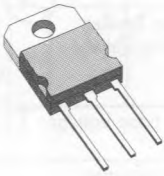
SGS-THOMSON MICROELECTRONICS

2N6933/34/35

NPN HIGH VOLTAGE POWER TRANSISTORS

- OFF-LINE POWER SUPPLIES
- HIGH VOLTAGE INVERTERS
- SWITCHING REGULATORS



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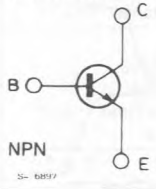
INTERNAL SCHEMATIC DIAGRAM



DESCRIPTION

High voltage, high speed, switching power transistors suited for use on medium voltage supply.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		2N6933	2N6934	2N6935	Unit
V_{CEV}	Collector-emitter Voltage	(V_{BE} = – 1.5 V)	450	550	650	V
V_{CEX}	Collector-emitter Voltage		350	400	450	V
V_{CEO}	Collector-emitter Voltage	(I_B = 0)	300	350	400	V
V_{EBO}	Emitter-base Voltage	(I_C = 0)	8			V
I_C	Collector Current		15			A
I_{CM}	Collector Peak Current		23			A
I_B	Base Current		5			A
I_{BM}	Base Peak Current		7			A
I_C	Emitter Current		20			A
I_{CM}	Emitter Peak Current		30			A
P_{tot}	Total Dissipation at T_C < 25 °C		175			W
T_{stg}	Storage Temperature		– 65 to 150			°C
T_j	Max. Operating Junction Temperature		150			°C

THERMAL DATA

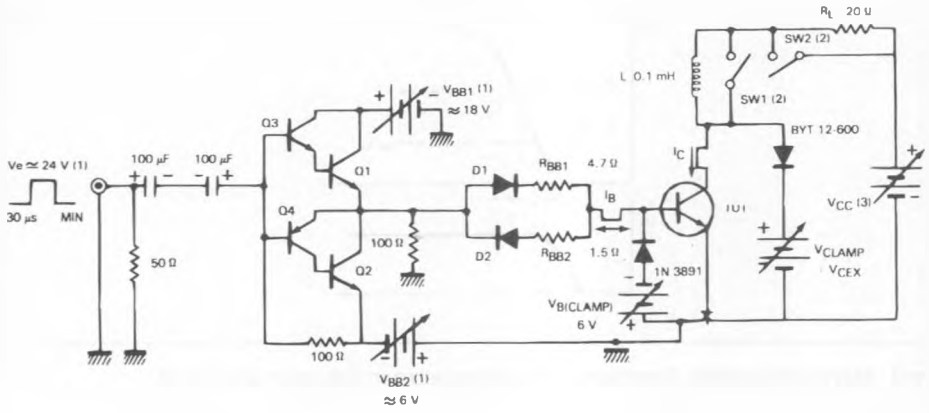
$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case	Max.	0.71	°C/W
T_L	Maximum Lead Temperature for Soldering Purpose		235	°C

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CEV}	Collector Cutoff Current	$V_{CE} = V_{CEV}$ $V_{BE} = -1.5$ V $V_{CE} = V_{CEV}$ $V_{BE} = -1.5$ V T_c = 100 °C			0.1 1	mA mA
I_{EBO}	Emitter Cutoff Current (I_C = 0)	V_{EB} = 8 V			2	mA
$V_{CEO(sus)}$*	Collector Emitter sustaining Voltage	I_C = 0.2 A L = 25 mH for **2N6933** for **2N6934** for **2N6935**	 300 350 400			 V V V
V_{EBO}	Emitter-base Voltage (I_C = 0)	I_E = 50 mA	8			V
$V_{CE(sat)}$*	Collector-emitter Saturation Voltage	I_C = 15 A I_B = 3 A I_C = 15 A I_B = 3 A T_C = 100 °C			1 2	V V
$V_{BE(sat)}$*	Base-emitter Saturation Voltage	I_C = 15 A I_B = 3 A I_C = 15 A I_B = 3 A T_C = 100 °C			1.5 1.5	V V
h_{FE}*	DC Current Gain	I_C = 15 A V_{CE} = 3 V	8		35	
h_{fe}	Small Signal Current Gain	I_C = 1 A V_{CE} = 10 V f = 5 MHz	2		6	
C_{cbo}	Collector-base Capacitance	V_{CB} = 10 V f = 1 MHz	150		400	pF
		RESISTIVE LOAD				
t_d	Delay Time	V_{CC} = 300 V I_C = 15 A			0.1	µs
t_r	Rise Time	R_C = 20 Ω $I_{B1} = -I_{B2}$ = 3 A			0.7	µs
t_s	Storage Time	V_{BB} = −5 V t_p = 30 µs			2.5	µs
t_f	Fall time	see fig. 1			0.5	µs
		INDUCTIVE LOAD				
t_s	Storage Time	V_{CC} = 50 V I_C = 15 A			3.5	µs
t_f	Fall Time	L_C = 100 µH $I_{B1} = -I_{B2}$ = 3 A			0.4	µs
t_c	Crossover Time	R_{BB} = 1.5 Ω $V_{clamp} = V_{CEX}$ T_c = 100 °C see fig. 1			0.8	µs
di_c/dt	Turn-on Current Slope	V_{CC} = 300 V I_B = 4.5 A R_C = 0 t_p = 3 µs see fig. 2	75			A/µs
V_{CEX}	Collector-emitter Sustaining Voltage	V_{CC} = 50 V I_C = 15 A L_C = 100 µH $I_{B1} = -I_{B2}$ = 3 A R_{BB} = 1.5 Ω $V_{clamp} = V_{CEX}$ T_c = 100 °C see fig. 3 for **2N6933** for **2N6934** for **2N6935**	 350 400 450			 V V V

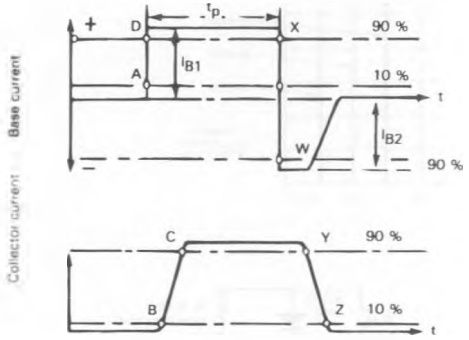
* Pulse duration = 300 µs, duty cycle 2 %.

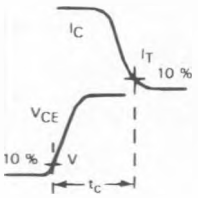
Figure 1 : Switching Time Measurements.



(1) Adjust for I_{B1} and $I_{B2} \pm 3A$.
(2) SW1 Closed for t_d, t_r, t_s, t_f, SW1 Open for t_c.
SW2 Closed for t_c, Open for t_d, t_r, t_s, t_f.
(3) V_{CC} : 300V for t_d, t_r, t_s, t_f.
V_{CC} : 50V for t_c.

Q1, Q2 BUT60
Q3 BD243
Q4 BD244
D1, D2 BYW100





t_d A-$B_{transition}$ A-D : $\sigma \leq 0.3\mu s$
t_r B-$C_{transition}$ X-W : $\leq 0.3\mu s$
t_s X-Y
t_f Y-Z
t_c V-I

Figure 2 : Turn-on Switching Waveforms.

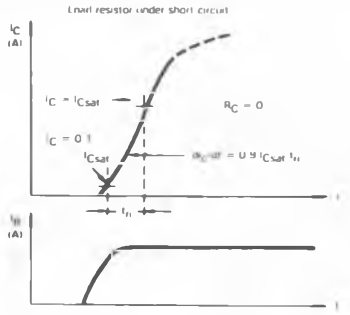
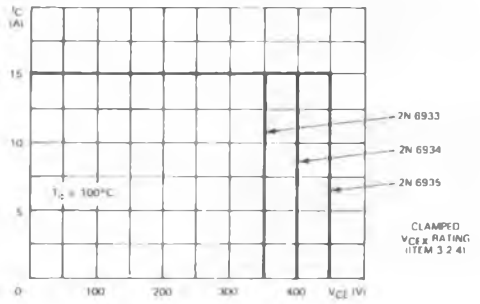
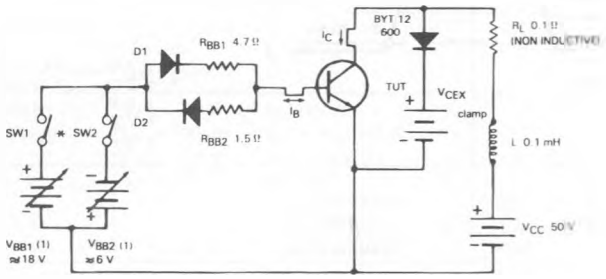


Figure 3 : Maximum Operating Conditions for Switching between Saturation and Cut off.





(1) Adjust for I_{B1} and I_{B2} ± 3A.
* SW1 and SW2 : Electronic Switches.
D1-D2 = BYW100