BUL416

HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

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

APPLICATIONS

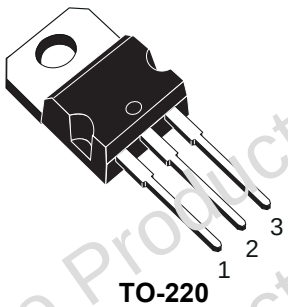
- ELECTRONIC BALLAST FOR FLUORESCENT LIGHTING
- SWITCH MODE POWER SUPPLIES

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.

Figure 1: Package



TO-220

Figure 2: Internal Schematic Diagram

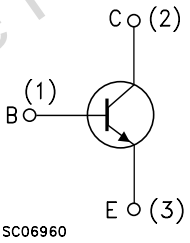


Table 1: Order Codes

Part Number	Marking	Package	Packaging
BUL416	BUL416A or (#) BUL416B	TO-220	Tube

See:note on page 2

Table 2. Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage (V_{BE} = 0)	1600	V
V_{CEO}	Collector-Emitter Voltage (I_B = 0)	800	V
V_{EBO}	Emitter-Base Voltage (I_C = 0)	9	V
I_C	Collector Current	6	A
I_{CM}	Collector Peak Current (t_p < 5ms)	9	A
I_B	Base Current	5	A
I_{BM}	Base Peak Current (t_p < 5ms)	8	A
P_{tot}	Total Dissipation at T_C = 25 °C	110	W
T_{stg}	Storage Temperature	-65 to 150	°C

Symbol	Parameter	Value	Unit
T_J	Max. Operating Junction Temperature	150	°C

Table 3: Thermal Data

$R_{thj\text{-}case}$	Thermal Resistance Junction-Case	Max	1.14	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-Ambient	Max	62.5	°C/W

Table 4: Electrical Characteristics (T_{case} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
I_{CES}	Collector Cut-off Current (V_{BE} =0 V)	V_{CE} = 1600 V				100	µA
		V_{CE} = 1600 V	T_j = 125 °C			500	µA
I_{CEO}	Collector Cut-off Current (I_B = 0)	V_{CE} = 800 V				250	µA
$V_{CEO(sus)}$*	Collector-Emitter Sustaining Voltage (I_B = 0)	I_C = 100 mA	L = 25 mH	800			V
V_{EBO}	Emitter-Base Voltage (I_C = 0)	I_E = 10 mA		9			V
$V_{CE(sat)}$*	Collector-Emitter Saturation Voltage	I_C = 2 A	I_B = 0.4 A			1.5	V
		I_C = 4 A	I_B = 1.33 A			3	V
$V_{BE(sat)}$*	Base-Emitter Saturation Voltage	I_C = 2 A	I_B = 0.4 A			1.2	V
		I_C = 4 A	I_B = 1.33 A			1.5	V
h_{FE}*	DC Current Gain	I_C = 10 mA	V_{CE} = 5 V	10			
		I_C = 0.7 A	V_{CE} = 5 V				
		Group A		12		27	
		Group B		25		40	
	INDUCTIVE LOAD	I_C = 3 A	I_{B1} = 1 A				
t_s	Storage Time	$V_{BE(off)}$ = -5 V	R_{BB} = 0 Ω		2.3		µs
t_f	Fall Time	V_{clamp} = 200 V	L = 200 µH		650		ns
		(see figure 12)					
	INDUCTIVE LOAD	I_C = 3 A	I_{B1} = 1 A				
t_s	Storage Time	$V_{BE(off)}$ = -5 V	R_{BB} = 0 Ω		3		µs
t_f	Fall Time	V_{clamp} = 200 V	L = 200 µH		680		ns
		T_j = 100 °C	(see figure 12)				

* Pulsed: Pulsed duration = 300 µs, duty cycle ≤ 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 STMicrolectronics sales office for delivery datails.

Figure 3: Safe Operating Area

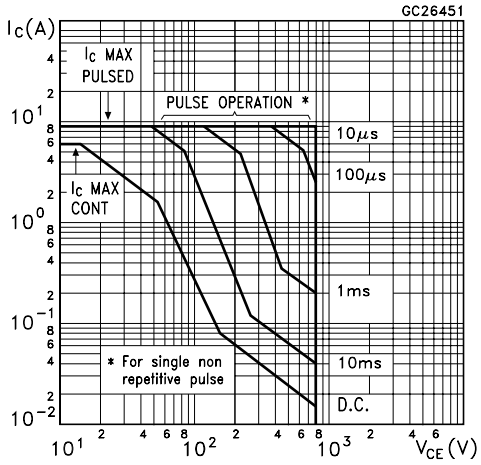


Figure 4: DC Current Gain

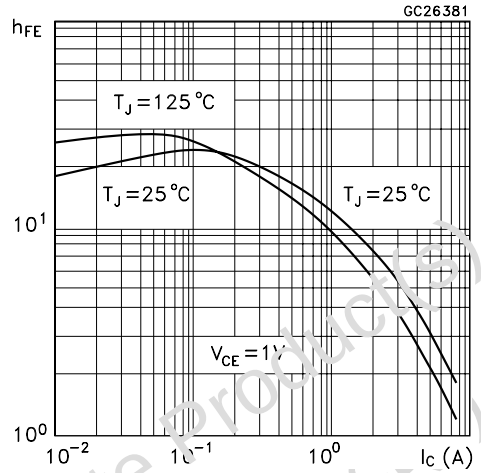


Figure 5: Collector-Emitter Saturation Voltage

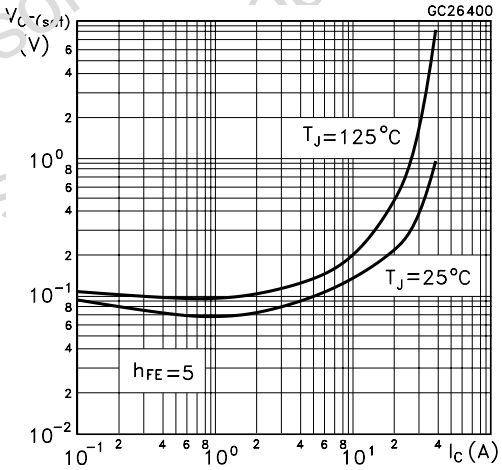


Figure 6: Derating Curve

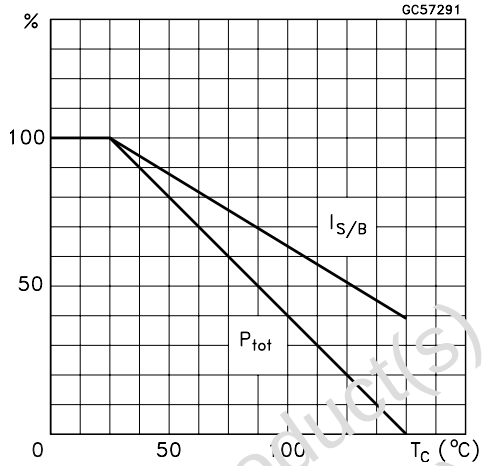


Figure 7: DC Current Gain

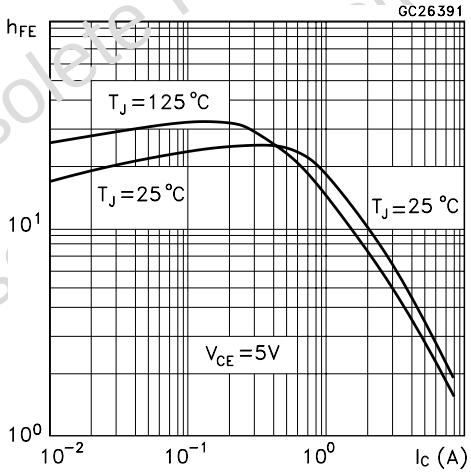


Figure 8: Base-Emitter Saturation Voltage

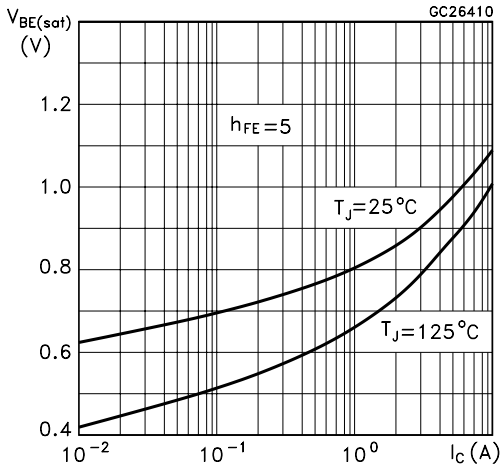


Figure 9: Inductive Load Fall Time

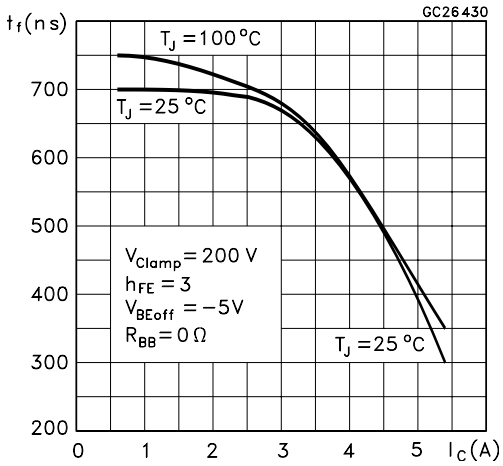


Figure 10: Reverse Biased SOA

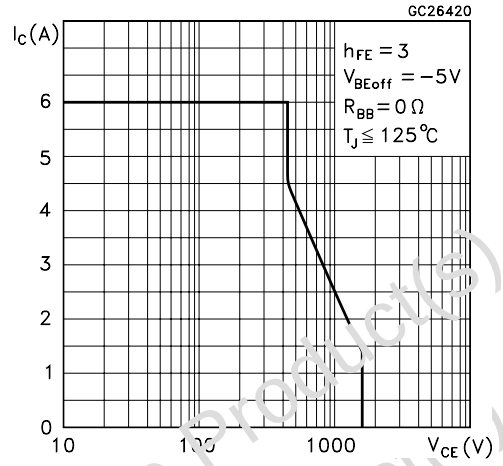


Figure 11: Resistive Load Stoarage Time

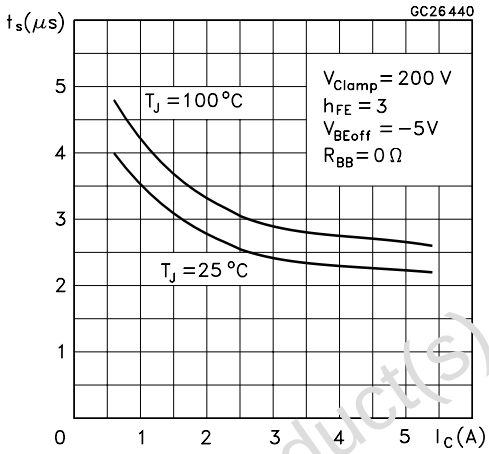
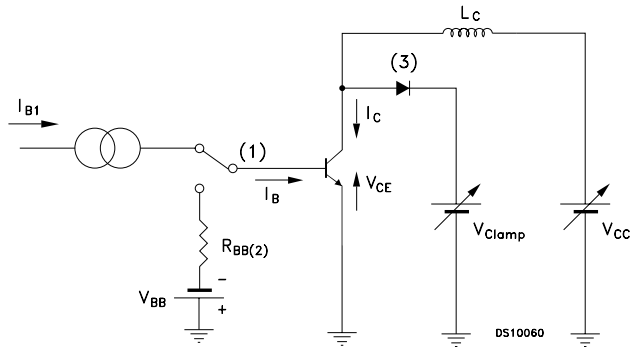


Figure 12: Inductive Load Switching Test Circuit



1) Fast electronic switch
2) Non-inductive Resistor
3) Fast recovery rectifier

TO-220 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	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
c	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
e	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

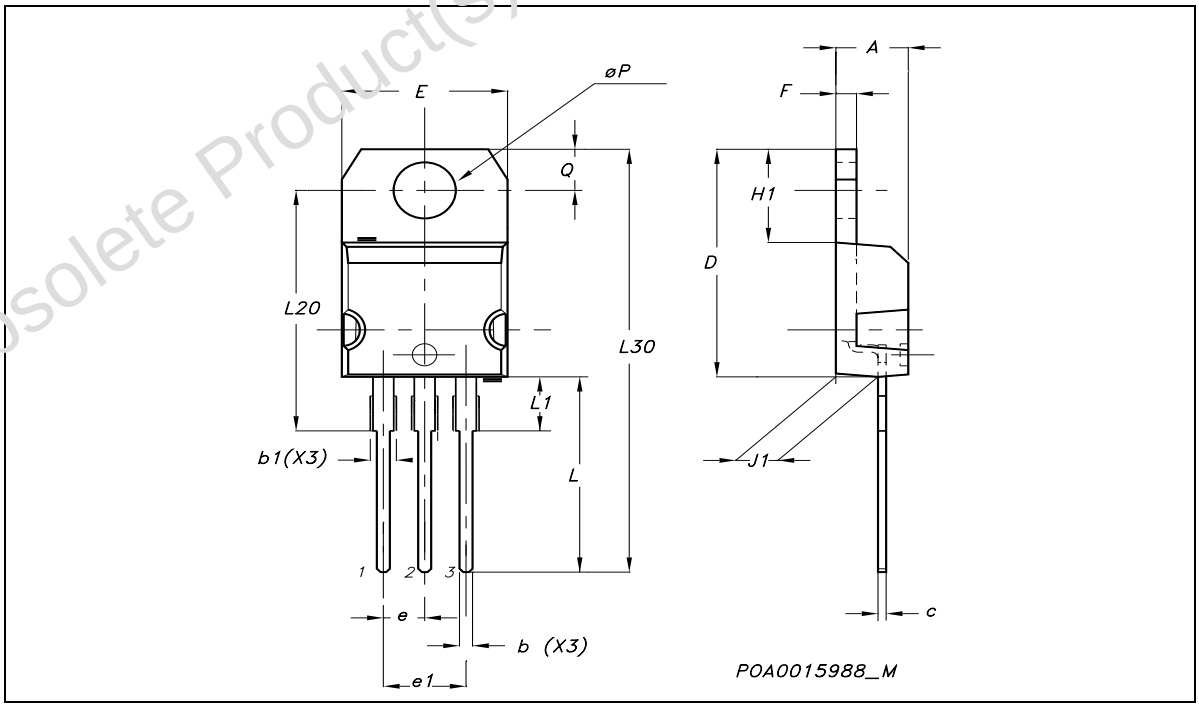


Table 5:

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