

# MJD128T4 (PNP)

Preferred Device

## Complementary Darlington Power Transistor

### DPAK For Surface Mount Applications

Designed for general purpose amplifier and low speed switching applications.

- 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

#### 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 @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	20 0.16	W W/ $^\circ\text{C}$
Total Power Dissipation* @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.75 0.014	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	6.25	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient*	$R_{\theta JA}$	71.4	$^\circ\text{C/W}$

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

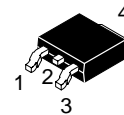


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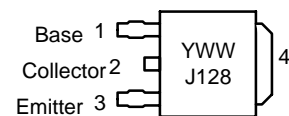
<http://onsemi.com>

**SILICON  
POWER TRANSISTOR  
8 AMPERES  
120 VOLTS  
20 WATTS**

#### MARKING DIAGRAM



**DPAK  
CASE 369C  
Style 1**



Y = Year  
WW = Work Week  
J128 = Device Code

#### ORDERING INFORMATION

Device	Package	Shipping
MJD128T4	DPAK	2500/Tape & Reel

Preferred devices are recommended choices for future use and best overall value.

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## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage ( $I_C = 30\text{ mAdc}$ , $I_B = 0$ )	$V_{CEO(sus)}$	120	–	Vdc
Collector Cutoff Current ( $V_{CE} = 120\text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	–	5	mA
Collector Cutoff Current ( $V_{CB} = 100\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	–	10	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{BE} = 5\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	2	mAdc

### ON CHARACTERISTICS

DC Current Gain ( $I_C = 4\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ ) ( $I_C = 8\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ )	$h_{FE}$	1000 100	12,000 –	–
Collector-Emitter Saturation Voltage ( $I_C = 4\text{ Adc}$ , $I_B = 16\text{ mAdc}$ ) ( $I_C = 8\text{ Adc}$ , $I_B = 80\text{ mAdc}$ )	$V_{CE(sat)}$	– –	2 4	Vdc
Base-Emitter Saturation Voltage (1) ( $I_C = 8\text{ Adc}$ , $I_B = 80\text{ mAdc}$ )	$V_{BE(sat)}$	–	4.5	Vdc
Base-Emitter On Voltage ( $I_C = 4\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ )	$V_{BE(on)}$	–	2.8	Vdc

### DYNAMIC CHARACTERISTICS

Current-Gain-Bandwidth Product ( $I_C = 3\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ , $f = 1\text{ MHz}$ )	$ h_{fe} $	4	–	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 0.1\text{ MHz}$ )	$C_{ob}$	–	300	pF
Small-Signal Current Gain ( $I_C = 3\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ , $f = 1\text{ kHz}$ )	$h_{fe}$	300	–	–

1. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

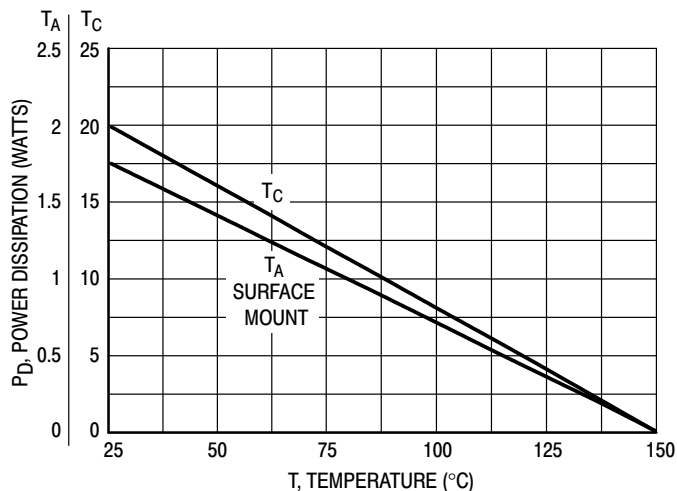


Figure 1. Power Derating

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## TYPICAL ELECTRICAL CHARACTERISTICS

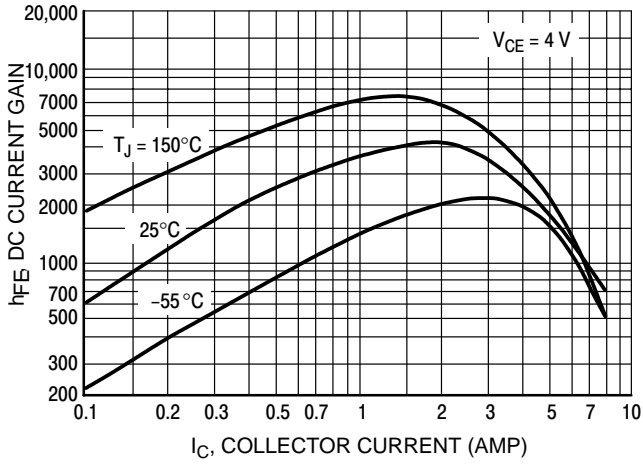


Figure 2. DC Current Gain

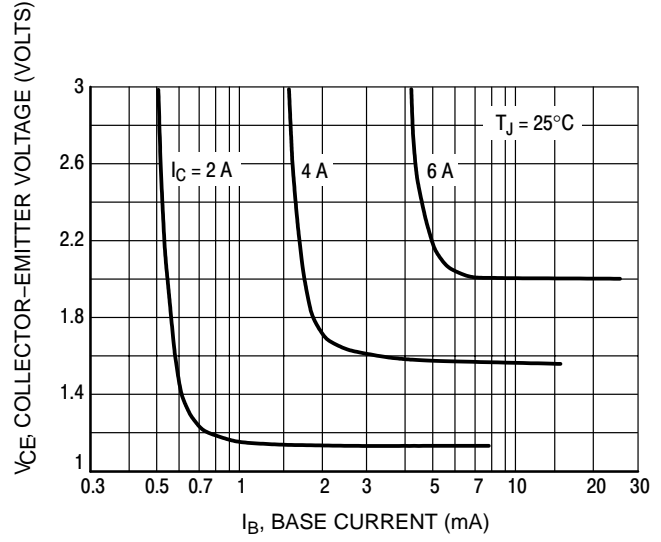


Figure 3. Collector Saturation Region

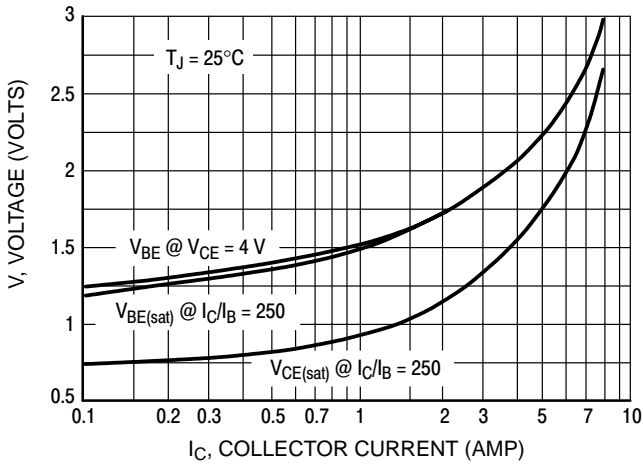


Figure 4. "On" Voltages

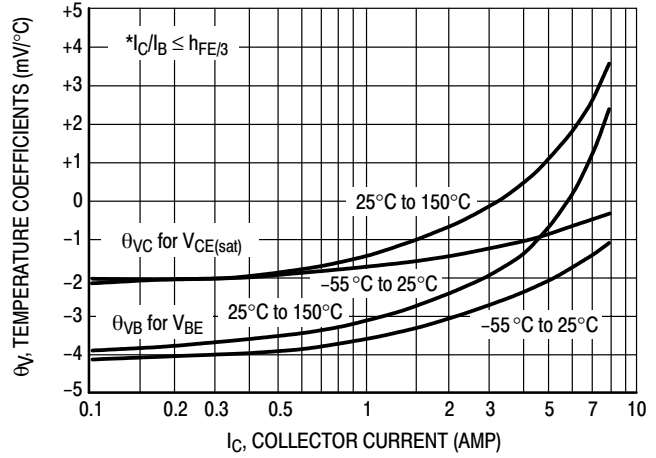


Figure 5. Temperature Coefficients

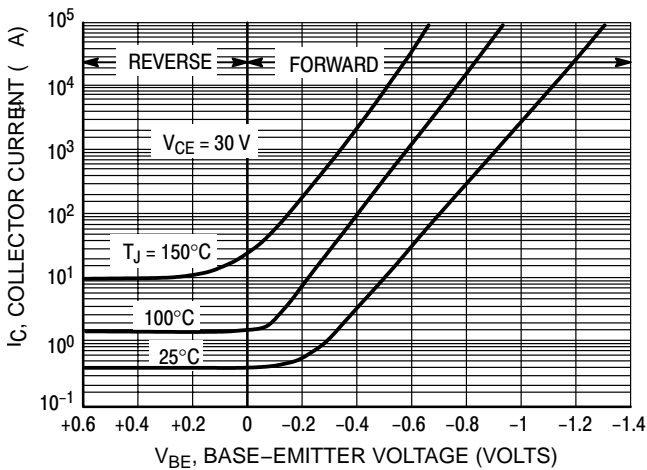


Figure 6. Collector Cut-Off Region

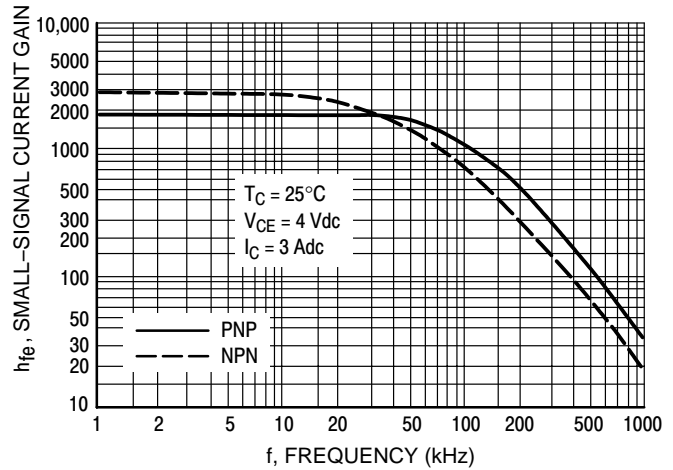


Figure 7. Small-Signal Current Gain

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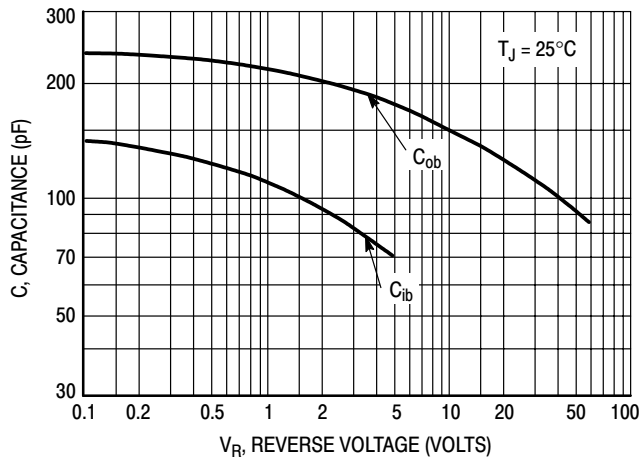


Figure 8. Capacitance

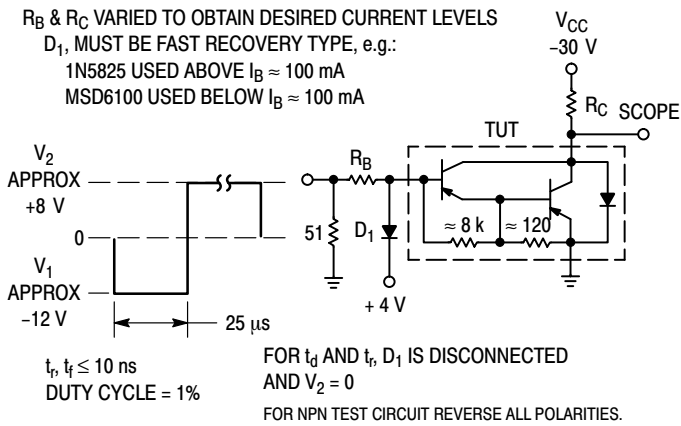


Figure 9. Switching Times Test Circuit

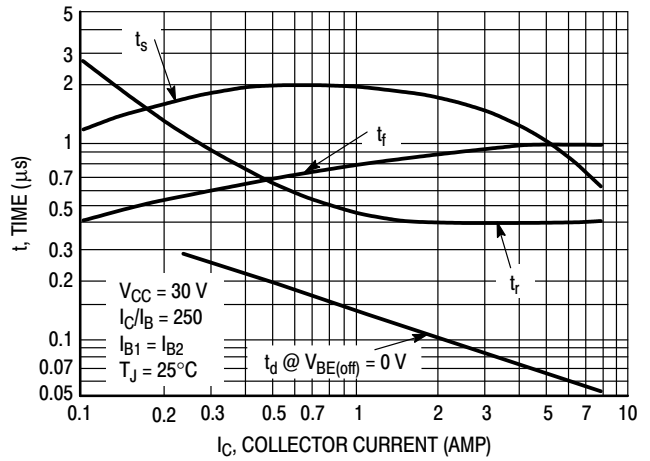


Figure 10. Switching Times

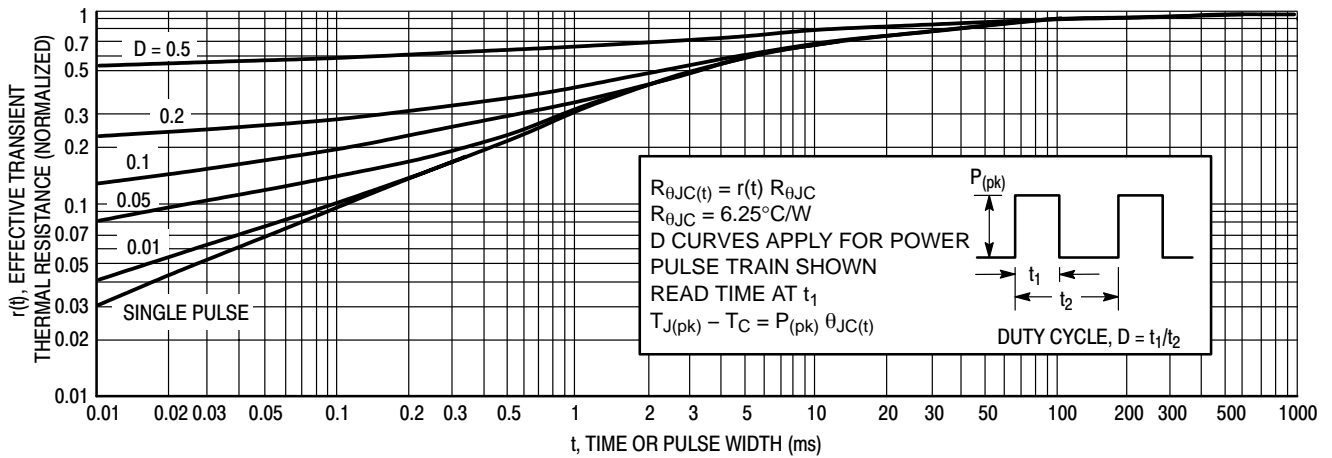
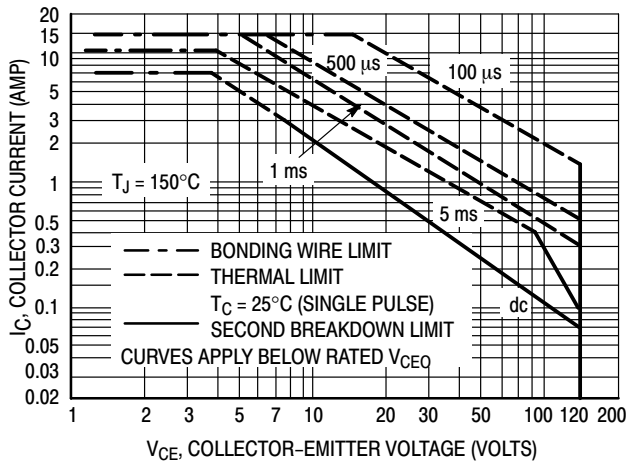


Figure 11. Thermal Response

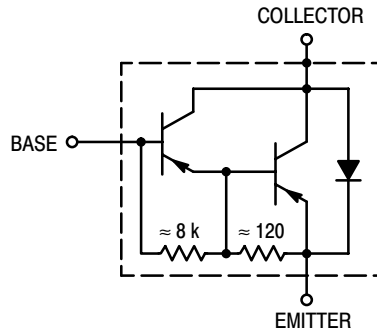
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**Figure 12. Maximum Forward Bias Safe Operating REA**

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  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} < 150^\circ\text{C}$ .  $T_{J(pk)}$  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.

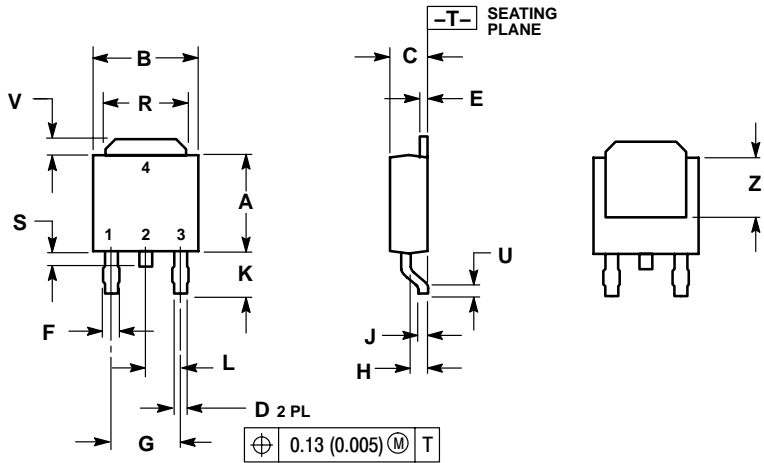


**Figure 13. Darlington Schematic**

# MJD128T4 (PNP)

## PACKAGE DIMENSIONS

DPAK  
CASE 369C-01  
ISSUE O




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.180	BSC	4.58	BSC
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090	BSC	2.29	BSC
R	0.180	0.215	4.57	5.45
S	0.025	0.040	0.63	1.01
U	0.020	---	0.51	---
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

STYLE 1:

- PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

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