

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- SGS-THOMSON PREFERRED SALESTYPES
- NPN TRANSISTOR
- HIGH VOLTAGE CAPABILITY
- VERY HIGH SWITCHING SPEED
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- LOW BASE-DRIVE REQUIREMENTS

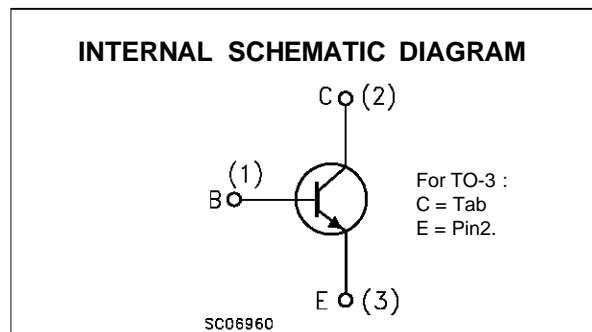
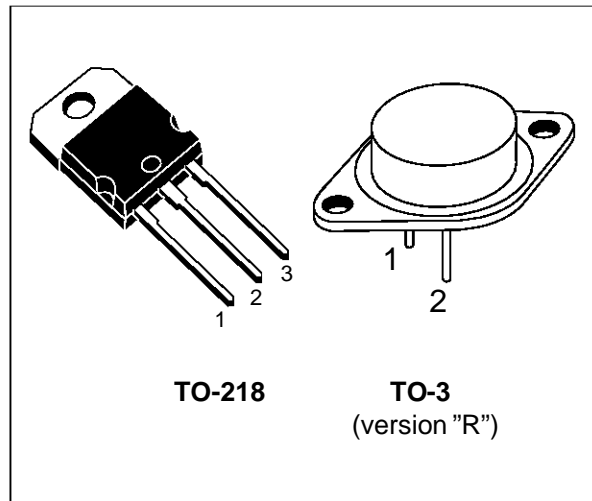
### APPLICATIONS:

- SWITCH MODE POWER SUPPLIES
- MOTOR CONTROL

### DESCRIPTION

The BUF420 and BUF420M are manufactured using High Voltage Multi Epitaxial Planar technology for high switching speeds and high voltage capacity. They use a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining a wide RBSOA.

The BUF series is designed for use in high-frequency power supplies and motor control applications.



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
$V_{CEV}$	Collector-Emitter Voltage ( $V_{BE} = -1.5\text{ V}$ )	850		V
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	450		V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	7		V
$I_C$	Collector Current	30		A
$I_{CM}$	Collector Peak Current ( $t_p < 5\text{ ms}$ )	60		A
$I_B$	Base Current	6		A
$I_{BM}$	Base Peak Current ( $t_p < 5\text{ ms}$ )	9		A
		<b>TO-218</b>	<b>TO-3</b>	
$P_{tot}$	Total Dissipation at $T_c = 25\text{ °C}$	200	200	W
$T_{stg}$	Storage Temperature	-65 to 150		°C
$T_j$	Max Operation Junction Temperature	150		°C

# BUF420 / BUF420M

## THERMAL DATA

			TO-218	TO-3	
$R_{thj-case}$	Thermal Resistance Junction-Case	Max	0.63	0.63	°C/W

## ELECTRICAL CHARACTERISTICS ( $T_{case} = 25^{\circ}C$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CER}$	Collector Cut-off Current ( $R_{BE} = 5 \Omega$ )	$V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV} \quad T_c = 100^{\circ}C$			0.2 1	mA mA
$I_{CEV}$	Collector Cut-off Current ( $I_B = 0$ )	$V_{CE} = V_{CEV} \quad V_{BE} = -1.5 V$ $V_{CE} = V_{CEV} \quad V_{BE} = -1.5 V \quad T_c = 100^{\circ}C$			0.2 1	mA mA
$I_{EBO}$	Emitter Cut-off Current ( $I_C = 0$ )	$V_{BE} = 5 V$			1	mA
$V_{CEO(sus)}^*$	Collector-Emitter Sustaining Voltage	$I_C = 200 mA \quad L = 25 mH$	450			V
$V_{EBO}$	Emitter Base Voltage ( $I_C = 0$ )	$I_E = 50 mA$	7			V
$V_{CE(sat)}^*$	Collector-Emitter Saturation Voltage	$I_C = 10 A \quad I_B = 1 A$ $I_C = 10 A \quad I_B = 1 A \quad T_c = 100^{\circ}C$ $I_C = 20 A \quad I_B = 2 A$ $I_C = 20 A \quad I_B = 2 A \quad T_c = 100^{\circ}C$		0.8 0.5	2.8 2	V V V V
$V_{BE(sat)}^*$	Base-Emitter Saturation Voltage	$I_C = 10 A \quad I_B = 1 A$ $I_C = 10 A \quad I_B = 1 A \quad T_c = 100^{\circ}C$ $I_C = 20 A \quad I_B = 2 A$ $I_C = 20 A \quad I_B = 2 A \quad T_c = 100^{\circ}C$		0.9 1.1	1.5 1.5	V V V V
$di_c/dt$	Rate of rise on-state Collector Current	$V_{CC} = 300 V \quad R_C = 0 \quad t_p = 3 \mu s$ $I_{B1} = 1.5 A \quad T_j = 25^{\circ}C$ $I_{B1} = 1.5 A \quad T_j = 100^{\circ}C$ $I_{B1} = 6 A \quad T_j = 100^{\circ}C$	70 150	100		A/ $\mu s$ A/ $\mu s$ A/ $\mu s$
$V_{CE(3\mu s)}$	Collector-Emitter Dynamic Voltage	$V_{CC} = 300 V \quad R_C = 60 \Omega$ $I_{B1} = 1.5 A \quad T_j = 25^{\circ}C$ $I_{B1} = 1.5 A \quad T_j = 100^{\circ}C$		2.1	8	V V
$V_{CE(5\mu s)}$	Collector-Emitter Dynamic Voltage	$V_{CC} = 300 V \quad R_C = 60 \Omega$ $I_{B1} = 1.5 A \quad T_j = 25^{\circ}C$ $I_{B1} = 1.5 A \quad T_j = 100^{\circ}C$		1.1	4	V V
$t_s$ $t_f$ $t_c$	Storage Time Fall Time Cross Over Time	$I_C = 10 A \quad V_{CC} = 50 V$ $V_{BB} = -5 V \quad R_{BB} = 0.6 \Omega$ $V_{clamp} = 400 V \quad I_{B1} = 0.5 A$ $L = 0.25 mH$		1 0.05 0.08		$\mu s$ $\mu s$ $\mu s$
$t_s$ $t_f$ $t_c$	Storage Time Fall Time Cross Over Time	$I_C = 10 A \quad V_{CC} = 50 V$ $V_{BB} = -5 V \quad R_{BB} = 0.6 \Omega$ $V_{clamp} = 400 V \quad I_{B1} = 1 A$ $L = 0.25 mH \quad T_j = 100^{\circ}C$			2 0.1 0.18	$\mu s$ $\mu s$ $\mu s$
$V_{CEW}$	Maximum Collector Emitter Voltage without Snubber	$I_C = 10 A \quad V_{CC} = 50 V$ $V_{BB} = -5 V \quad R_{BB} = 0.6 \Omega$ $V_{clamp} = 400 V \quad I_{B1} = 1 A$ $L = 0.25 mH \quad T_j = 125^{\circ}C$	500			V
$t_s$ $t_f$ $t_c$	Storage Time Fall Time Cross Over Time	$I_C = 10 A \quad V_{CC} = 50 V$ $V_{BB} = 0 \quad R_{BB} = 0.15 \Omega$ $V_{clamp} = 400 V \quad I_{B1} = 1 A$ $L = 0.25 mH$		1.5 0.04 0.07		$\mu s$ $\mu s$ $\mu s$

**ELECTRICAL CHARACTERISTICS** (continued)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$t_s$	Storage Time	$I_C = 10\text{ A}$	$V_{CC} = 50\text{ V}$			3	$\mu\text{s}$
$t_f$	Fall Time	$V_{BB} = 0$	$R_{BB} = 0.15\ \Omega$			0.15	$\mu\text{s}$
$t_c$	Cross Over Time	$V_{clamp} = 400\text{ V}$ $L = 0.25\text{ mH}$	$I_{B1} = 1\text{ A}$ $T_j = 100^\circ\text{C}$			0.25	$\mu\text{s}$
$V_{CEW}$	Maximum Collector Emitter Voltage without Snubber	$I_C = 10\text{ A}$ $V_{BB} = 0$ $V_{clamp} = 400\text{ V}$ $L = 0.25\text{ mH}$	$V_{CC} = 50\text{ V}$ $R_{BB} = 0.15\ \Omega$ $I_{B1} = 1\text{ A}$ $T_j = 125^\circ\text{C}$	500			V
$t_s$	Storage Time	$I_C = 20\text{ A}$	$V_{CC} = 50\text{ V}$		2.2		$\mu\text{s}$
$t_f$	Fall Time	$V_{BB} = -5\text{ V}$	$R_{BB} = 0.6\ \Omega$		0.06		$\mu\text{s}$
$t_c$	Cross Over Time	$V_{clamp} = 400\text{ V}$ $L = 0.12\text{ mH}$	$I_{B1} = 4\text{ A}$		0.12		$\mu\text{s}$
$t_s$	Storage Time	$I_C = 20\text{ A}$	$V_{CC} = 50\text{ V}$			3.5	$\mu\text{s}$
$t_f$	Fall Time	$V_{BB} = -5\text{ V}$	$R_{BB} = 0.6\ \Omega$			0.12	$\mu\text{s}$
$t_c$	Cross Over Time	$V_{clamp} = 400\text{ V}$ $L = 0.12\text{ mH}$	$I_{B1} = 4\text{ A}$ $T_j = 125^\circ\text{C}$			0.3	$\mu\text{s}$
$V_{CEW}$	Maximum Collector Emitter Voltage without Snubber	$I_{C\text{Woff}} = 30\text{ A}$ $V_{BB} = -5\text{ V}$ $L = 0.08\text{ mH}$ $T_j = 125^\circ\text{C}$	$V_{CC} = 50\text{ V}$ $R_{BB} = 0.6\ \Omega$ $I_{B1} = 6\text{ A}$	400			V

Figure 1: Turn-on Switching Test Circuit

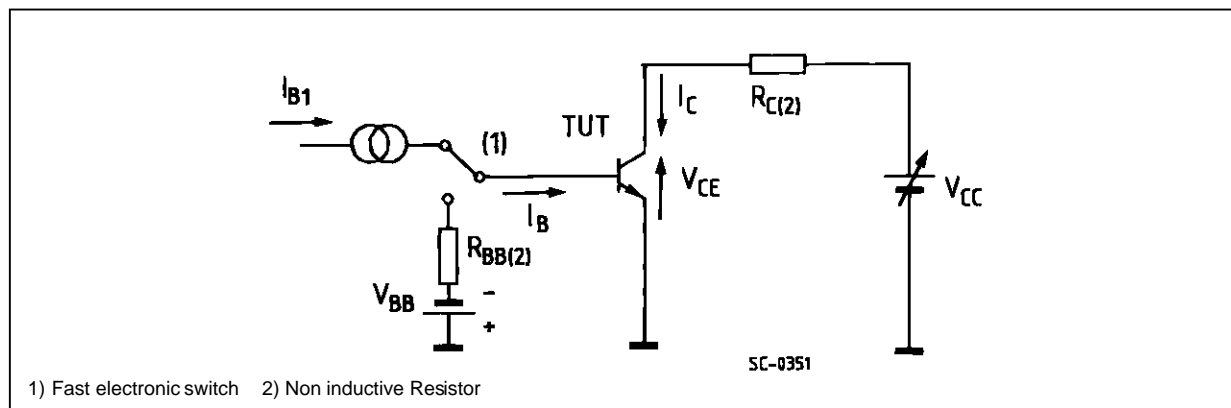
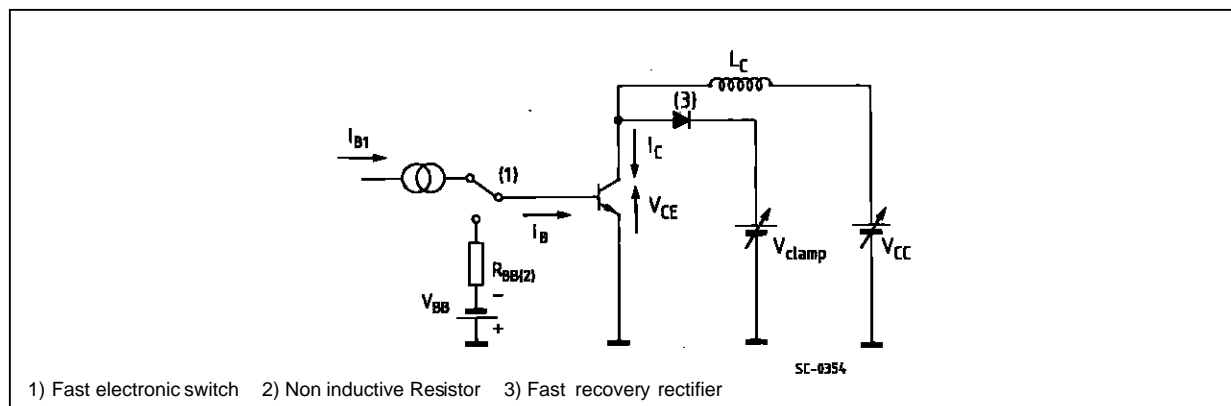
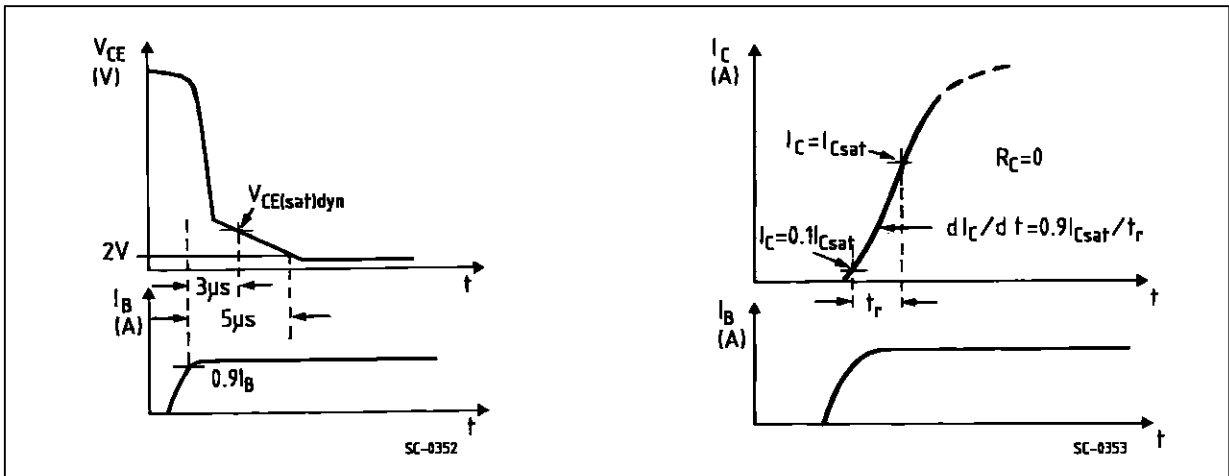


Figure 2: Turn-off Switching Test Circuit

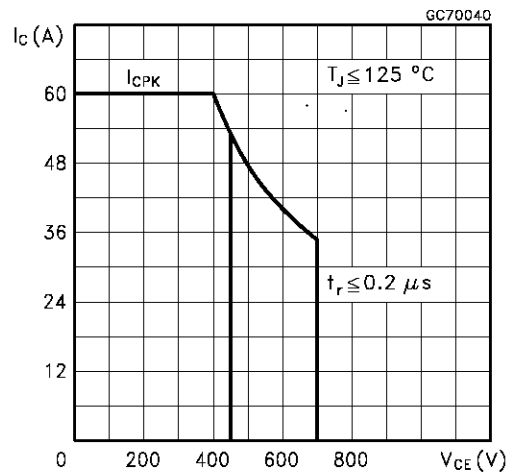
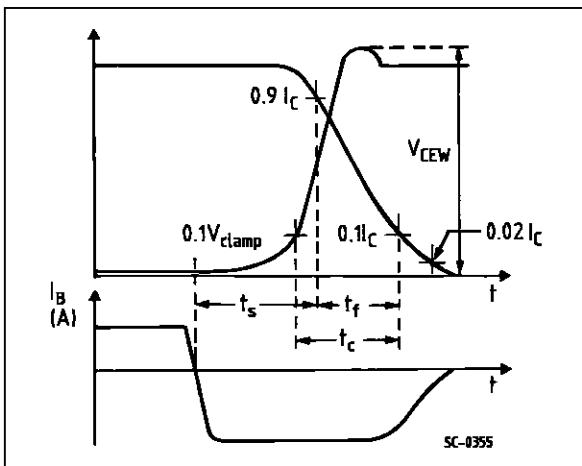


# BUF420 / BUF420M

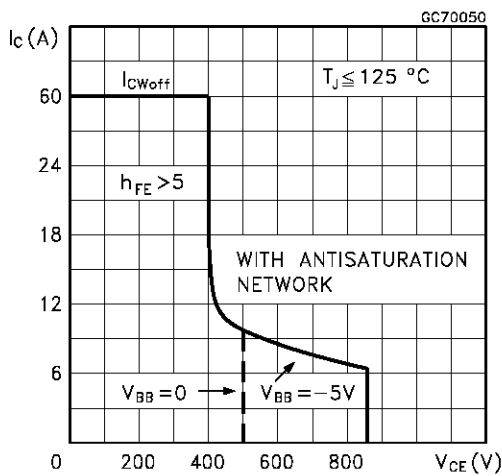
Turn-on Switching Test Waveforms.



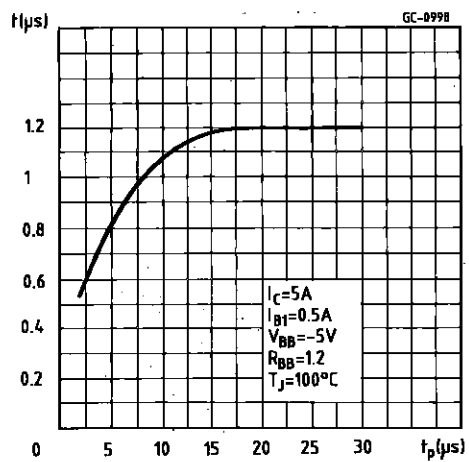
Turn-off Switching Test Waveforms (inductive load). Forward Biased Safe Operating Areas.



Reverse Biased Safe Operating Area

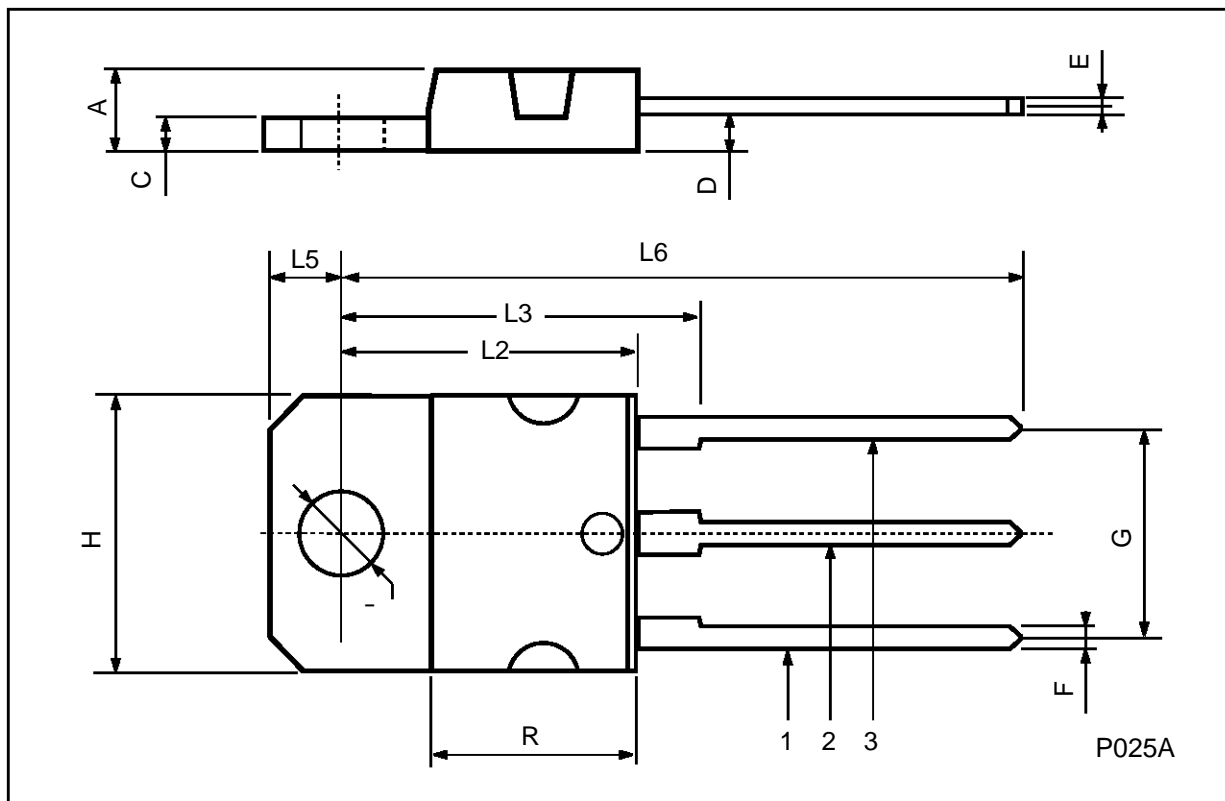


Storage Time Versus Pulse Time.



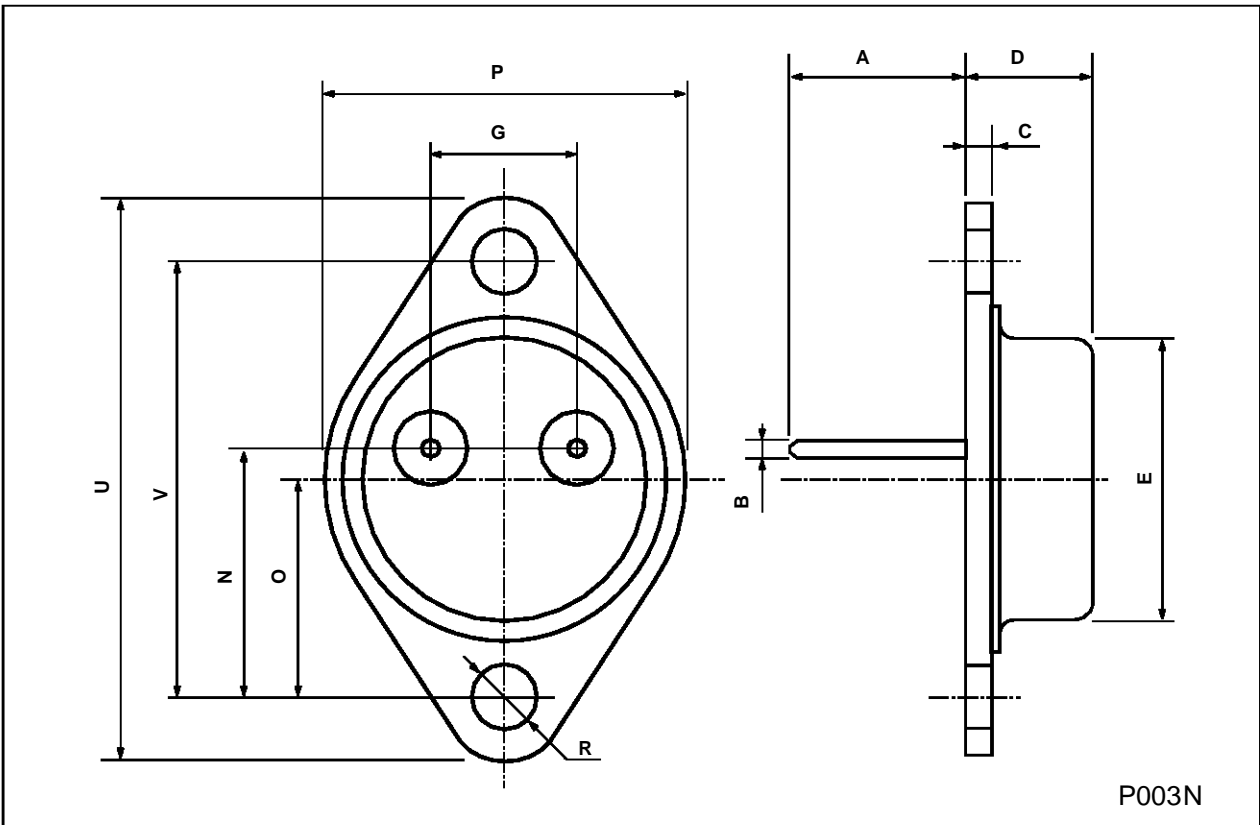
**TO-218 (SOT-93) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		4.9	0.185		0.193
C	1.17		1.37	0.046		0.054
D		2.5			0.098	
E	0.5		0.78	0.019		0.030
F	1.1		1.3	0.043		0.051
G	10.8		11.1	0.425		0.437
H	14.7		15.2	0.578		0.598
L2	-		16.2	-		0.637
L3		18			0.708	
L5	3.95		4.15	0.155		0.163
L6		31			1.220	
R	-		12.2	-		0.480
Ø	4		4.1	0.157		0.161



**TO-3 (version R) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		11.7			0.460	
B	0.96		1.10	0.037		0.043
C			1.70			0.066
D			8.7			0.342
E			20.0			0.787
G		10.9			0.429	
N		16.9			0.665	
P			26.2			1.031
R	3.88		4.09	0.152		0.161
U			39.50			1.555
V		30.10			1.185	



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