

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

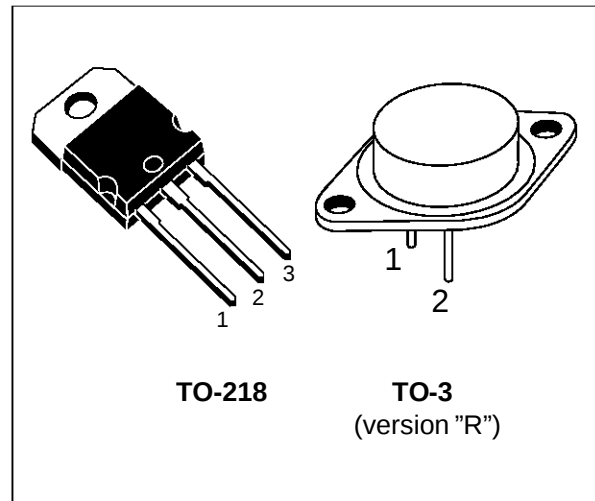
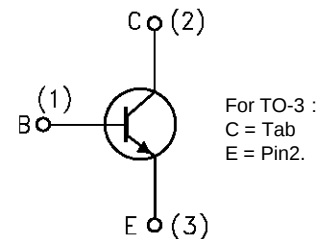
APPLICATIONS:

- 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.


INTERNAL SCHEMATIC DIAGRAM

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
		TO-218	TO-3	
P_{tot}	Total Dissipation at $T_c = 25\text{ }^\circ\text{C}$	200	200	W
T_{stg}	Storage Temperature	-65 to 150		$^\circ\text{C}$
T_j	Max Operation Junction Temperature	150		$^\circ\text{C}$

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	$I_C = 10 A \quad I_B = 1 A \quad T_c = 100^{\circ}C$ $I_C = 10 A \quad I_B = 1 A \quad T_c = 100^{\circ}C$ $I_C = 20 A \quad I_B = 2 A \quad T_c = 100^{\circ}C$ $I_C = 20 A \quad I_B = 2 A \quad T_c = 100^{\circ}C$		0.8 0.5	2.8 2	V V V V
$V_{BE(sat)}^*$	Base-Emitter Saturation Voltage	$I_C = 10 A \quad I_B = 1 A \quad T_c = 100^{\circ}C$ $I_C = 10 A \quad I_B = 1 A \quad T_c = 100^{\circ}C$ $I_C = 20 A \quad I_B = 2 A \quad T_c = 100^{\circ}C$ $I_C = 20 A \quad I_B = 2 A \quad T_c = 100^{\circ}C$		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/ μs A/ μs A/ μs
$V_{CE(3\mu s)}$	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		μs μs μs
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	μs μs μs
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		μs μs μs

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

Figure 1: Turn-on Switching Test Circuit

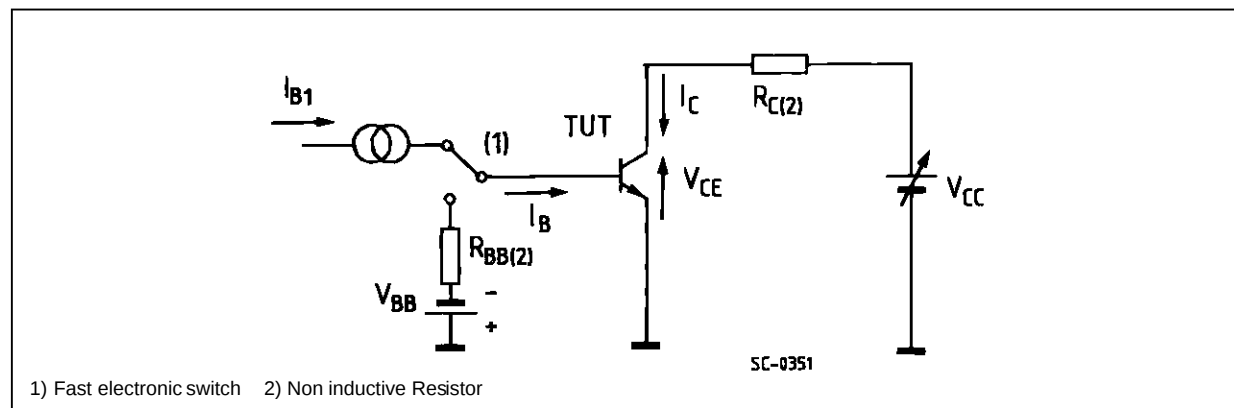
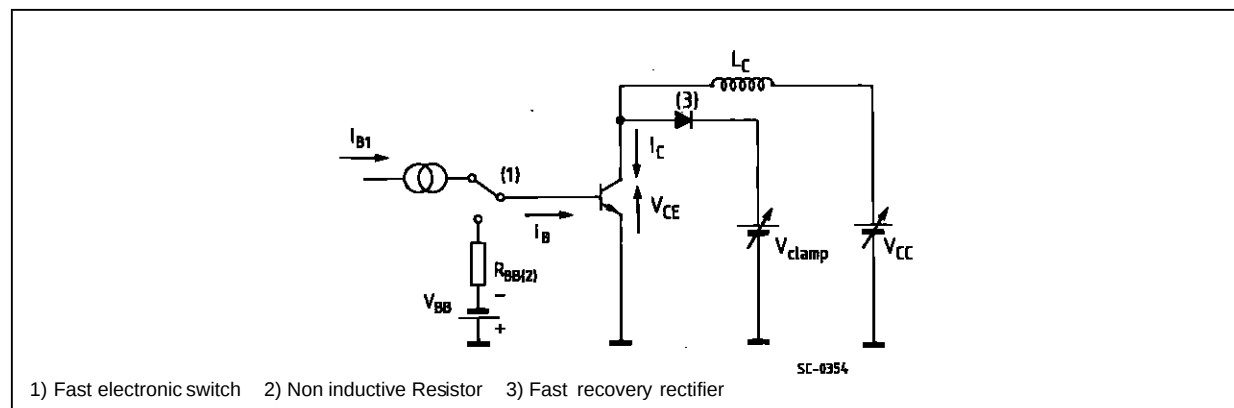
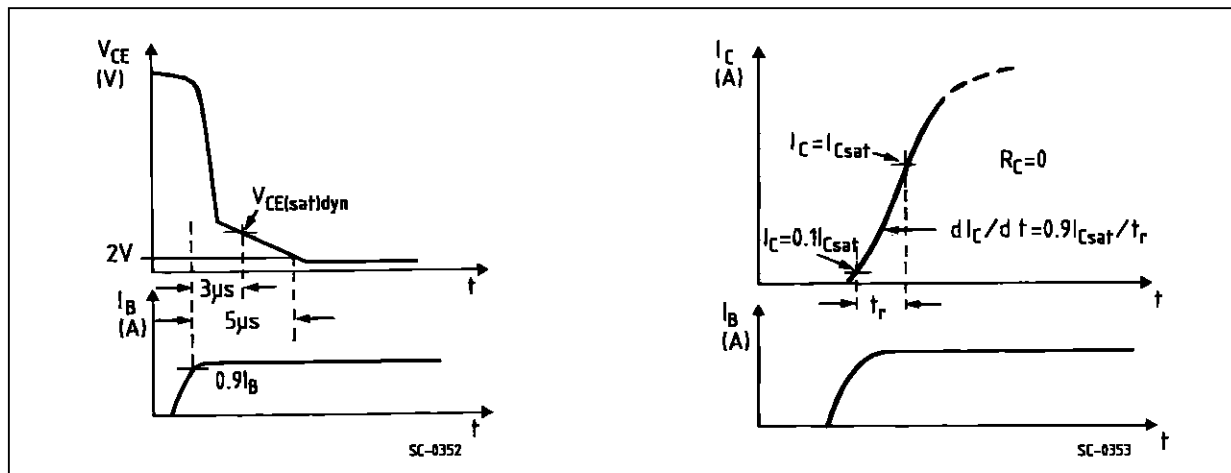


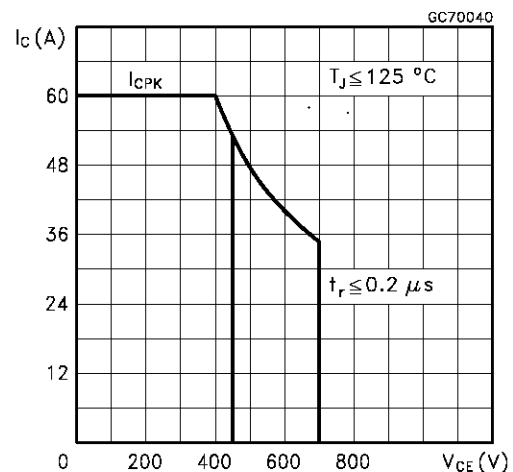
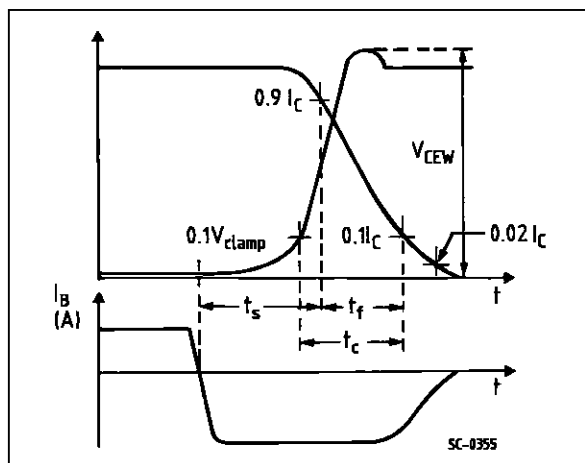
Figure 2: Turn-off Switching Test Circuit



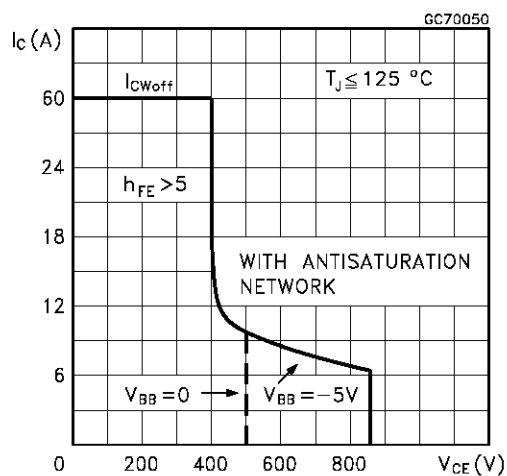
Turn-on Switching Test Waveforms.



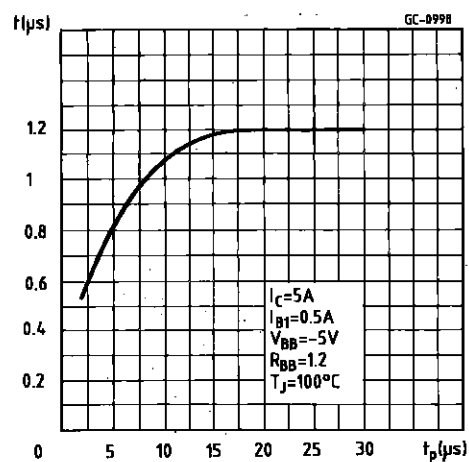
Turn-off Switching Test Waveforms (inductive load). Forward Biased Safe Operating Areas.



Reverse Biased Safe Operating Area

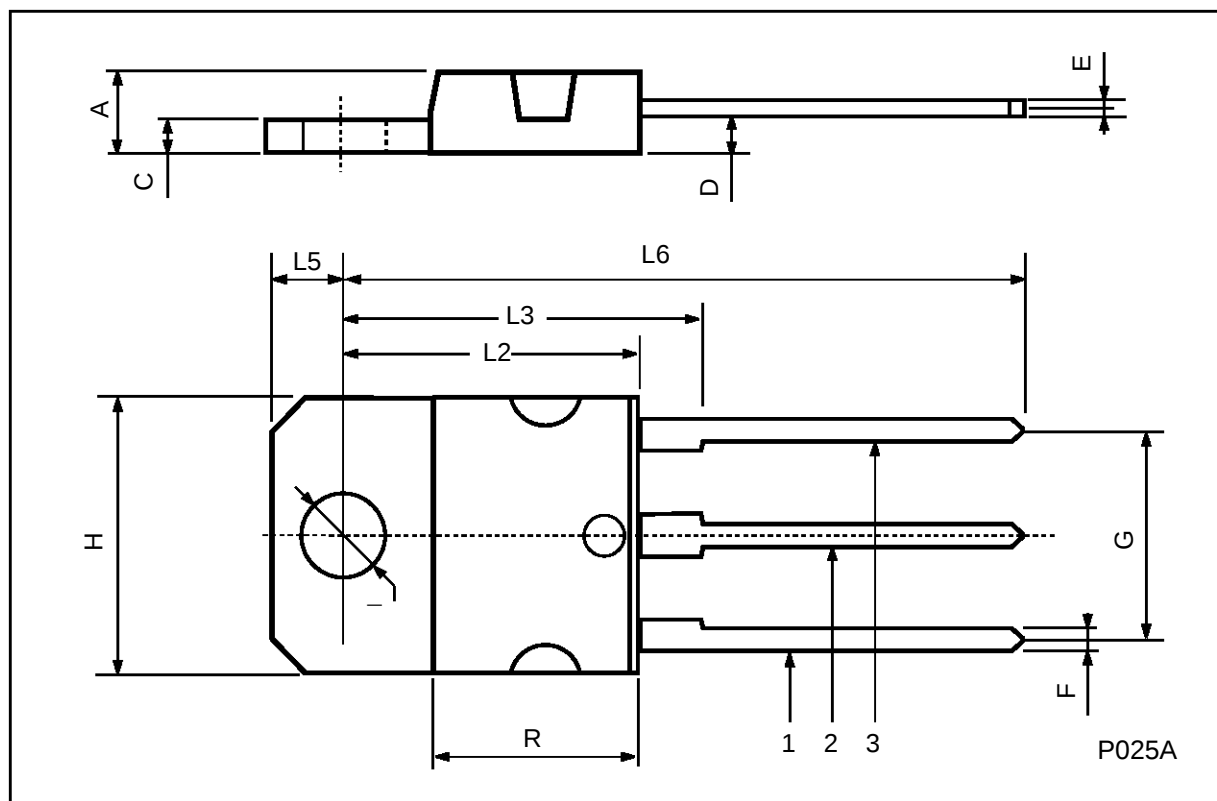


Storage Time Versus Pulse Time.



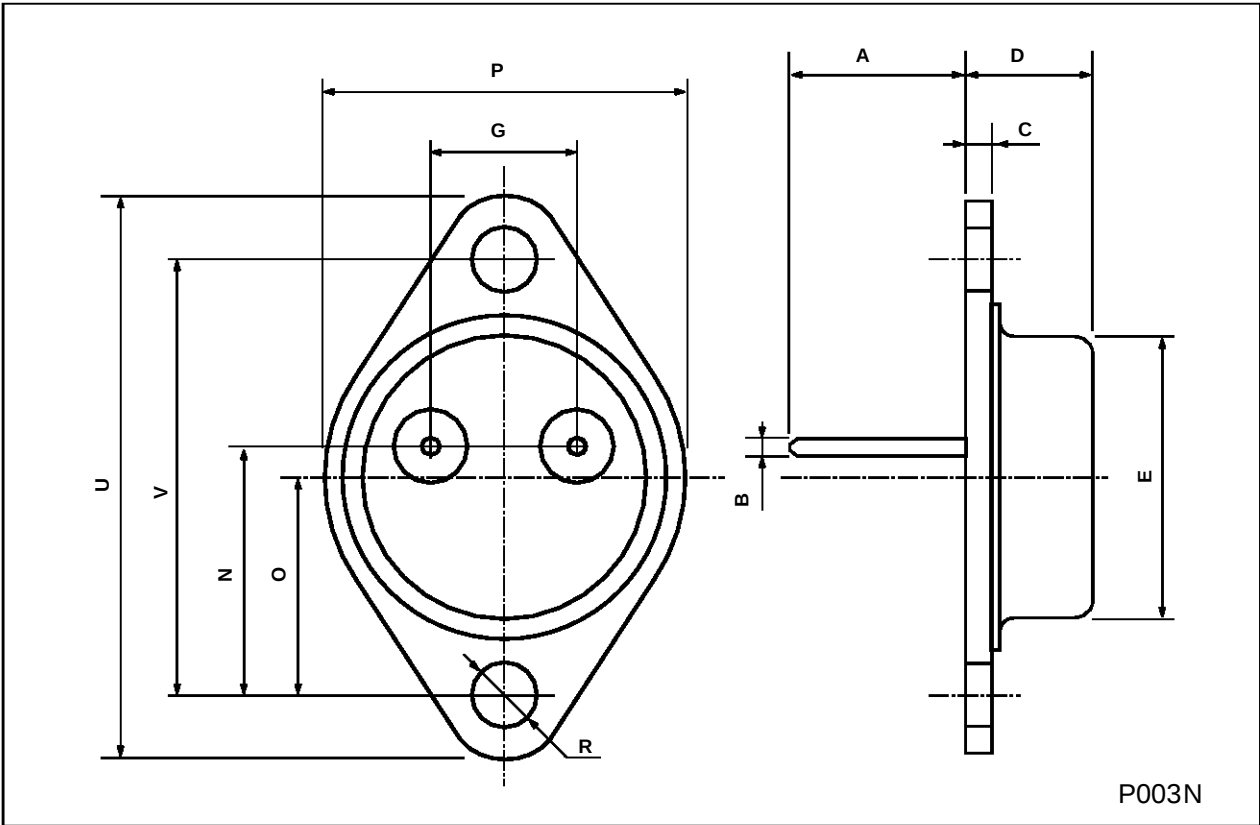
TO-218 (SOT-93) MECHANICAL DATA

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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