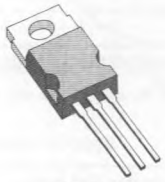
SGS-THOMSON MICROELECTRONICS

MJE13006
MJE13007/A

MOTOR CONTROL, SWITCH REGULATORS

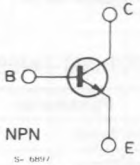
DESCRIPTION

The MJE13006, MJE13007 and MJE13007A are silicon multiepitaxial mesa NPN transistors. They are mounted in Jedec TO-220 plastic package, intended for use in motor controls, switching regulator's etc.



TO-220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value			Unit
		MJE13006	MJE13007	MJE13007A	
V_{CEO}	Collector-emitter Voltage ($V_B = 0$)	300	400	400	V
V_{CEV}	Collector-emitter Voltage	600	700	850	V
V_{EBO}	Emitter-base Voltage ($I_C = 0$)	9			V
I_C	Collector Current	8			A
I_{CM}	Collector Peak Current	16			A
I_B	Base Current	4			A
I_{BM}	Base Peak Current	8			A
I_E	Emitter Current	12			A
I_{EM}	Emitter Peak Current	24			A
P_{tot}	Total Power Dissipation at $T_{case} \leq 25°C$	80			W
T_{stg}	Storage Temperature	– 65 to 150			°C
T_j	Junction Temperature	150			°C

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case	Max	1.56	°C/W

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{EBO}	Emitter Cutoff Current (I_C = 0)	V_{EB} = 9 V			1	mA
I_{CEV}	Collector Cutoff Current (V_{BE} = 1.5V)	V_{CEV} = rated value V_{CEV} = rated value T_{case} = 100°C			1 5	mA mA
$V_{CEO(sus)}$*	Collector-Emitter Sustaining Voltage (I_B = 0)	I_C = 10 mA for **MJE13006** for **MJE13007/13007A**	 300 400		 	 V V
$V_{CE(sat)}$*	Collector-emitter Saturation Voltage	I_C = 2A I_B = 0.4A I_C = 5A I_B = 1A I_C = 8A I_B = 2A I_C = 5A I_B = 1A T_{case} = 100°C			1 1.5 3 2	V V V V
$V_{BE(sat)}$*	Base-emitter Saturation Voltage	I_C = 2A I_B = 0.4A I_C = 5A I_B = 1A I_C = 5A I_B = 1A T_{case} = 100°C			1.2 1.6 1.5	V V V
h_{FE}*	DC Current Gain	I_C = 2A V_{CE} = 5V I_C = 5A V_{CE} = 5V	8 6		40 30	
f_T	Transition Frequency	I_C = 500mA V_{CE} = 10V f = 1MHz	4			MHz
C_{CBO}	Output Capacitance	V_{CB} = 10V I_E = 0 f = 0.1MHz		110		pF

RESISTIVE SWITCHING TIMES (fig. 2)

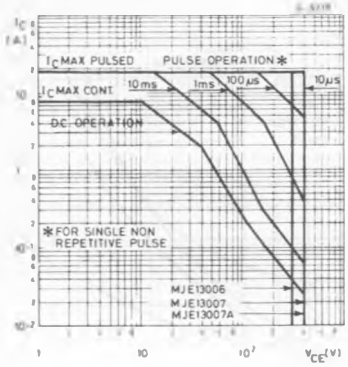
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_{on}	Turn-on Time	V_{CC} = 125 V I_C = 5A I_{B1} = − I_{B2} = 1A t_p = 25µs Duty Cycle < 1%			0.7	µs
t_s	Storage Time				3	µs
t_f	Fall Time				0.7	µs

INDUCTIVE SWITCHING TIMES (fig. 1)

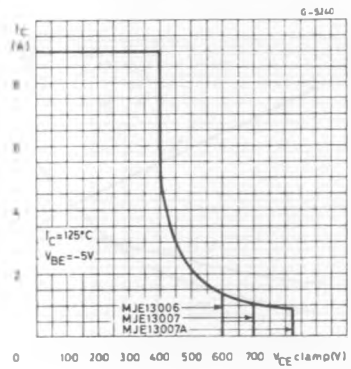
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_f	Fall Time	V_{CC} = 125 V I_C = 5A I_{B1} = 1A t_p = 25µs Duty Cycle < 1% T_{case} = 100°C			0.3	µs
		V_{CC} = 125 V I_C = 5A I_{B1} = 1A t_p = 25µs Duty Cycle ≤ 1%			0.6	µs

* Pulsed : pulse duration ≤ 300 µs, duty cycle < 1.5 %.

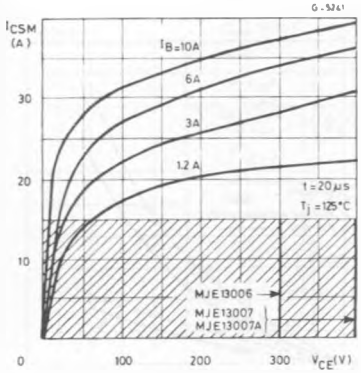
Safe Operating Areas.



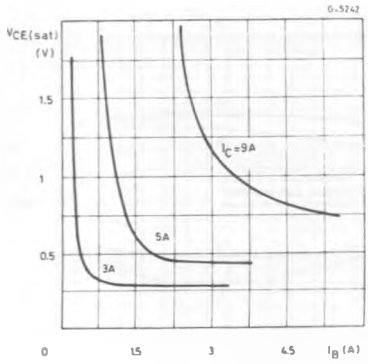
Clamped Reverse Bias operating Areas.



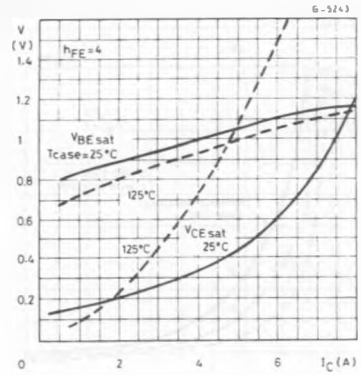
Forward Biased Accidental Overload Area (see fig. 3).



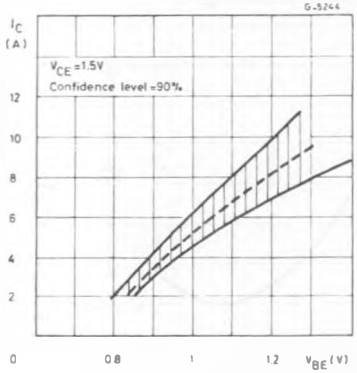
Collector Saturation Voltage.



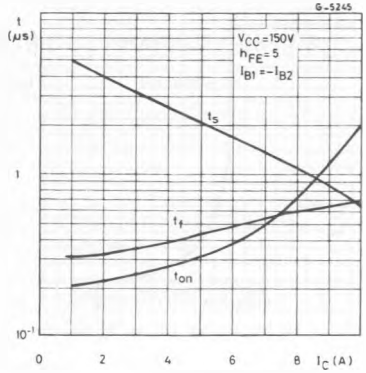
Saturation Voltages.



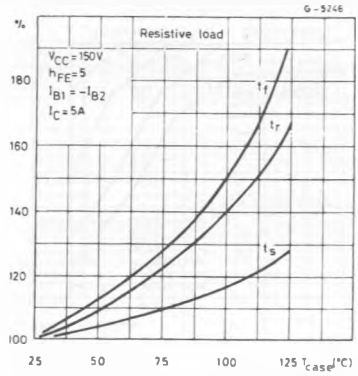
Collector Current Spread vs. Emitter Voltage.



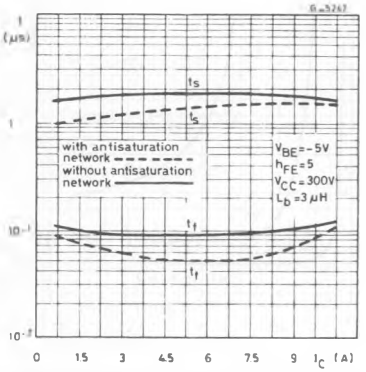
Switching Times Resistive Load (see fig. 2).



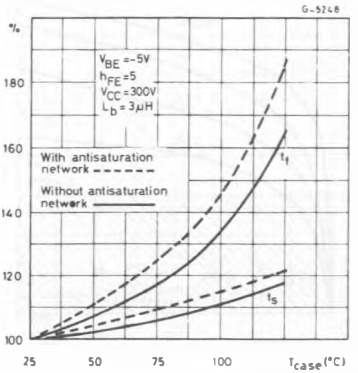
Switching Times Percentage Variation vs. Case Temperature.



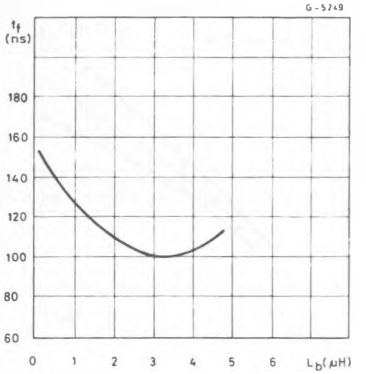
Switching Times Inductive Load (see fig. 1).



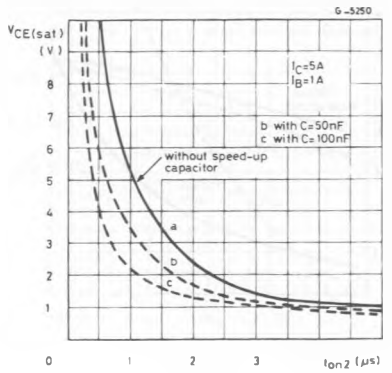
Switching Times Inductive Load vs. Case Temperature.



Fall Times vs. Lb (see fig. 1).



Dynamic Collector-emitter Saturation Voltage (see fig. 4).



DC Current Gain.

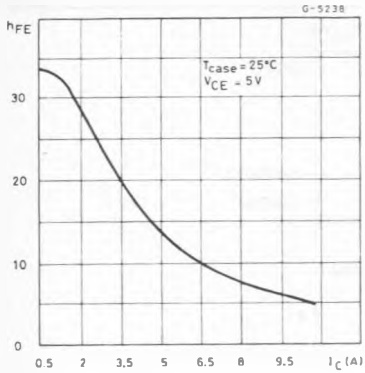


Figure 1 : Switching Times Test Circuit on Inductive Load, with and without Antisaturation Network.

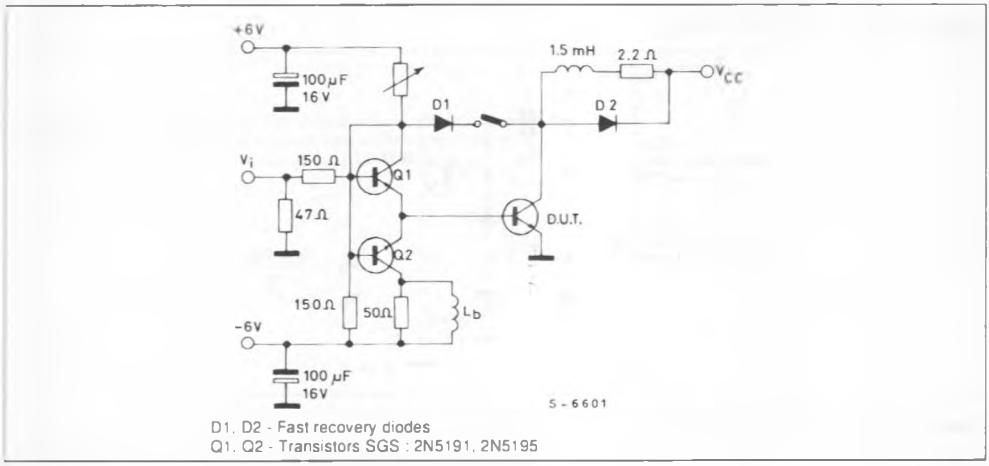


Figure 2 : Switching Times Test Circuit on Resistive Load.

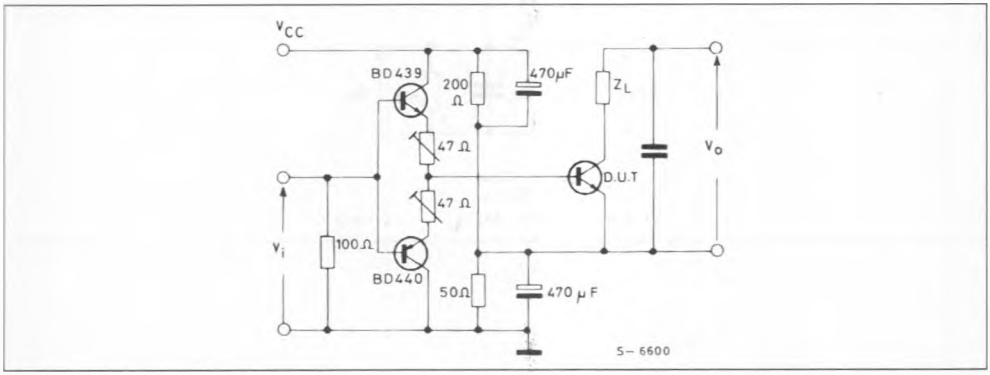


Figure 3 : Forward Biased Accidental Overload Area Test Circuit.

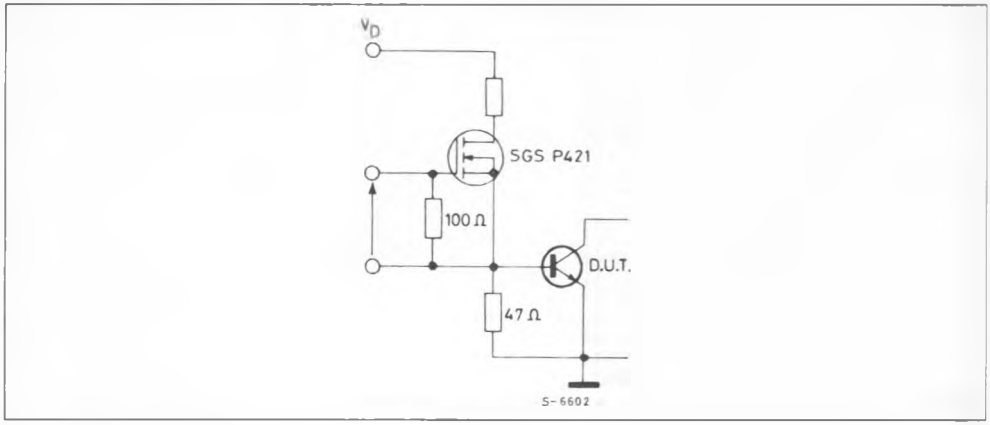


Figure 4 : $V_{CE(sat)}$ Dyn. Test Circuit.

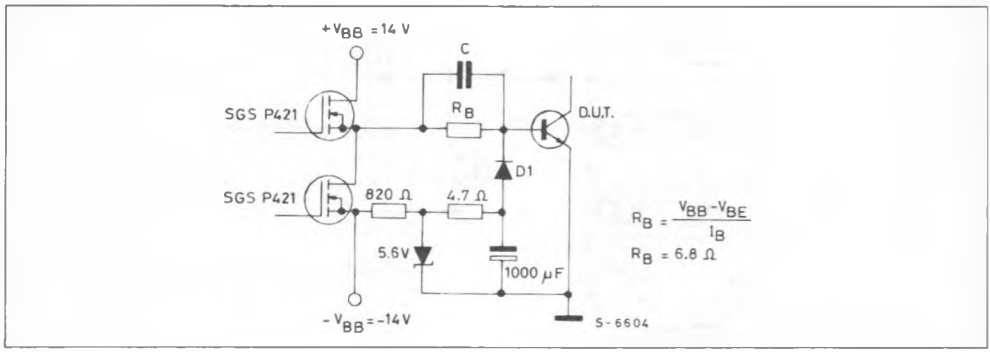


Figure 5 : Equivalent Input Schematic Circuit at Turn-on.

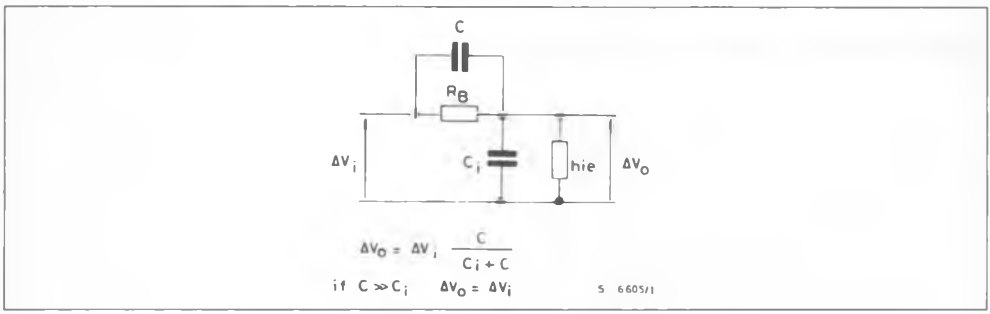
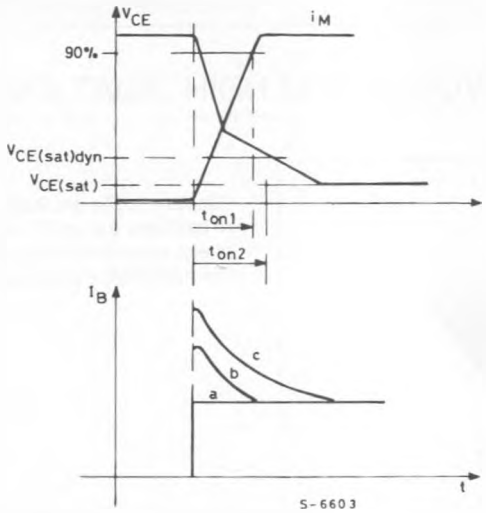


Figure 6 : Remarks to VCE(sat) Dyn. Test Circuit (fig. 4).



The speed-up capacitor decreases the V_{CE}(sat) dyn. as shown in diagram (figure 6).
The 50 nF capacitor modifies the shape of base current with a overshoot