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	

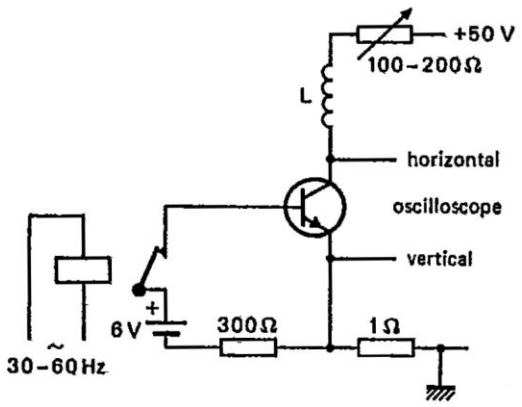

Fig 1. Test circuit for $V_{CEOsust}$

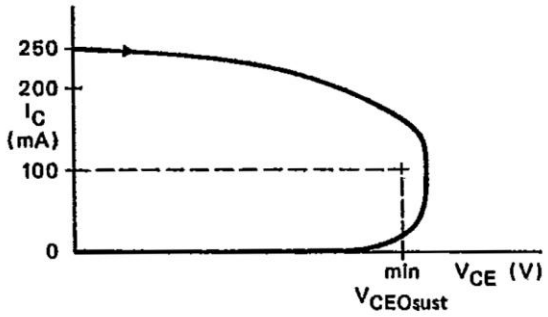

Fig 2. Oscilloscope display for sustaining voltage

DYNAMIC CHARACTERISTICS

HIGH POWER SILICON NPN TRANSISTOR BUS14/BUS14A

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	

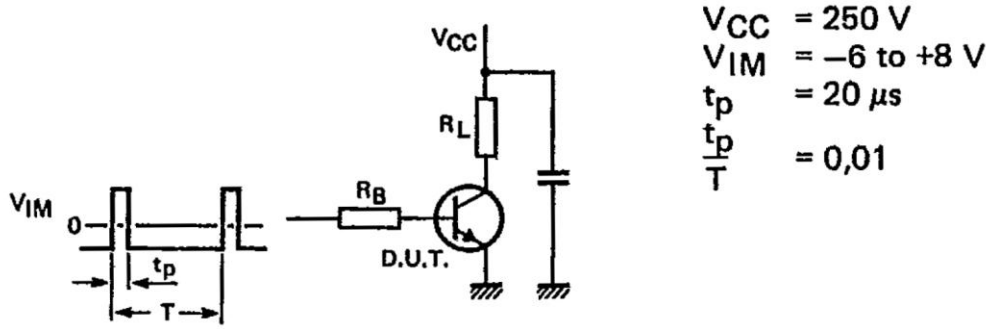

Fig 3. Test Circuit Resistive Load

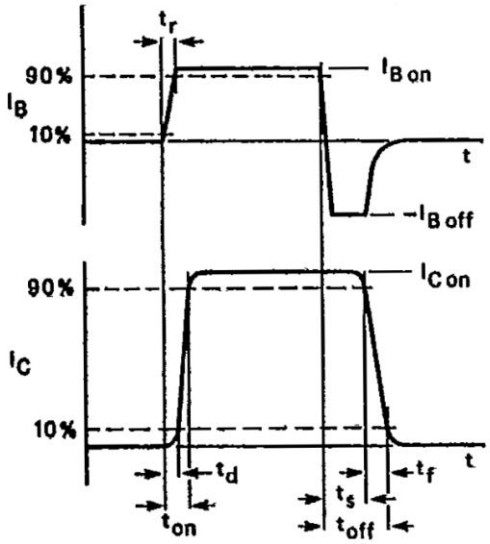

Fig 4. Switching Times Waveform Resistive Load

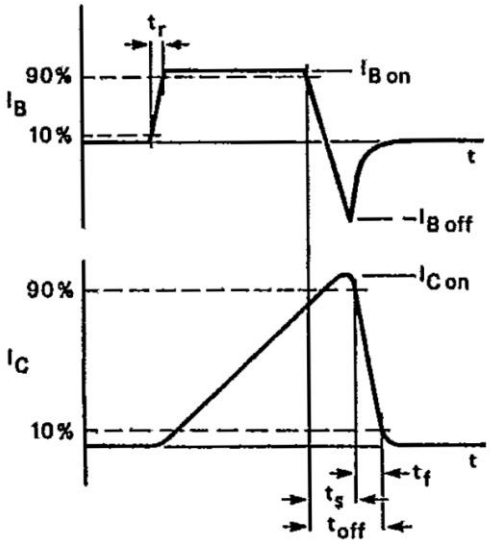

Fig 5. Switching Times Waveform Inductive Load

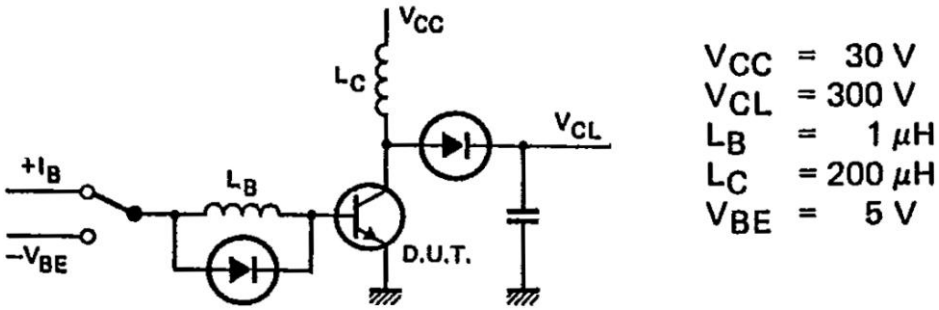

Fig 6. Test Circuit Resistive Load

TYPICAL CHARACTERISTICS

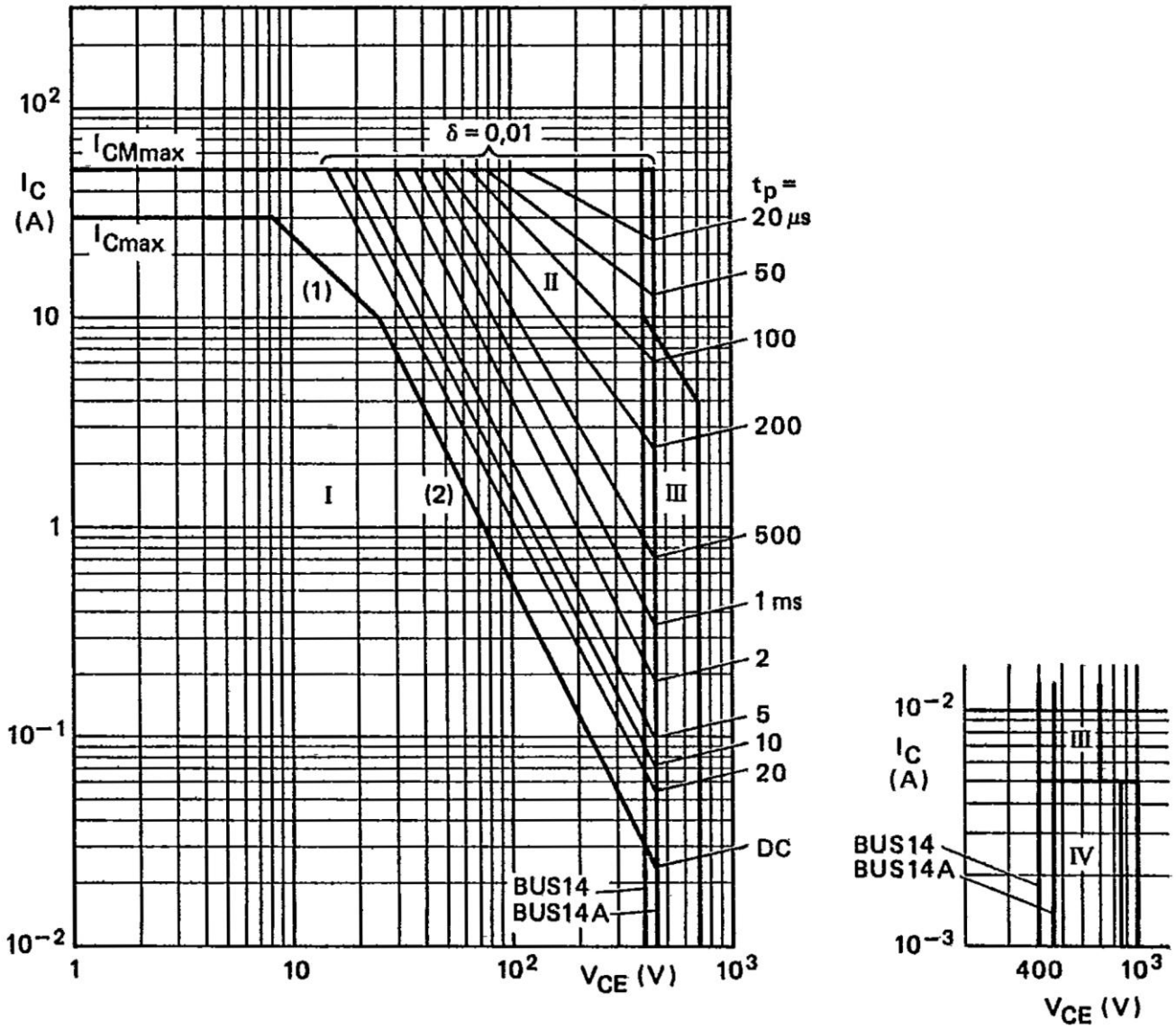

Fig 7. Safe Operating Area at T_{mb} ≤ 25°C

(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} ≤100Ω and t_p≤0.6µs.
IV Repetitive pulse operation in this region is permissible provided V_{BE} ≤ 0 and t_p ≤ 2ms.

TYPICAL CHARACTERISTICS

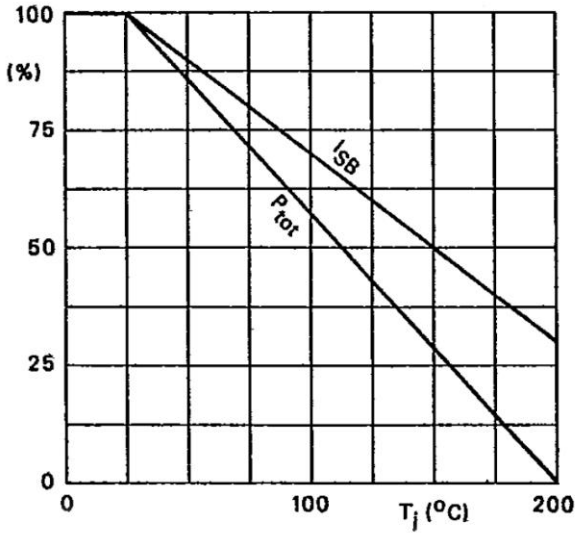

Fig 8. Total power dissipation and second-breakdown current derating curve.

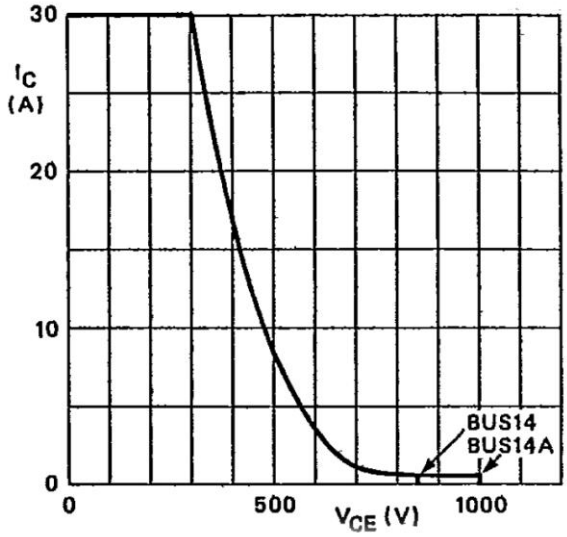

Fig. 9 Reverse Bias SOAR

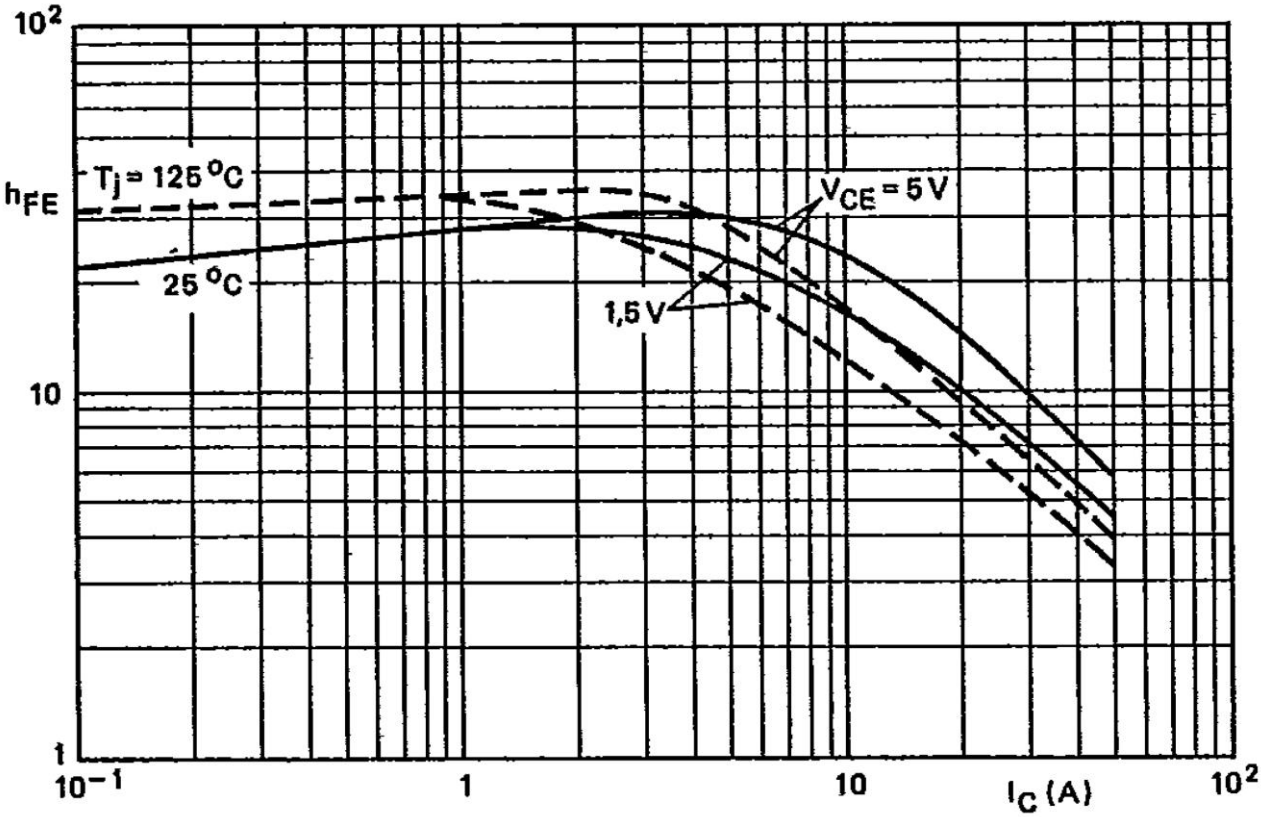

Fig 10. Typical values d.c. current gain.

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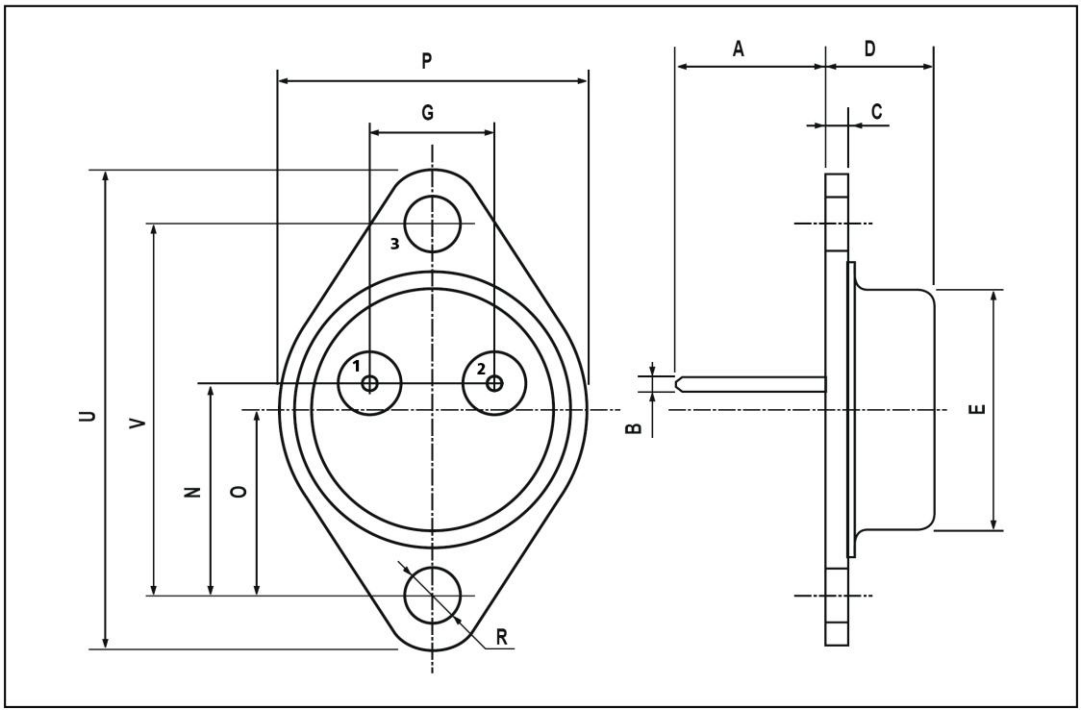
MECHANICAL DATA

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