

HIGH POWER SILICON NPN TRANSISTOR

BUS14/BUS14A

- TO-3 Metal Package
- High Voltage, High Speed
- Intended for use in converters, inverters, switching regulators, Motor control systems, etc.



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise stated)

		BUS14	BUS14A
V _{CESM}	Collector – Emitter Voltage V _{BE} = 0, peak value	850V	1000V
V _{CEO}	Collector – Emitter Voltage	400V	450V
I _C	Collector Current (dc)		30A
I _{CM}	Peak Collector Current t _p ≤ 2ms		50A
I _B	Base Current (dc)		6A
I _{BM}	Peak Base Current t _p ≤ 2ms		10A
P _{tot}	Total Power Dissipation at T _{mb} = 25°C		250W
T _J	Maximum Junction Temperature		200°C
T _{stg}	Storage Temperature Range		-65 to +200°C

THERMAL PROPERTIES

Symbols	Parameters	Min.	Typ.	Max.	Units
R _{θJ-mb}	Thermal Resistance, Junction To mounting base			0.7	K/W

Magnatec reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by Magnatec is believed to be both accurate and reliable at the time of going to press. However Magnatec assumes no responsibility for any errors or omissions discovered in its use. Magnatec encourages customers to verify that datasheets are current before placing orders.

HIGH POWER SILICON NPN TRANSISTOR BUS14/BUS14A

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise stated)

Symbols	Parameters	Test Conditions		BUS14	BUS14A	Units
V _{CESM}	Collector-Emitter voltage	V _{BE} = 0 Peak value	Max	850	1000	V
V _{CEO}	Collector-Emitter voltage	Open base	Max	400	450	
I _{CES}	Collector cut-off current	V _{CE} = V _{CESMmax} V _{BE} = 0	<	1		mA
I _{CES}	Collector cut-off current	V _{CE} = V _{CESMmax} V _{BE} =0, T _J = 125°C	<	5		
I _{EBO}	Emitter cut-off current	I _C = 0 V _{EB} = 9V	<	10		
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C = 20A I _B = 4A	<	1.5	-	V
		I _C = 16A I _B = 3.2A	<	-	1.5	
V _{BE(sat)}	Base-Emitter Saturation Voltage	I _C = 20A I _B = 4A	<	1.7	-	
		I _C = 16A I _B = 3.2A	<	-	1.7	
V _{CEOsust}	Collector-Emitter sustaining voltage	I _C = 0, I _{Boff} = 0, L=25mH	>	400	450	

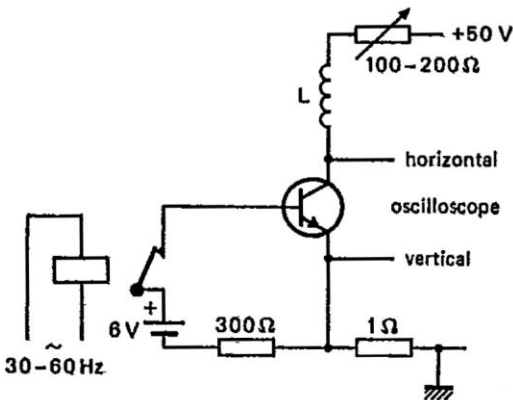


Fig 1. Test circuit for V_{CEOsust}

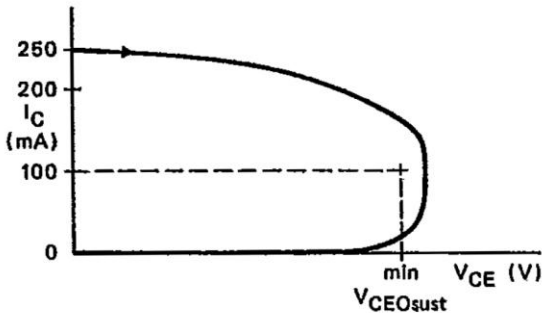


Fig 2. Oscilloscope display for sustaining voltage

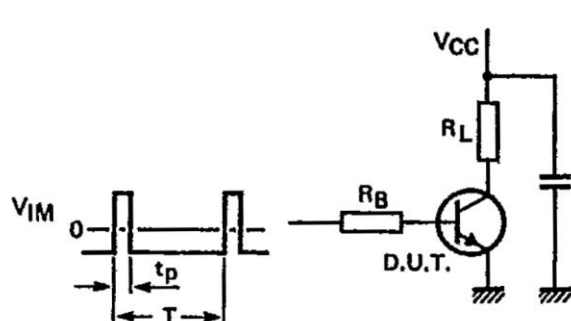
DYNAMIC CHARACTERISTICS

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Switching times resistive load (Figs 3 and 4)					BUS14	BUS14A	Units
t_{on}	Turn-on time	$I_{Con} = 20A$	$I_{Bon} = -I_{Boff} = 4A$	<	1	-	μs
t_s	Storage time	$I_{Con} = 20A$	$I_{Bon} = -I_{Boff} = 4A$	<	4	-	
t_f	Fall time	$I_{Con} = 20A$	$I_{Bon} = -I_{Boff} = 4A$	<	0.8	-	
t_{on}	Turn-on time	$I_{Con} = 16A$	$I_{Bon} = -I_{Boff} = 3.2A$	<	-	1	
t_s	Storage time	$I_{Con} = 16A$	$I_{Bon} = -I_{Boff} = 3.2A$	<	-	4	
t_f	Fall time	$I_{Con} = 16A$	$I_{Bon} = -I_{Boff} = 3.2A$	<	-	0.8	
Switching times inductive load (Figs 5 and 6)							
t_s	Storage time	$I_{Con} = 20A$	$I_{Bon} = -I_{Boff} = 4A$	typ	2.8	-	μs
t_s	Storage time	$I_{Con} = 20A$	$I_{Bon} = -I_{Boff} = 4A$	<	3.6	-	
t_f	Fall time	$I_{Con} = 20A$	$I_{Bon} = -I_{Boff} = 4A$	typ	80	-	ns
t_f	Fall time	$I_{Con} = 20A$	$I_{Bon} = -I_{Boff} = 4A$	<	150	-	
t_s	Storage time	$I_{Con} = 20A; T_J = 100^\circ C$	$I_{Bon} = -I_{Boff} = 4A$	typ	3.1	-	μs
t_s	Storage time	$I_{Con} = 20A; T_J = 100^\circ C$	$I_{Bon} = -I_{Boff} = 4A$	<	4.0	-	
t_f	Fall time	$I_{Con} = 20A; T_J = 100^\circ C$	$I_{Bon} = -I_{Boff} = 4A$	typ	140	-	ns
t_f	Fall time	$I_{Con} = 20A; T_J = 100^\circ C$	$I_{Bon} = -I_{Boff} = 4A$	<	300	-	
t_s	Storage time	$I_{Con} = 16A$	$I_{Bon} = -I_{Boff} = 3.2A$	typ	-	2.8	μs
t_s	Storage time	$I_{Con} = 16A$	$I_{Bon} = -I_{Boff} = 3.2A$	<	-	3.6	
t_f	Fall time	$I_{Con} = 16A$	$I_{Bon} = -I_{Boff} = 3.2A$	typ	-	80	ns
t_f	Fall time	$I_{Con} = 16A$	$I_{Bon} = -I_{Boff} = 3.2A$	<	-	150	
t_s	Storage time	$I_{Con} = 16A; T_J = 100^\circ C$	$I_{Bon} = -I_{Boff} = 3.2A$	typ	-	3.1	μs
t_s	Storage time	$I_{Con} = 16A; T_J = 100^\circ C$	$I_{Bon} = -I_{Boff} = 3.2A$	<	-	4.0	
t_f	Fall time	$I_{Con} = 16A; T_J = 100^\circ C$	$I_{Bon} = -I_{Boff} = 3.2A$	typ	-	140	ns
t_f	Fall time	$I_{Con} = 16A; T_J = 100^\circ C$	$I_{Bon} = -I_{Boff} = 3.2A$	<	-	300	

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$V_{CC} = 250 \text{ V}$
 $V_{IM} = -6 \text{ to } +8 \text{ V}$
 $t_p = 20 \mu\text{s}$
 $\frac{t_p}{T} = 0,01$

Fig 3. Test Circuit Resistive Load

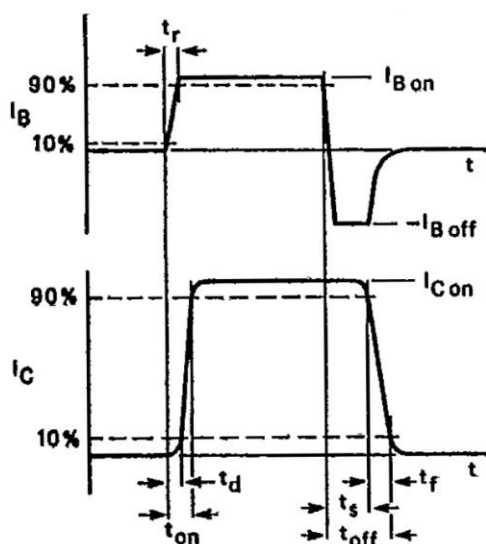


Fig 4. Switching Times Waveform Resistive Load

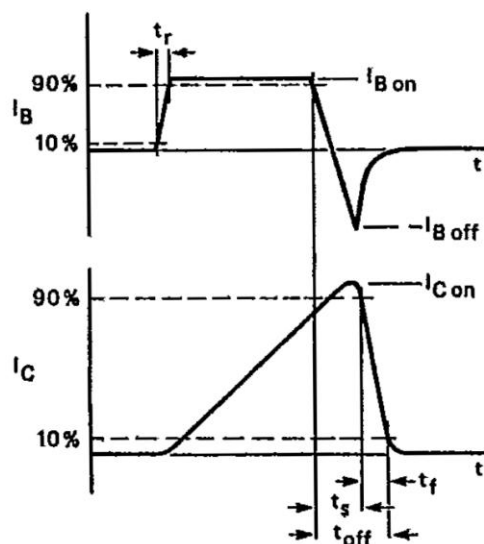
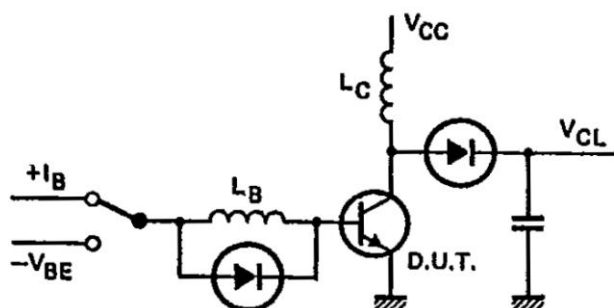


Fig 5. Switching Times Waveform Inductive Load



$V_{CC} = 30 \text{ V}$
 $V_{CL} = 300 \text{ V}$
 $L_B = 1 \mu\text{H}$
 $L_C = 200 \mu\text{H}$
 $V_{BE} = 5 \text{ V}$

Fig 6. Test Circuit Resistive Load

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TYPICAL CHARACTERISTICS

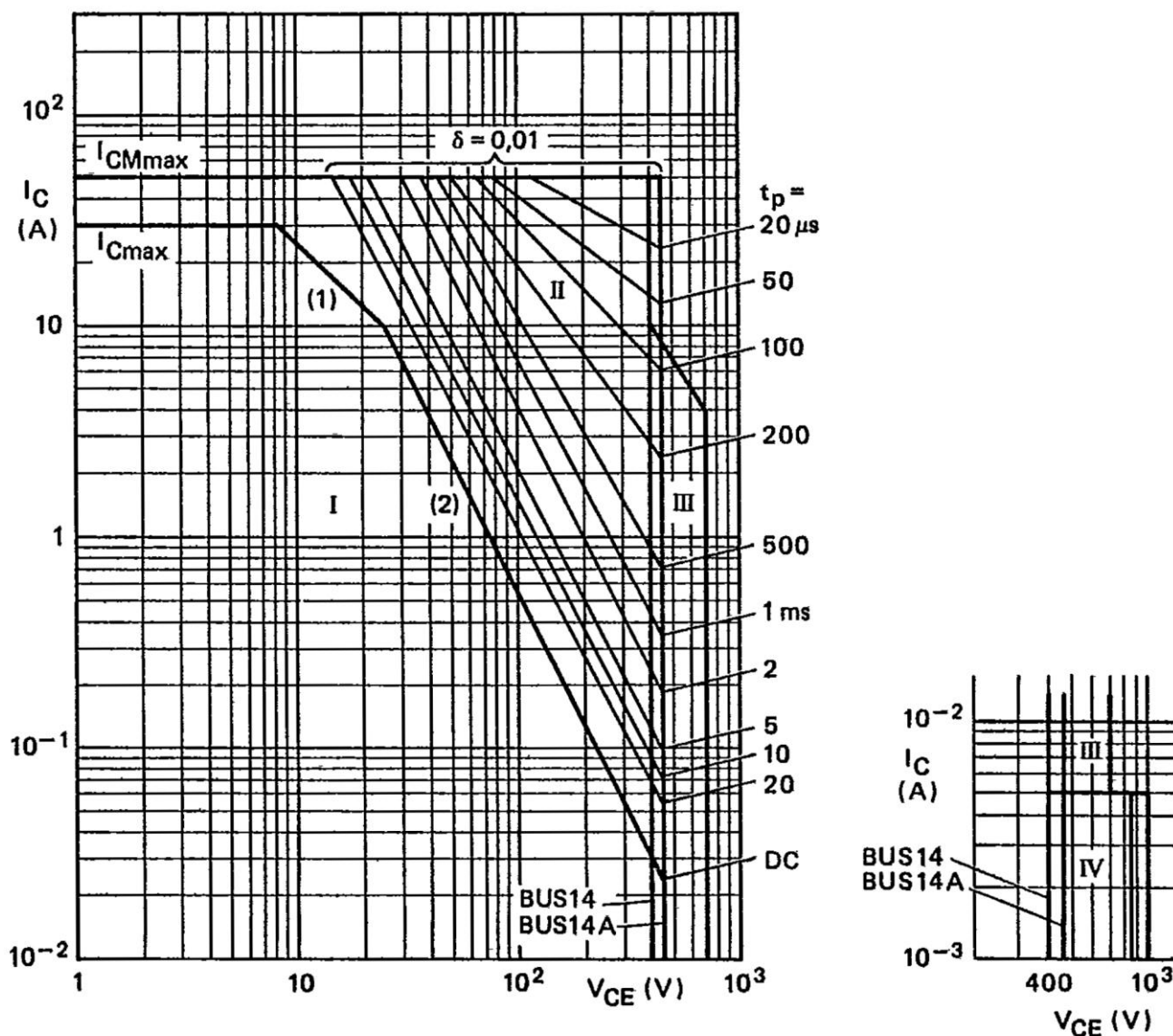


Fig 7. Safe Operating Area at $T_{mb} \leq 25^{\circ}\text{C}$

- (1) $P_{tot(max)}$ and $P_{peak(max)}$ lines.
- (2) **Second-breakdown limits (independent of temperature).**
- I Region of permissible d.c. operation.
- II Permissible extension for repetitive pulse operation.
- III Area of permissible operation during turn-on in single transistor converters provided $R_{BE} \leq 100\Omega$ and $t_p \leq 0.6\mu\text{s}$.
- IV Repetitive pulse operation in this region is permissible provided $V_{BE} \leq 0$ and $t_p \leq 2\text{ms}$.

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TYPICAL CHARACTERISTICS

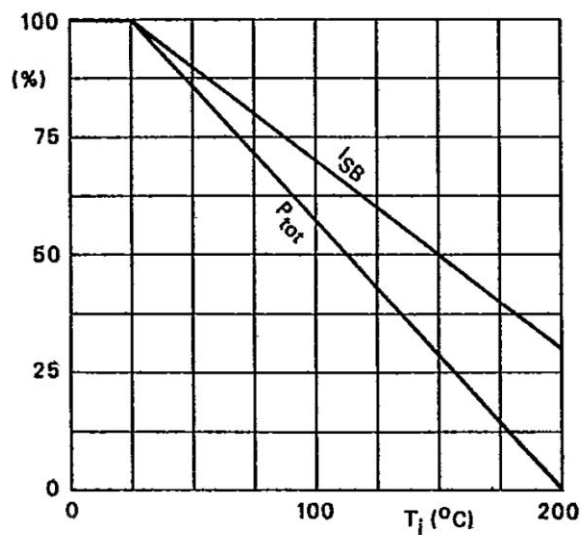


Fig. 8. Total power dissipation and second-breakdown current derating curve.

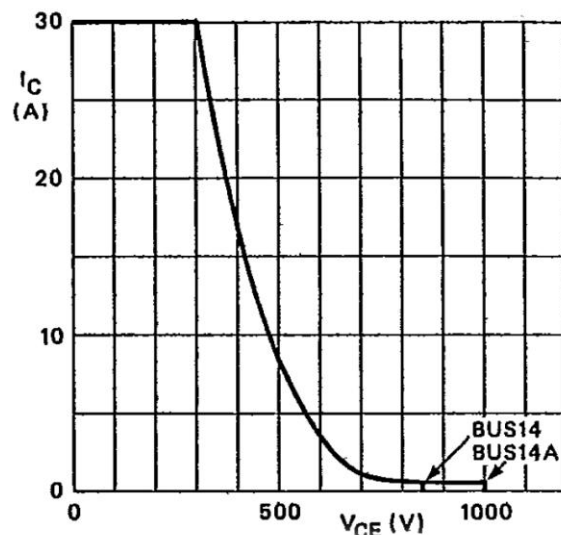


Fig. 9 Reverse Bias SOAR

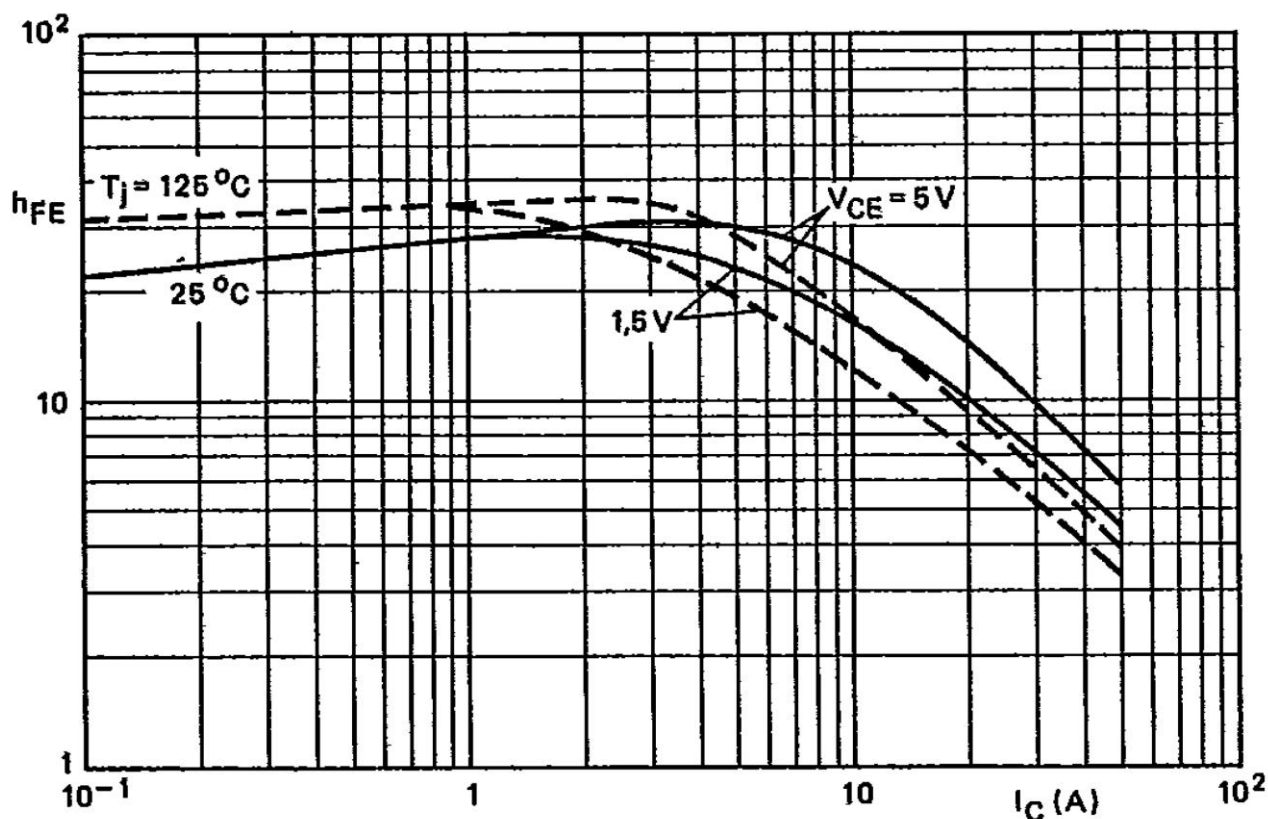


Fig. 10. Typical values d.c. current gain.

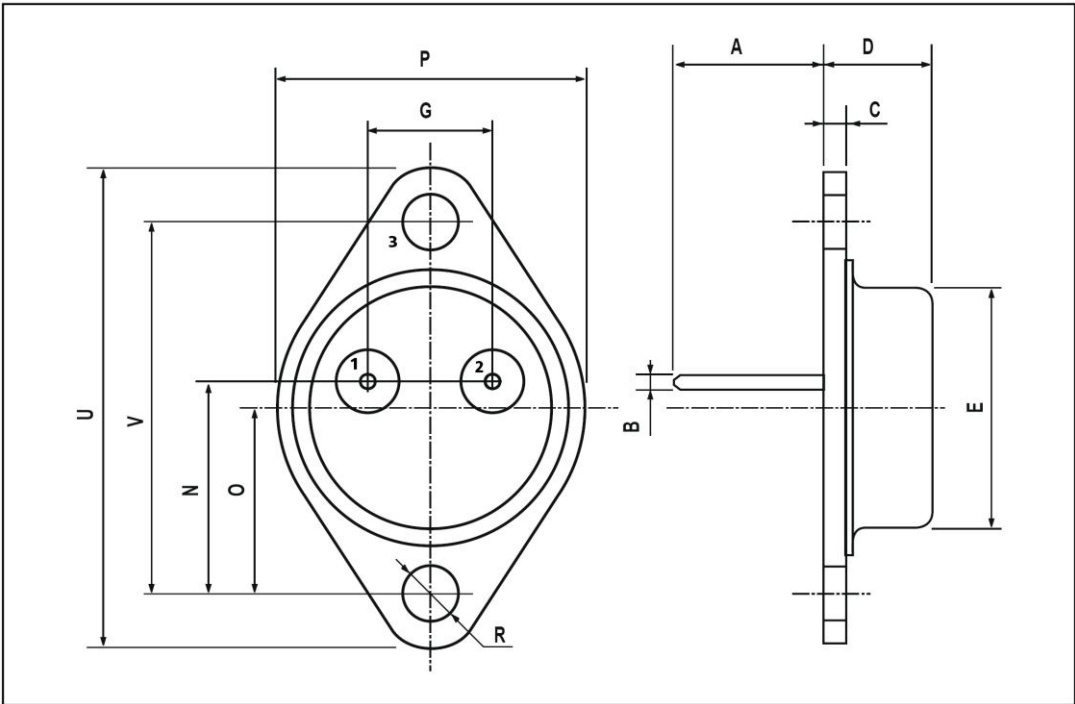
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MECHANICAL DATA

Dimensions in mm

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	



TO-3

Pin 1 - Emitter Pin 2 - Base Case (3) – Collector