MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

2N6648
See Page
3-209

NPN Silicon Power Transistors

2N6676
2N6677
2N6678

MJH6676
MJH6677
MJH6678

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

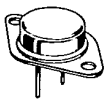
- Off-Line Supplies
- Converter Circuits
- Pulse Width Modulated Regulators

Specification Features —
- High Voltage Capability
- Fast Switching Speeds
- Low Saturation Voltages
- High SOA Ratings

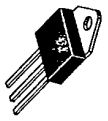
NPN SILICON

POWER TRANSISTORS

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



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



CASE 340-01
TO-218AC
MJH6676
MJH6677
MJH6678

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 — Peak	I_C I_{CM}	15 20			Adc
Base Current — Continuous	I_B	5			Adc
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	$R_{\theta JC}$	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	−65 to +150	°C

T-33-13

T-33-15

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

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector Cutoff Current (V_{CE} = Rated V_{CEV}, $V_{BE(off)}$ = 1.5 Vdc) (V_{CE} = Rated V_{CEV}, $V_{BE(off)}$ = 1.5 Vdc, T_C = 100°C)		I_{CEV}	— —	0.1 1	mA
Emitter Cutoff Current (V_{EB} = 8 Vdc, I_C = 0)		I_{EBO}	—	2	mA
Collector-Emitter Sustaining Voltage (I_C = 200 mA, I_B = 0)	2N6676, MJH6676 2N6677, MJH6677 2N6678, MJH6678	$V_{CEO(sus)}$	300 350 400	— — —	Vdc
Collector-Emitter Sustaining Voltage (I_C = 15 A, $V_{CE(pk)}$ = V_{clamp} = Rated V_{CEX})	2N6676, MJH6676 2N6677, MJH6677 2N6678, MJH6678	$V_{CEX(sus)}$	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 A, V_{CE} = 3 V)		h_{FE}	8	—	—
Base-Emitter Saturation Voltage (I_C = 15 A, I_B = 3 A)		$V_{BE(sat)}$	—	1.5	Vdc
Collector-Emitter, Saturation Voltage (I_C = 15 A, I_B = 3 A) (I_C = 15 A, I_B = 3 A, T_C = 100°C)		$V_{CE(sat)}$	— —	1.5 2	Vdc
DYNAMIC CHARACTERISTICS					
Current Gain (I_C = 1 A, V_{CE} = 10 Vdc, f = 5 MHz)		$\|h_{fe}\|$	3	10	—
Output Capacitance (I_C = 1 A, V_{CB} = 10 Vdc, f = 0.1 MHz)		C_{ob}	150	500	pF
SWITCHING CHARACTERISTICS					
Resistive Load					
Delay Time	V_{CC} = 200 V, I_C = 15 A, I_{B1} = I_{B2} = 3 A, t_p = 20 μs, Duty Cycle ≤ 2 %, V_{B2} ≃ 6 V, R_L ≃ 13.5 Ω (See Figure 3)	T_C = 25°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_C = 100°C	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 = 60 μH, $V_{CE(pk)}$ = V_{clamp} = Rated V_{CEX} (See Figure 3)	T_C = 25°C	t_c	—	0.5	μs
		T_C = 100°C		—	0.8	

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T-33-13

T-33-15

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

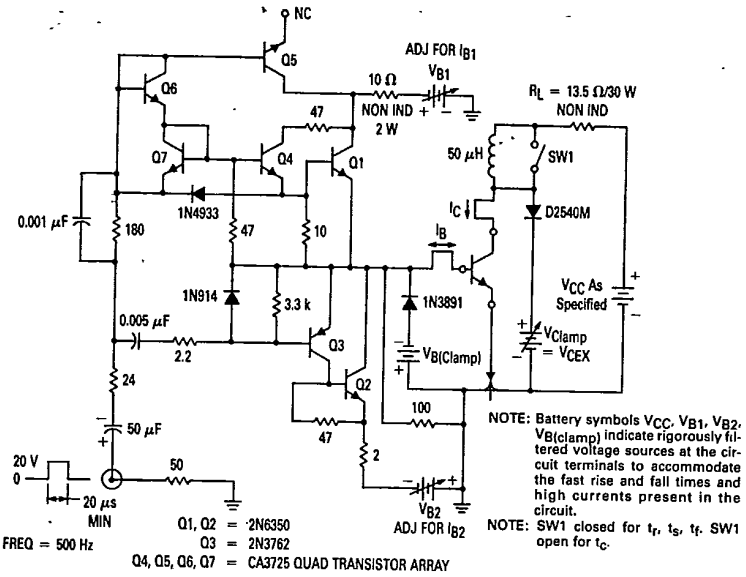
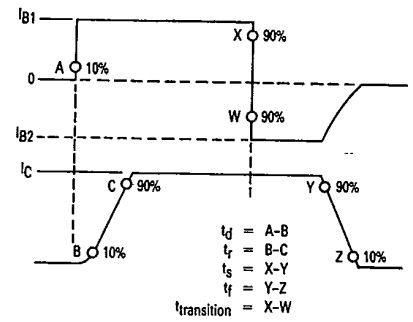


Figure 3. Switching Times Test Circuit



NOTE: TRANSITION TIME FROM 90% IB1 to 90% IB2 MUST BE LESS THAN 0.5 μs.

Figure 4. Switching Time Measurements

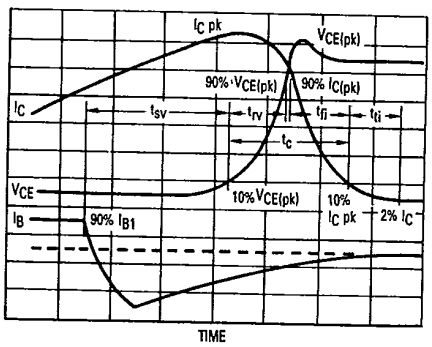


Figure 5. Inductive Switching Measurements

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