

6367254 MOTOROLA SC (XSTRS/R F)

96D 80516 DT-33-13

T-33-15

**MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA**

**NPN Silicon
Power Transistors**

The 2N6676, 2N6677, 2N6678, MJH6676, MJH6677, and MJH6678 transistors are designed for high voltage switching applications such as:

- Off-Line Supplies
 - Converter Circuits
 - Pulse Width Modulated Regulators
- Specification Features —
- High Voltage Capability
 - Fast Switching Speeds
 - Low Saturation Voltages
 - High SOA Ratings

2N6648
See Page
3-209

**2N6676
2N6677
2N6678**

**MJH6676
MJH6677
MJH6678**

**NPN SILICON
POWER TRANSISTORS**

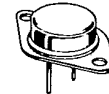
**15 AMPERES
300, 350, 400 VOLTS
125 and 175 WATTS**

MAXIMUM RATINGS

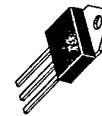
Rating	Symbol	2N6676 MJH6676	2N6677 MJH6677	2N6678 MJH6678	Unit
Collector-Emitter Voltage	V _{CEV}	450	550	650	Vdc
Collector-Emitter Voltage	V _{CEX}	350	400	450	Vdc
Collector-Emitter Voltage	V _{CEO}	300	350	400	Vdc
Emitter-Base Voltage	V _{EBO}	8			Vdc
Collector Current — Continuous	I _C	15			A _{dc}
Collector Current — Peak	I _{CM}	20			A _{dc}
Base Current — Continuous	I _B	5			A _{dc}
Maximum Lead Temperature At Distance > 1/16 in. (1.58 mm) from seating plane for 10 s max		235			°C

MAXIMUM THERMAL RATINGS

Rating	Symbol	2N6676 2N6677 2N6678	MJH6676 MJH6677 MJH6678	Unit
Thermal Resistance Junction to Case	R _{θJC}	1		°C/W
Power Dissipation T _C = 25°C Derate above 25°C	P _T	175 1	125 1	Watts W/C
Operating and Storage Junction	T _J , T _{stg}	-65 to +200		°C



CASE 1-05
TO-204AA
2N6676
2N6677
2N6678



CASE 340-01
TO-218AC
MJH6676
MJH6677
MJH6678



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96D 80517 D

2N6676, 2N6677, 2N6678
 MJH6676, MJH6677, MJH6678

T-33-13
 T-33-15

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector Cutoff Current ($V_{CE} = \text{Rated } V_{CEV}, V_{BE(\text{off})} = 1.5 \text{ Vdc}$) ($V_{CE} = \text{Rated } V_{CEV}, V_{BE(\text{off})} = 1.5 \text{ Vdc}$, $T_C = 100^\circ\text{C}$)	I_{CEV}	—	0.1 1	mA
Emitter Cutoff Current ($V_{EB} = 8 \text{ Vdc}, I_C = 0$)	I_{EBO}	—	2	mA
Collector-Emitter Sustaining Voltage ($I_C = 200 \text{ mA}, I_B = 0$)	$V_{CEO(\text{sus})}$	300 350 400	— — —	Vdc
Collector-Emitter Sustaining Voltage ($I_C = 15 \text{ A}, V_{CE(\text{pk})} = V_{\text{clamp}} = \text{Rated } V_{CEX}$)	$V_{CEX(\text{sus})}$	350 400 450	— — —	Vdc

SECOND BREAKDOWN

Second Breakdown Collector with Base Forward Biased	$I_{S/b}$	See Figure 1
Clamped Inductive SOA with Base Reverse Biased	RBSOA	See Figure 2

ON CHARACTERISTICS

DC Current Gain ($I_C = 15 \text{ A}, V_{CE} = 3 \text{ V}$)	h_{FE}	8	—	—
Base-Emitter Saturation Voltage ($I_C = 15 \text{ A}, I_B = 3 \text{ A}$)	$V_{BE(\text{sat})}$	—	1.5	Vdc
Collector-Emitter Saturation Voltage ($I_C = 15 \text{ A}, I_B = 3 \text{ A}$) ($I_C = 15 \text{ A}, I_B = 3 \text{ A}, T_C = 100^\circ\text{C}$)	$V_{CE(\text{sat})}$	—	1.5 2	Vdc

DYNAMIC CHARACTERISTICS

Current Gain ($I_C = 1 \text{ A}, V_{CE} = 10 \text{ Vdc}, f = 5 \text{ MHz}$)	$ h_{fe} $	3	10	—
Output Capacitance ($I_C = 1 \text{ A}, V_{CB} = 10 \text{ Vdc}, f = 0.1 \text{ MHz}$)	C_{ob}	150	500	pF

SWITCHING CHARACTERISTICS

Resistive Load								
Delay Time	$V_{CC} = 200 \text{ V}, I_C = 15 \text{ A},$ $I_{B1} = I_{B2} = 3 \text{ A}, t_p = 20 \mu\text{s},$ Duty Cycle $\leq 2\%$ $V_{B2} = 6 \text{ V}, R_L = 13.5 \Omega$ (See Figure 3)	$T_C = 25^\circ\text{C}$	t_d	—	0.1	μs		
Rise Time			t_r	—	0.6			
Storage Time			t_s	—	2.5			
Fall Time			t_f	—	0.5			
Delay Time			t_d	—	0.4			
Rise Time		t_r	—	1				
Storage Time		t_s	—	4				
Fall Time		t_f	—	1				
Inductive Load								
Cross Over Time		$L = 50 \mu\text{H}$ $V_{CE(\text{pk})} = V_{\text{clamp}} = \text{Rated } V_{CEX}$ (See Figure 3)	$T_C = 25^\circ\text{C}$	t_c	—		0.5	μs
	$T_C = 100^\circ\text{C}$		—		0.8			



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2N6676, 2N6677, 2N6678
MJH6676, MJH6677, MJH6678

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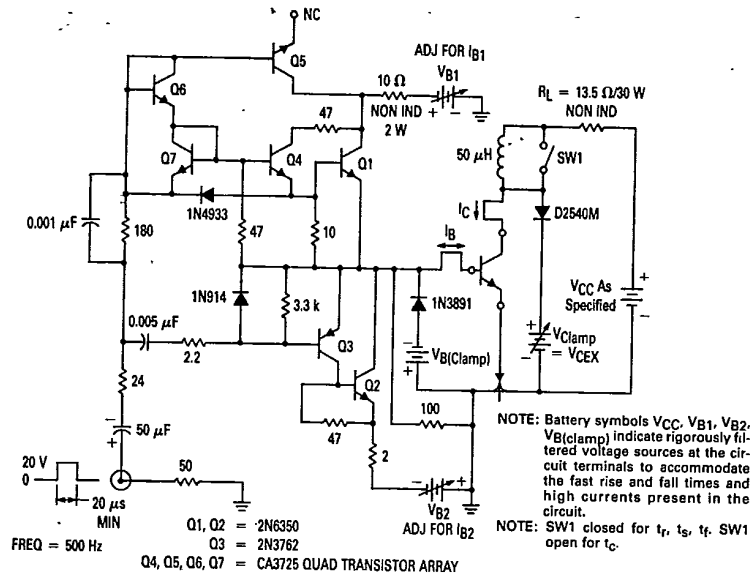
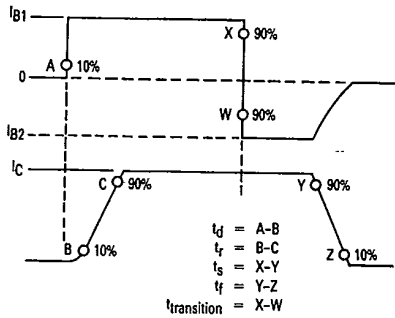


Figure 3. Switching Times Test Circuit



NOTE: TRANSITION TIME FROM 90% I_{B1} TO 90% I_{B2} MUST BE LESS THAN 0.5 μs .

Figure 4. Switching Time Measurements

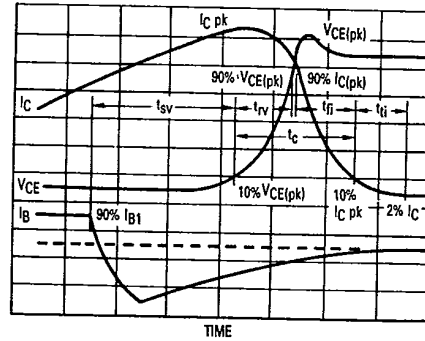


Figure 5. Inductive Switching Measurements

