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	$t_p \leq 2ms$	50A	
I_B	Base Current	(dc)	6A	
I_{BM}	Peak Base Current	$t_p \leq 2ms$	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
$R_{\theta J\text{-}mb}$	Thermal Resistance, Junction To mounting base			0.7	K/W

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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	

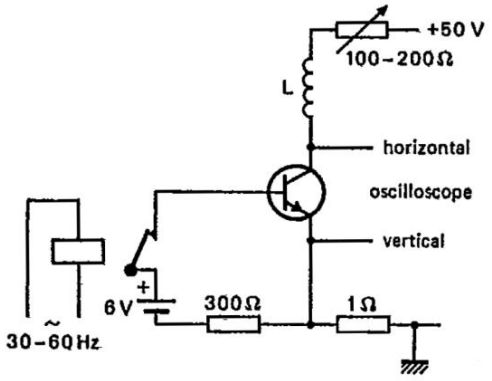


Fig 1. Test circuit for $V_{CEOsust}$

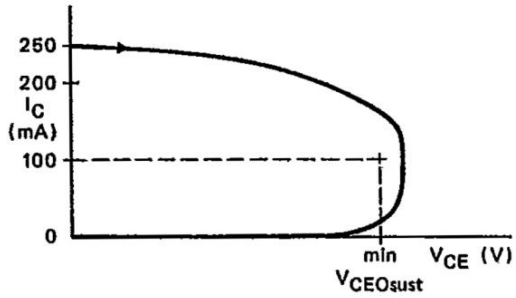
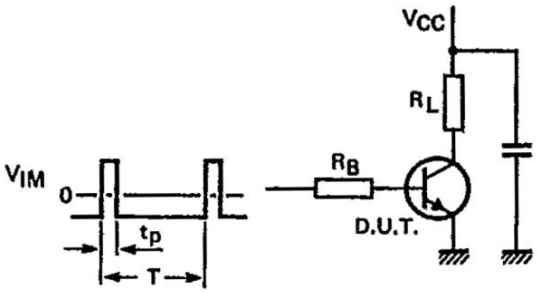


Fig 2. Oscilloscope display for sustaining voltage

DYNAMIC CHARACTERISTICS

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°C	I_{Bon} = -I_{Boff} = 4A	typ	3.1	-	µs
t_s	Storage time	I_{Con} = 20A; T_J= 100°C	I_{Bon} = -I_{Boff} = 4A	<	4.0	-	
t_f	Fall time	I_{Con} = 20A; T_J= 100°C	I_{Bon} = -I_{Boff} = 4A	typ	140	-	ns
t_f	Fall time	I_{Con} = 20A; T_J= 100°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°C	I_{Bon} = -I_{Boff} = 3.2A	typ	-	3.1	µs
t_s	Storage time	I_{Con} = 16A; T_J= 100°C	I_{Bon} = -I_{Boff} = 3.2A	<	-	4.0	
t_f	Fall time	I_{Con} = 16A; T_J= 100°C	I_{Bon} = -I_{Boff} = 3.2A	typ	-	140	ns
t_f	Fall time	I_{Con} = 16A; T_J= 100°C	I_{Bon} = -I_{Boff} = 3.2A	<	-	300	



V_{CC} = 250 V
V_{IM} = −6 to +8 V
t_p = 20 μs
$\frac{t_p}{T}$ = 0,01

Fig 3. Test Circuit Resistive Load

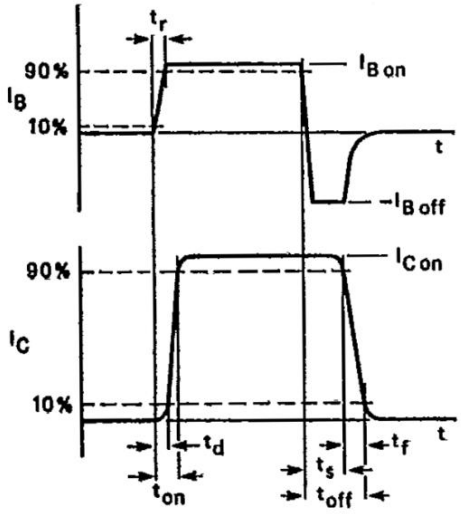


Fig 4. Switching Times Waveform Resistive Load

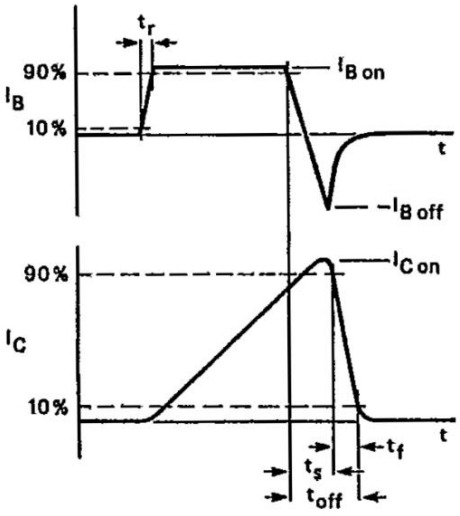
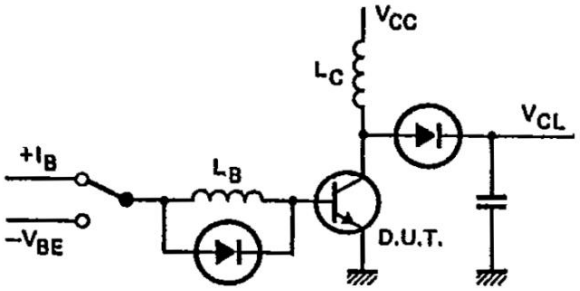


Fig 5. Switching Times Waveform Inductive Load



V_{CC} = 30 V
V_{CL} = 300 V
L_B = 1 μH
L_C = 200 μH
V_{BE} = 5 V

Fig 6. Test Circuit Resistive Load

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TYPICAL CHARACTERISTICS

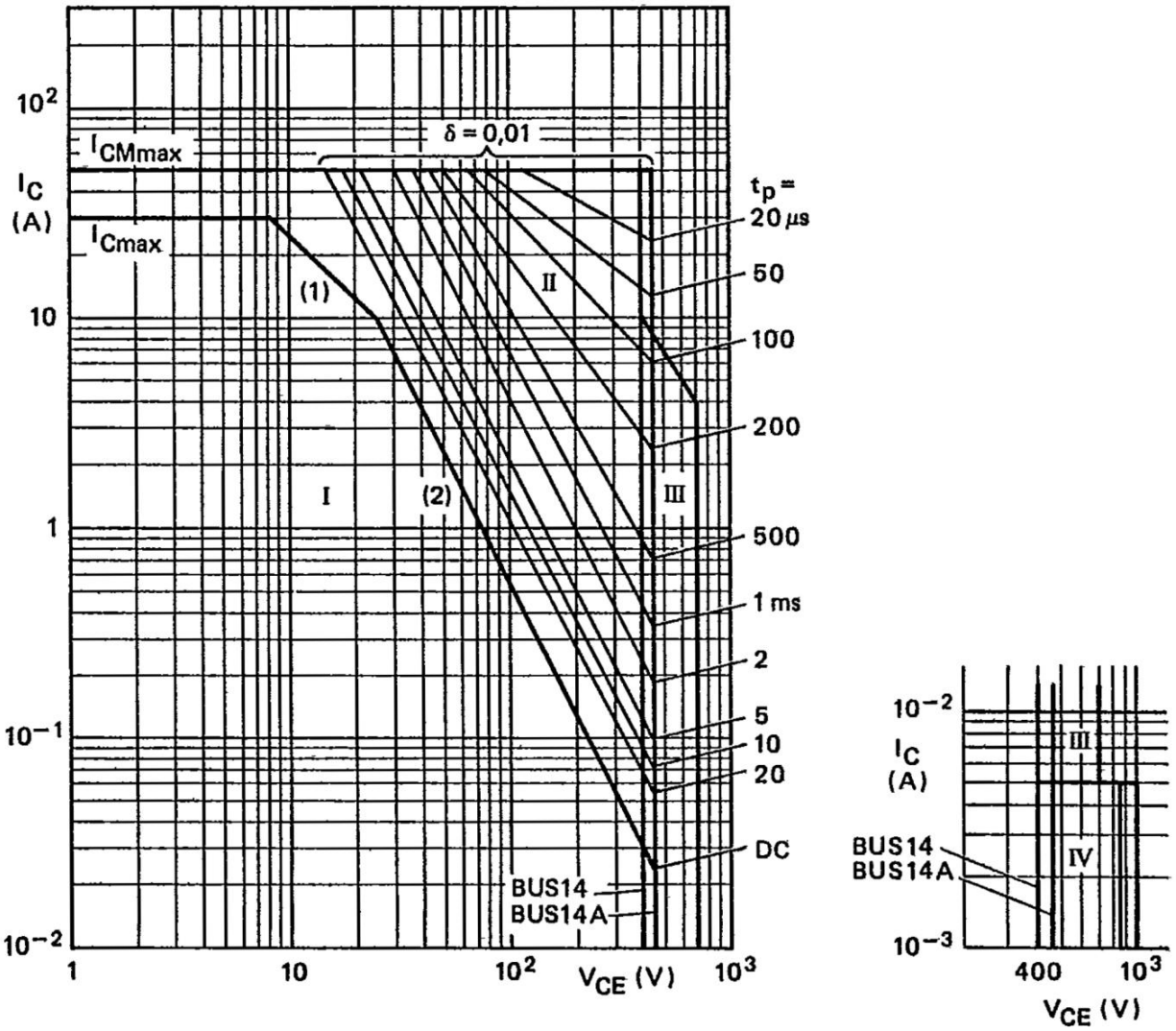

Fig 7. Safe Operating Area at $T_{mb} \leq 25°C$

(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 $t_p \leq 0.6\mu s$.

IV Repetitive pulse operation in this region is permissible provided $V_{BE} \leq 0$ and $t_p \leq 2ms$.

TYPICAL CHARACTERISTICS

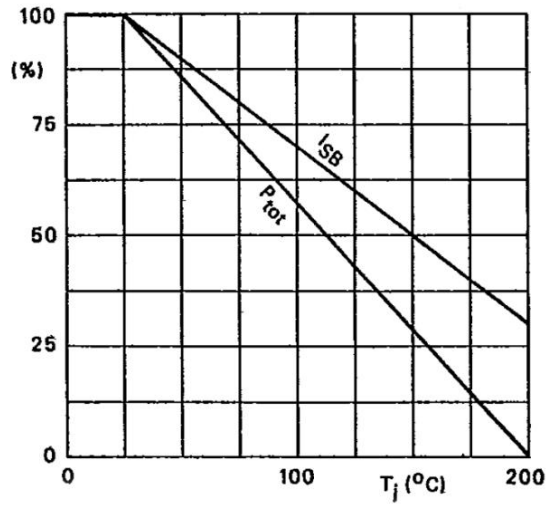

Fig 8. Total power dissipation and second-breakdown current derating curve.

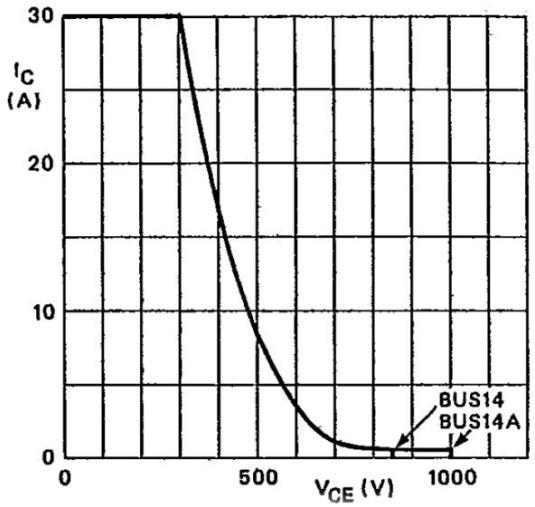

Fig. 9 Reverse Bias SOAR

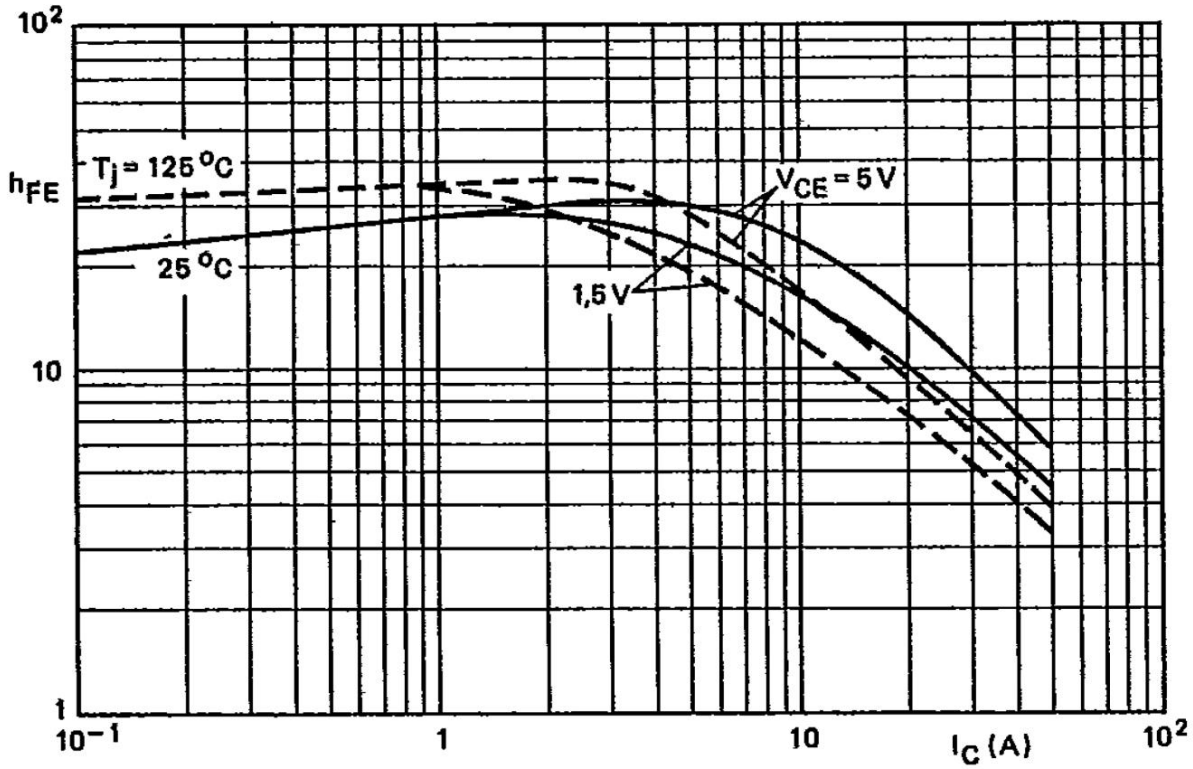

Fig 10. Typical values d.c. current gain.

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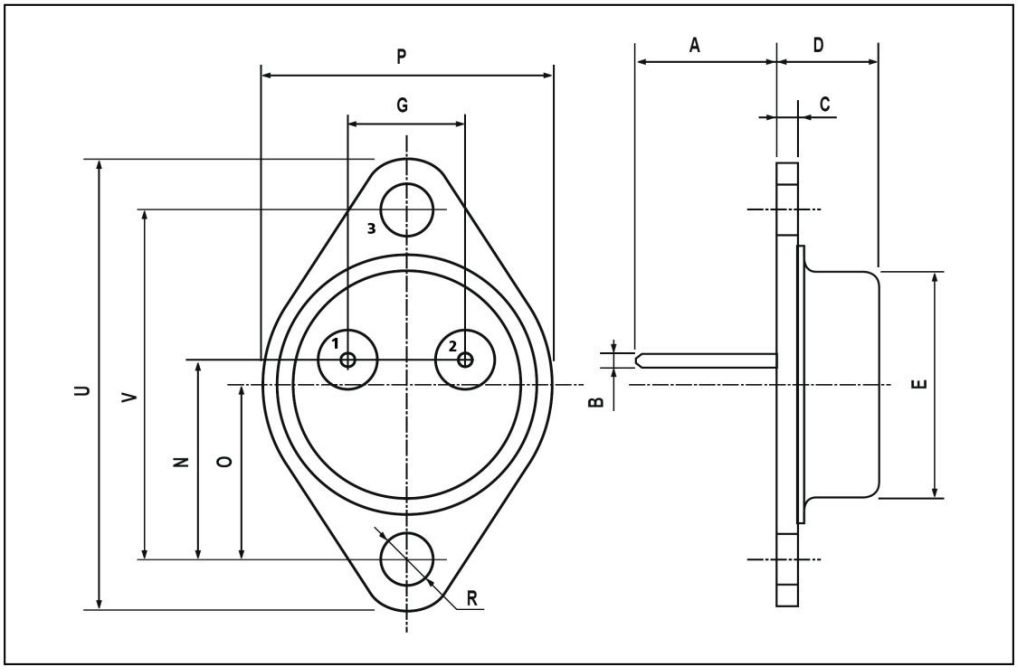
MECHANICAL DATA

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