cutoff Current (V_{CE} = 50 Vdc, I_B = 0)	I_{CEO}	–	20	μAdc
Collector Cutoff Current (V_{CB} = 100 Vdc, I_E = 0)	I_{CBO}	–	20	μAdc
Emitter Cutoff Current (V_{BE} = 5 Vdc, I_C = 0)	I_{EBO}	–	2	mAdc
Collector–Cutoff Current (V_{CB} = 80 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 = 0.5 Adc, V_{CE} = 3 Vdc) (I_C = 2 Adc, V_{CE} = 3 Vdc) (I_C = 4 Adc, V_{CE} = 3 Vdc)	h_{FE}	 500 1000 200	 – 12,000 –	–
Collector–Emitter Saturation Voltage (I_C = 2 Adc, I_B = 8 mAdc) (I_C = 4 Adc, I_B = 40 mAdc)	$V_{CE(sat)}$	 – –	 2 3	Vdc
Base–Emitter Saturation Voltage (I_C = 4 Adc, I_B = 40 mAdc)	$V_{BE(sat)}$	–	4	Vdc
Base–Emitter On Voltage (I_C = 2 Adc, V_{CE} = 3 Vdc)	$V_{BE(on)}$	–	2.8	Vdc
DYNAMIC CHARACTERISTICS				
Current–Gain – Bandwidth Product (I_C = 0.75 Adc, V_{CE} = 10 Vdc, f = 1 MHz)	f_T	25	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 Mhz) MJD117T4G MJD112T4G	C_{ob}	 – –	 200 100	pF

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
*These ratings are applicable when surface mounted on the minimum pad sizes recommended.

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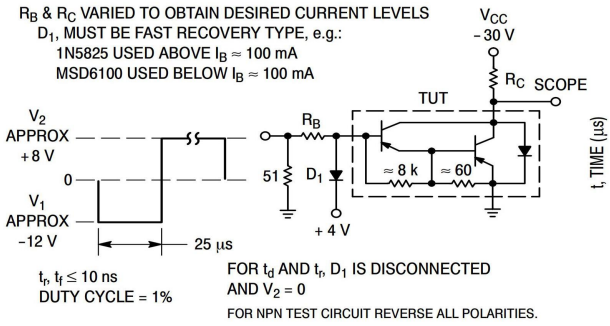

Figure 1. Switching Times Test Circuit

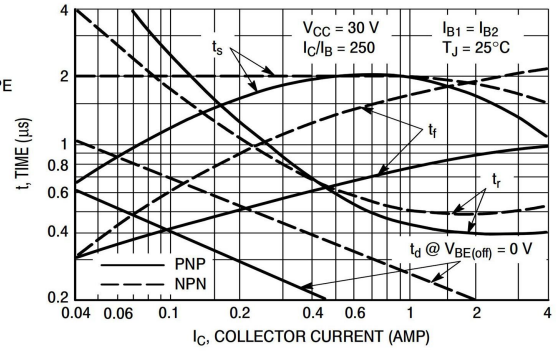

Figure 2. Switching Times

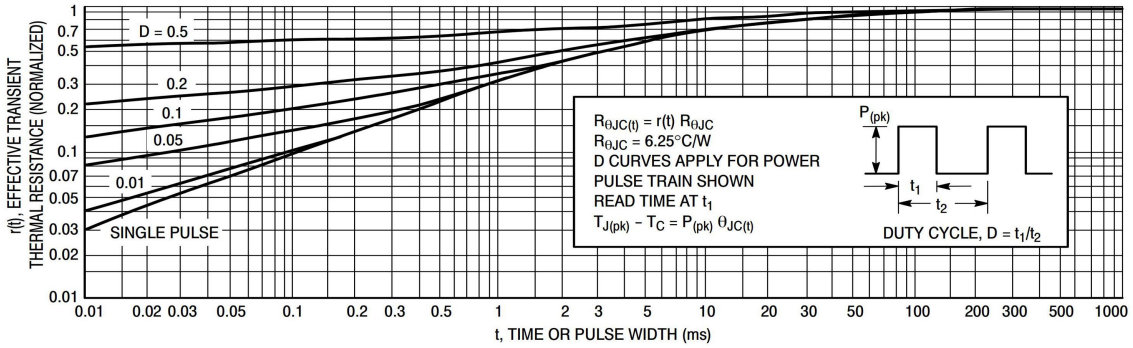

Figure 3. Thermal Response

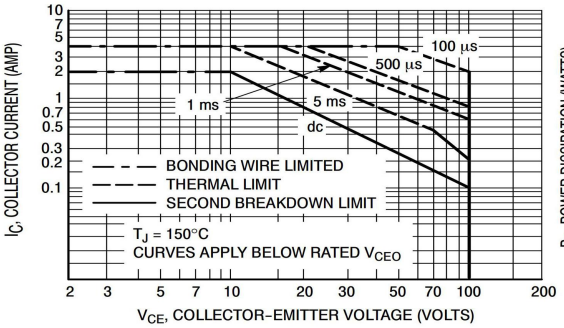

Figure 4. Maximum Rated Forward Biased Safe Operating Area

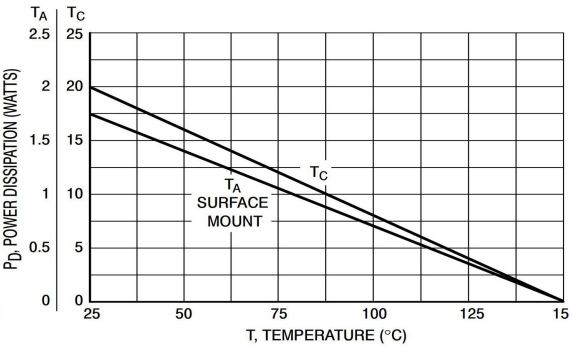

Figure 5. Power Derating

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 Figures 5 and 6 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 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

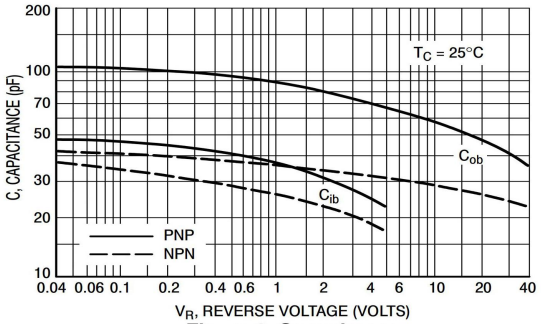

Figure 6. Capacitance

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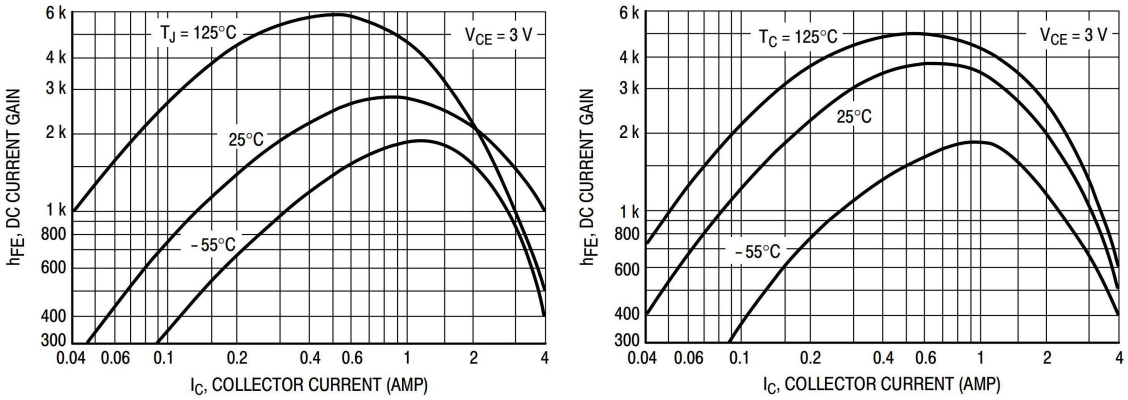

Figure 7. DC Current Gain

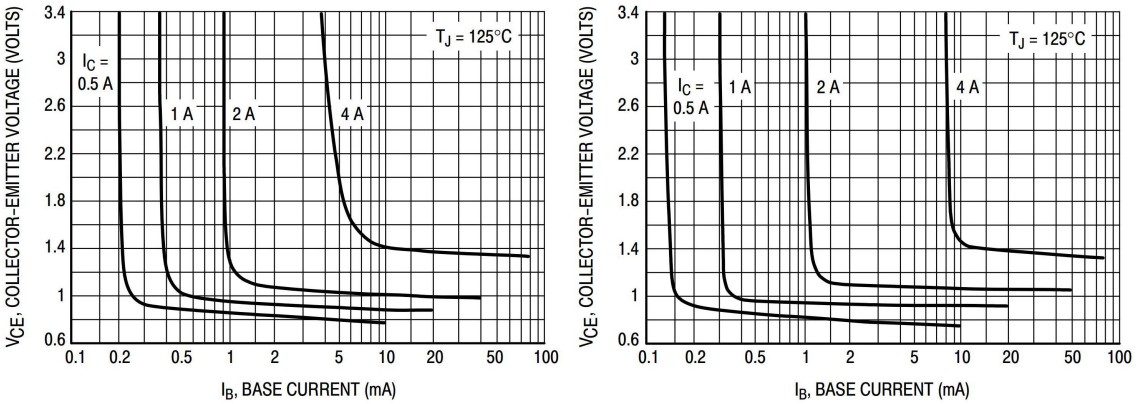

Figure 8. Collector Saturation Region

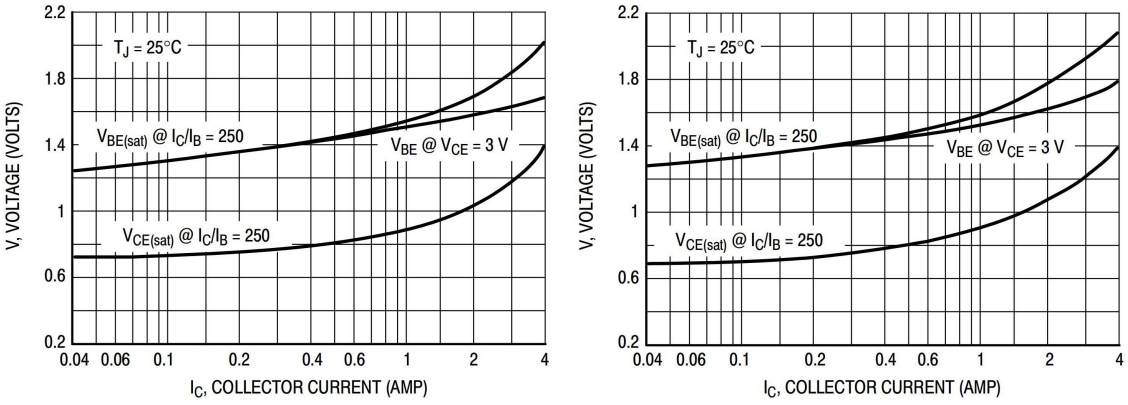

Figure 9. "On Voltages

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NPN MJD112 PNP MJD117

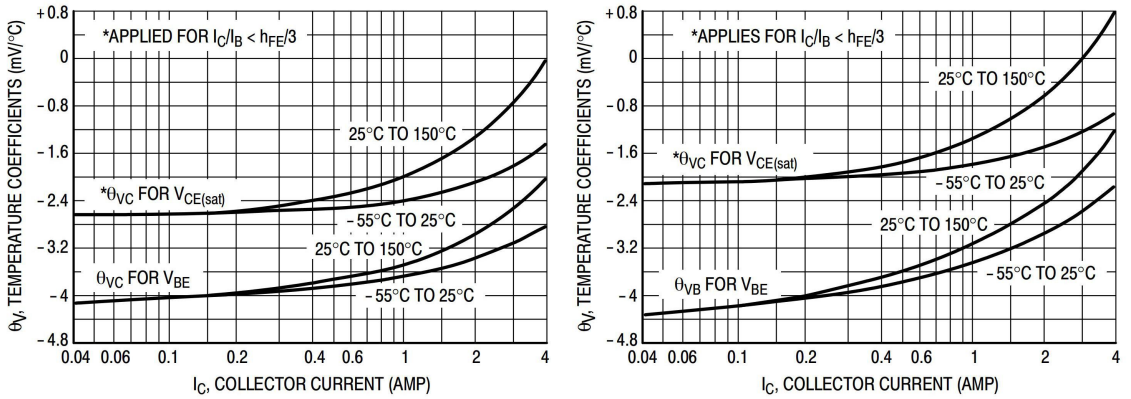

Figure 10. Temperature Coefficients

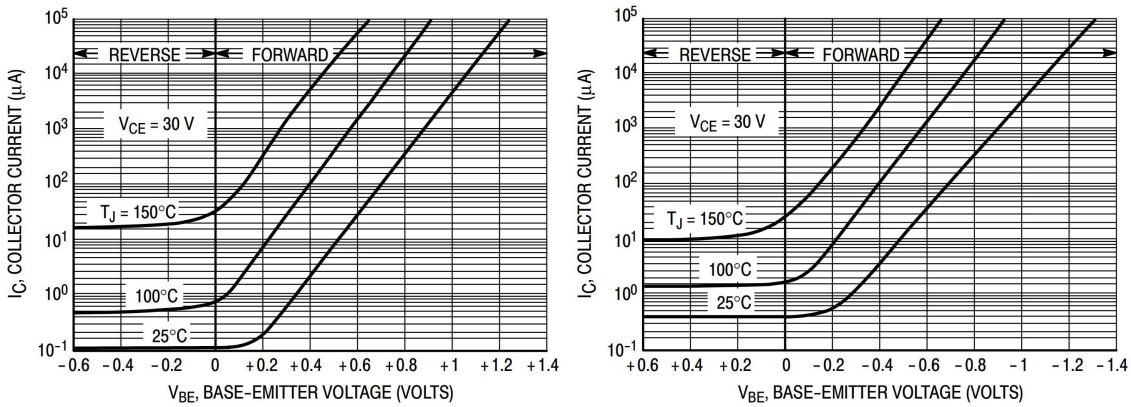

Figure 11. Collector Cut−Off Region

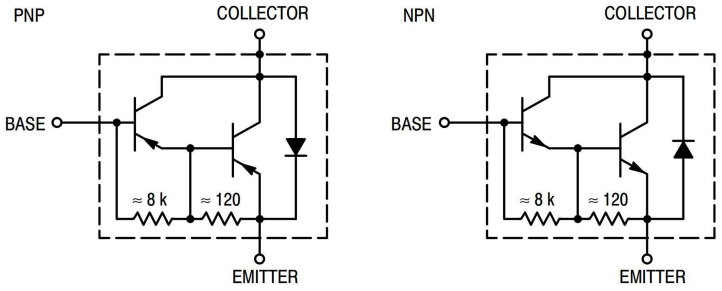

Figure 12. Darlington Schematic

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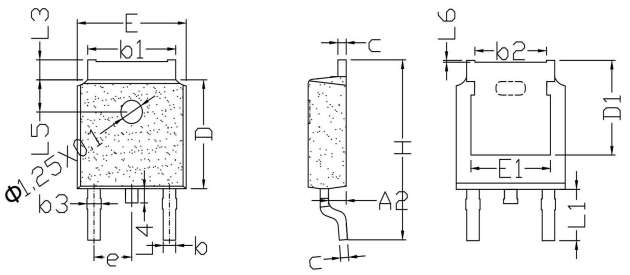
Ordering Information

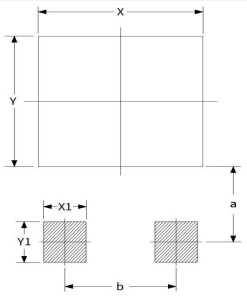
PACKAGE	PACKAGE CODE	UNIT WEIGHT(g)	REEL(pcs)	BOX(pcs)	CARTON(pcs)	DELIVERY MODE
TO-252	R3	0.305	2500	5000	25000	13''

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