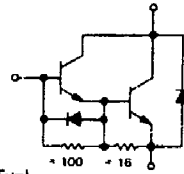


## BUT14

### SWITCHMODE SERIES NPN SILICON POWER DARLINGTON TRANSISTORS WITH BASE-EMITTER SPEEDUP DIODE

The BUT14 Darlington transistor is designed for high-voltage, high-speed, power switching in inductive circuits where fall time is critical. They are particularly suited for line-operated switchmode applications such as:

- AC and DC Motor Controls
- Switching Regulators
- Inverters
- Solenoid and Relay Drivers
- Fast Turn-Off Times
  - 300 nS Inductive Fall Time at 25°C (Typ)
  - 1.3 μS Inductive Storage Time at 25°C (Typ)
- Operating Temperature Range - 65 to 200°C

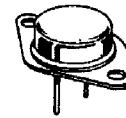


**25 AMPERES  
NPN SILICON  
POWER DARLINGTON  
TRANSISTORS**

**850 VOLTS  
175 WATTS**

#### Designer's Data for "Worst Case" Conditions

The Designer's Data Sheet permits the design of most circuits entirely from the information presented. Limit data - representing device characteristics boundaries - are given to facilitate "worst case" design.



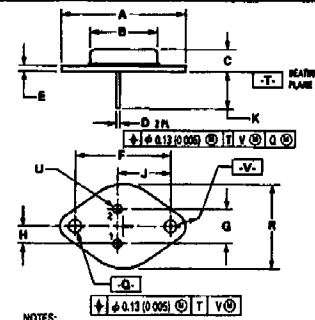
#### MAXIMUM RATINGS

Rating	Symbol	BUT14	Unit
Collector-Emitter Voltage	$V_{CE0(sus)}$	500	Vdc
Collector-Emitter Voltage	$V_{CEV}$	850	Vdc
Emitter Base Voltage	$V_{EB}$	10	Vdc
Collector Current			Adc
- Continuous	$I_C$	25	
- Peak(1)	$I_{CM}$	35	
Base Current			Adc
- Continuous	$I_B$	5	
- Peak(1)	$I_{BM}$	7.5	
Free Wheel Diode:			Adc
Forward current - Continuous	$I_F$	25	
- Peak	$I_{FM}$	35	
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	$P_D$	175	Watts
Derate above 25°C @ $T_C = 100^\circ\text{C}$		100	W/°C
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	- 65 to +200	°C

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.0	°C/W
Maximum Lead Temperature for Soldering Purpose 1/8" from Case for 5 Seconds	$T_L$	276	°C

(1) Pulse Test. Pulse Width = 5 ms, Duty Cycle ≤ 10%

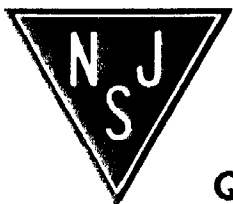


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION, INCH.
  3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	29.31	—	1.150
B	—	21.08	—	0.830
C	0.26	0.76	0.250	0.295
D	0.97	1.09	0.038	0.043
E	1.40	1.77	0.055	0.070
F	30.15 BSC	—	1.187 BSC	—
G	16.92 BSC	—	0.666 BSC	—
H	5.46 BSC	—	0.215 BSC	—
J	14.80 BSC	—	0.583 BSC	—
K	11.18	12.19	0.440	0.480
L	3.84	4.19	0.151	0.165
M	—	25.47	—	1.000
N	4.83	5.33	0.190	0.210
V	3.84	4.19	0.151	0.165

STYLE 1:  
PIN 1. BASE  
2. EMITTER  
CASE COLLECTOR

(TO-3)



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Quality Semi-Conductors

## BUT14

### ELECTRICAL CHARACTERISTICS (TC = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Sustaining Voltage (Table 1) (IC = 100 mA, IB = 0)	VCE(sus)	500	-	-	Vdc
Collector Cutoff Current (VCEV = Rated Value, VBE(off) = 1.5 Vdc) (VCEV = Rated Value, VBE(off) = 1.5 Vdc, TC = 100°C)	ICEV	-	-	0.2 2.0	mAdc
Emitter Cutoff Current (VEB = 2.0 V, IC = 0)	IEBO	-	-	175	mAdc

### SECOND BREAKDOWN

Second Breakdown Collector Current with base forward biased	IS/b		See Figure 16		
Clamped Inductive SOA with Base Reverse Biased	RBSOA		See Figure 17		

### ON CHARACTERISTICS (1)

DC Current Gain (IC = 8 A, VCE = 5 V) (IC = 16 A, VCE = 5 V)	hFE	30 15	-	-	
Collector-Emitter Saturation Voltage (IC = 8 A, IB = 0.4 A) (IC = 16 A, IB = 1.6 A) (IC = 20 A, IB = 2.0 A) (IC = 25 A, IB = 5 A)	VCE(sat)	-	-	2.0 3.0 3.5 5.0	Vdc
Base-Emitter Saturation Voltage (IC = 8 A, IB = 0.4 A) (IC = 16 A, IB = 1.6 A) (IC = 20 A, IB = 2 A)	VBE(sat)	-	-	2.5 2.9 3.3	Vdc
Diode Forward Voltage (IF = 20 A)	VF	-	-	4.0	Vdc

### SWITCHING CHARACTERISTICS

Inductive Load, Clamped (Table 1)

Storage Time	TC = 25°C	See Table 1 IC = 16 A	t <sub>s</sub>	-	1.3	2.8	μs
Fall Time			t <sub>f</sub>	-	0.3	0.8	μs
Storage Time	TC = 100°C	IB1 = 1.6 A VBE(off) = 5 V	t <sub>s</sub>	-	1.5	-	μs
Fall Time			t <sub>f</sub>	-	0.35	-	μs

(1) Pulse Test PW = 300 μs, Duty Cycle ≤ 2%.

TYPICAL CHARACTERISTICS

FIGURE 1 — DC CURRENT GAIN

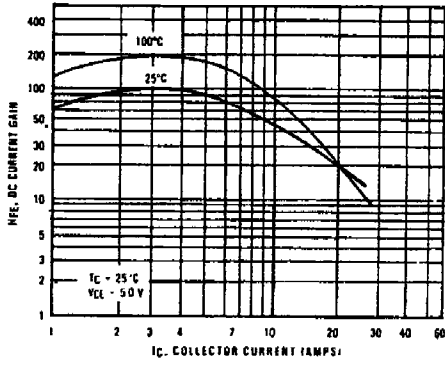


FIGURE 2 — COLLECTOR SATURATION REGION

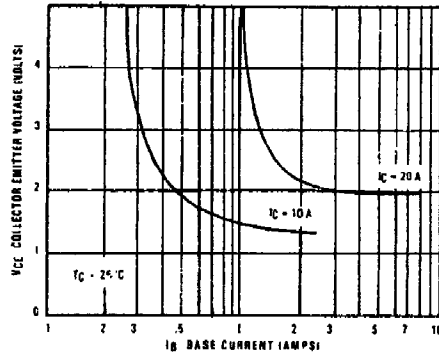


FIGURE 3 — COLLECTOR-EMITTER SATURATION VOLTAGE

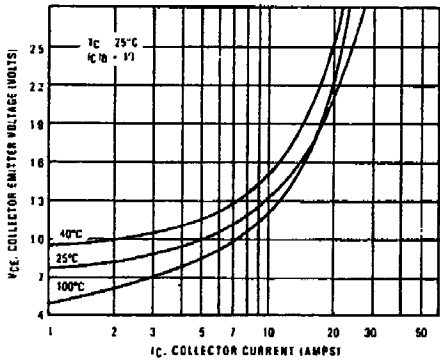


FIGURE 4 — BASE-EMITTER VOLTAGE

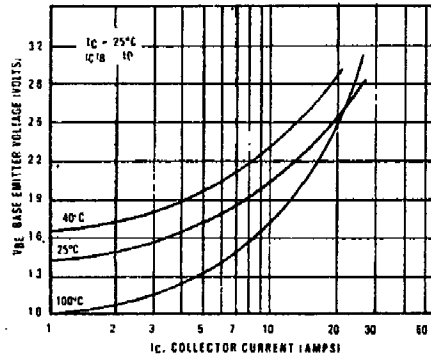
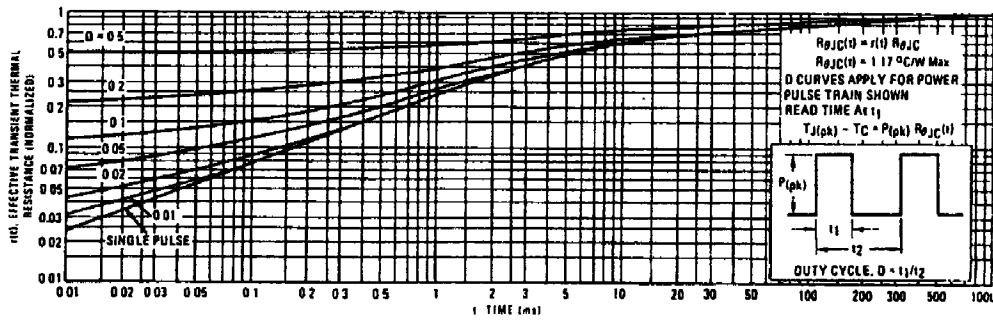


FIGURE 5 — THERMAL RESPONSE



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