

# **BUL416**

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- STMicroelectronics PREFERRED SALES TYPE
- n NPN TRANSISTOR
- n HIGH VOLTAGE CAPABILITY
- n VERY HIGH SWITCHING SPEED
- n FULLY CHARACTERISEZ AT 125 °C
- n LOW SPREAD OF DYNAMIC PARAMETERS

#### **APPLICATIONS**

- ELECTRONIC BALLAST FOR FLUORESCENT LIGHTING
- n SWITCH MODE POWER SUPPLIES

#### DESCRIPTION

The device is manufactured using high voltage Multi-Epitaxial Mesa technology for cost-effective high performance. It uses a Hollow Emitter structure to enhance switching speeds.

The BUL series is designed for use in lighting applications and low cost switch-mode power supplies.

#### **Table 1: Order Codes**

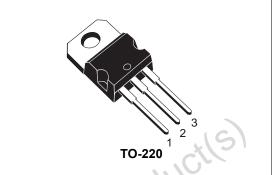
# Part NumberMarkingPackagePackagingBUL416A<br/>or (#)<br/>BUL416BTO-220Tube

# See:note on page 2

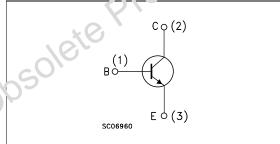
#### Table 2. A Seconde Maximum Ratings

Cymuul	Parameter	Value	Unit	
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>BE</sub> = 0)	1600	V	
V <sub>CEO</sub>	Collector-Emitter Voltage (I <sub>B</sub> = 0)	800	V	
V <sub>EBO</sub>	Emitter-Base Voltage (I <sub>C</sub> = 0)	9	V	
۱ <sub>C</sub>	Collector Current	6	Α	
I <sub>CM</sub>	Collector Peak Current (t <sub>p</sub> < 5ms)	9	А	
Ι <sub>Β</sub>	Base Current	5	Α	
I <sub>BM</sub>	Base Peak Current (t <sub>p</sub> < 5ms)	8	А	
P <sub>tot</sub>	Total Dissipation at $T_{\rm C}$ = 25 °C	110	W	
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C	
January 200	5	Rev. 3	1	

Figure 1: Package



#### Figure 2: Internal Schenatic Diagram



#### **BUL416**

Symbol	Parameter	Value	Unit
Τ <sub>J</sub>	Max. Operating Junction Temperature	150	°C

#### **Table 3: Thermal Data**

R <sub>thj-case</sub>	Thermal Resistance Junction-Case	Max	1.14	°C/W	
R <sub>thj-amb</sub>	Thermal Resistance Junction-Ambient	Max	62.5	°C/W	I

### Table 4: Electrical Characteristics ( $T_{case} = 25 \text{ }^{\circ}C$ unless otherwise specified)

Symbol	Parameter	Test	Conditions	Min.	Тур.	Max.	Unit
I <sub>CES</sub>	Collector Cut-off Current	V <sub>CE</sub> = 1600 V				100	μA
	(V <sub>BE</sub> =0 V)	V <sub>CE</sub> = 1600 V	T <sub>j</sub> = 125 °C			500	μA
I <sub>CEO</sub>	Collector Cut-off Current	V <sub>CE</sub> = 800 V				250	μA
	$(I_{B} = 0)$						
V <sub>CEO(sus)</sub> *	Collector-Emitter Sustaining Voltage	I <sub>C</sub> = 100 mA	L = 25 mH	800			V
	(I <sub>B</sub> = 0)					*	יק
V <sub>EBO</sub>	Emitter-Base Voltage	I <sub>E</sub> = 10 mA		9		5	V
	$(I_{\rm C}=0)$				$\lambda$		
V <sub>CE(sat)</sub> *	Collector-Emitter	I <sub>C</sub> = 2 A	I <sub>B</sub> = 0.4 A	~	<u> </u>	1.5	V
	Saturation Voltage	I <sub>C</sub> = 4 A	I <sub>B</sub> = 1.33 A	$O_{\mathcal{N}}$		3	V
V <sub>BE(sat)</sub> *	Base-Emitter Saturation	I <sub>C</sub> = 2 A	I <sub>B</sub> = 0.4 A			1.2	V
	Voltage	I <sub>C</sub> = 4 A	I <sub>B</sub> = 1.33 A			1.5	V
h <sub>FE</sub> *	DC Current Gain	I <sub>C</sub> = 10 mA	V <sub>CE</sub> = 5 V	10			
		I <sub>C</sub> = 0.7 A	$V_{CE} = 5 V$				
		Group A		12		27	
		Group B		25		40	
	INDUCTIVE LOAD	I <sub>C</sub> = 3 A	I <sub>B1</sub> = 1 A				
t <sub>s</sub>	Storage Time	$V_{BE(off)} = -5 V$	<b>R<sub>BB</sub> = 0</b> Ω		2.3		μs
t <sub>f</sub>	Fall Time	V <sub>clamp</sub> = 200 V	L = 200 µH		650		ns
		(see figure 12)					
	INDUCTIVE LOAD	I <sub>C</sub> = 3 A	I <sub>B1</sub> = 1 A				
t <sub>s</sub>	Storage Time	V <sub>BE(off)</sub> = -5 V	<b>R<sub>BB</sub> = 0</b> Ω		3		μs
t <sub>f</sub>	Fall Time	$V_{clamp} = 200 V$	L = 200 µH		680		ns
	9	T <sub>i</sub> = 100 °C	(see figure 12)				

\* Pulsed: Pulsed duration = 300  $\mu$ s, duty cycle  $\leq$  1.5 %.

# Note: Product is pre-selected in DC current gain (Group A and Group B). STMicroelectronics reserves the right to ship either groups according to production availability. Please contact your nearest STMicroelectronics sales office for delivery datails.

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Figure 3: Safe Operating Area

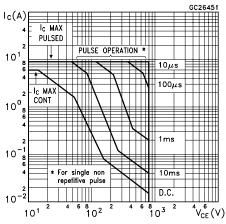


Figure 4: DC Current Gain

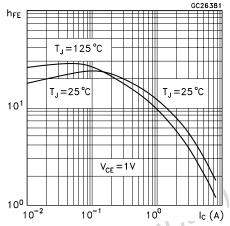
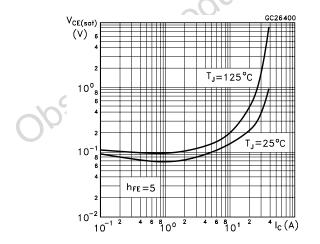
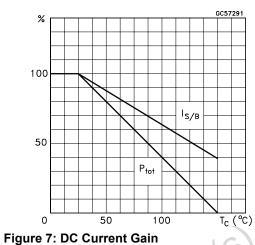
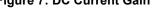


Figure 5: Collector-Emitter Saturation Voltage



**Figure 6: Derating Curve** 





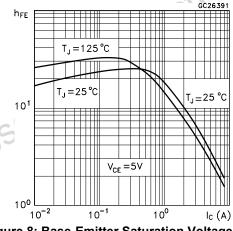
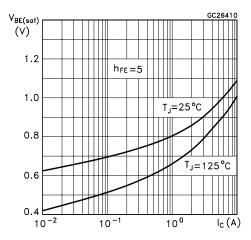


Figure 8: Base-Emitter Saturation Voltage



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#### Figure 9: Inductive Load Fall Time

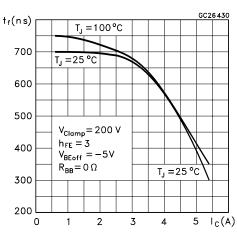
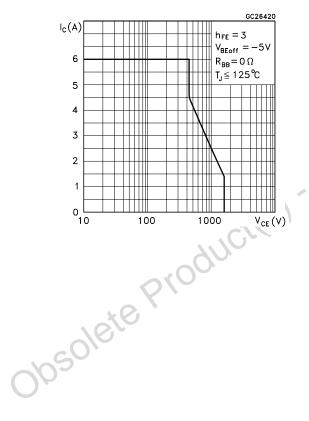
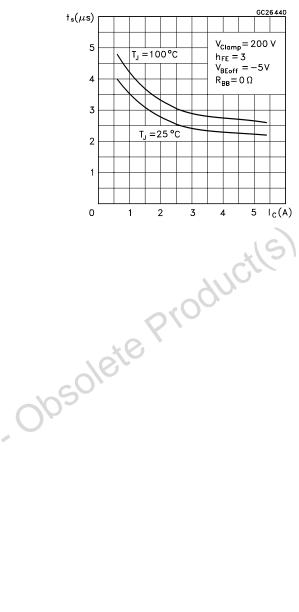


Figure 10: Reverse Biased SOA



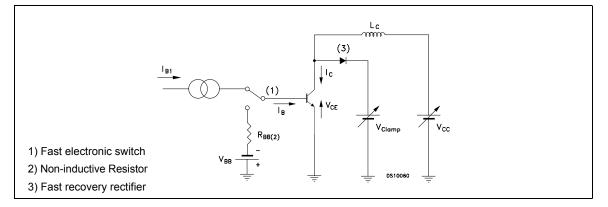




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#### Figure 12: Inductive Load Switching Test Circuit

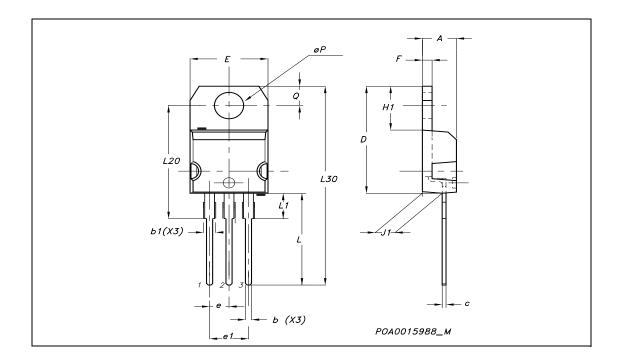


Obsolete Product(s). Obsolete Product(s)



DIM	mm.			inch			
DIM.	MIN.	ТҮР	MAX.	MIN.	TYP.	MAX.	
А	4.40		4.60	0.173		0.181	
b	0.61		0.88	0.024		0.034	
b1	1.15		1.70	0.045		0.066	
С	0.49		0.70	0.019		0.027	
D	15.25		15.75	0.60		0.620	
E	10		10.40	0.393		0.409	
е	2.40		2.70	0.094		0.106	
e1	4.95		5.15	0.194		0.202	
F	1.23		1.32	0.048		0.052	
H1	6.20		6.60	0.244		0.256	
J1	2.40		2.72	0.094		0.107	
L	13		14	0.511		0.551	
L1	3.50		3.93	0.137		0.154	
L20		16.40			0.645		
L30		28.90			1.137		
øP	3.75		3.85	0.147		0.151	
Q	2.65		2.95	0.104		0.116	





#### Table 5:

Version	Release Date	Change Designator
14-Jan-2004	1	First Release.
09-Sep-2004	2	Second Release.
26-Jan-2005	3	Third Release.

Obsolete Product(s). Obsolete Product(s)



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