

2N6676, 2N6677, 2N6678, RJH6676, RJH6677, RJH6678

File Number 1165

HARRIS SEMICONDUCTOR

27E D

4302271

0020060 2

HAS

15-A *SwitchMax* Power Transistors

High-Voltage N-P-N Types for Off-Line Power Supplies and Other High-Voltage Switching Applications

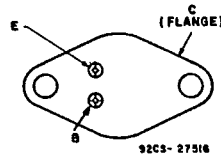
Features:

- Fast switching speed
- High voltage ratings:
V_{CEX} = 350 V to 450 V
- Low V_{CE(sat)} at I_C = 15 A

Applications:

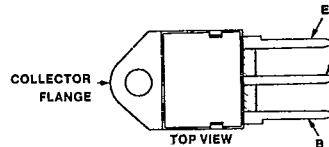
- Off-line power supplies
- High-voltage inverters
- Switching regulators

TERMINAL DESIGNATIONS



2N6676
2N6677
2N6678

JEDEC TO-204AA



RJH6676
RJH6677
RJH6678

JEDEC TO-218AC

The 2N6676, 2N6677 and 2N6678, RJH6676, RJH6677, and RJH6678 *SwitchMax* series of silicon n-p-n power transistors feature high-voltage capability, fast switching speeds, and low saturation voltages, together with high safe-operating-area (SOA) ratings. They are specially designed for off-line power supplies, converter circuits, and pulse-width-modulated regulators. These high-voltage, high-speed transistors are tested for parameters that are essential to the design of high-power switching circuits. Switching times, including inductive turn-off time, and saturation voltages are specified at 100°C to provide information necessary for worst-case design.

The 2N6676, 2N6677, and 2N6678 transistors are supplied in steel JEDEC TO-204AA hermetic packages. The RJH6676, RJH6677, and RJH6678 transistors are supplied in JEDEC TO-218AC plastic packages.

MAXIMUM RATINGS, Absolute-Maximum Values:

	RJH6676	RJH6677	RJH6678	2N6676	2N6677	2N6678	
* V _{CEV}							V
V _{BE} = -1.5 V	450	550	650	450	550	650	
* V _{CEX} (Clamped)							V
V _{BE} = -1.5 V	350	400	450	350	400	450	
* V _{CEO}	300	350	400	300	350	400	V
* V _{EB0}				8			V
I _{C(sat)}				15			A
* I _C				15			A
I _{CM}				20			A
* I _B				5			A
* P _T				175			W
T _C up to 25°C					1		W/°C
T _C above 25°C, derate linearly		1.4					
* T _{stg} , T _J		-65 to 150			-65 to 200		°C
* T _L					235		°C
At distance ≥ 1/16 in (1.58 mm) from seating plane for 10 s max.							
T _L					235		°C
At distance ≥ 1/8" in (3.17 mm) from seating plane for 10 s max.							

* In accordance with JEDEC registration data (2N6676, 2N6677, 2N6678 only).

2N6676, 2N6677, 2N6678, RJH6676, RJH6677, RJH6678

ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	TEST CONDITIONS				LIMITS						UNITS
	VOLTAGE V dc		CURRENT A dc		2N6676 RJH6676		2N6677 RJH6677		2N6678 RJH6678		
	V _{CE}	V _{BE}	I _c	I _B	Min.	Max.	Min.	Max.	Min.	Max.	

T_c=25°C

I _{CEV}	450 550 650	-1.5 -1.5 -1.5			— — —	0.1 — —	— — —	— 0.1 —	— — —	— — 0.1	mA
I _{EB0}		-8	0		—	2	—	2	—	2	
V _{CE0(SUS)^b}			0.2 ^a	0	300	—	350	—	400	—	V
h _{FE}	3		15 ^a		8	—	8	—	8	—	
V _{BE(sat)}			15 ^a	3	—	1.5	—	1.5	—	1.5	V
V _{CE(sat)}			15 ^a	3	—	1	—	1	—	1	V
V _{CE(sat)}			15 ^a	3	—	1.5	—	1.5	—	1.5	V
V _{CEX^b} (Clamped E _{S B}) L=50 μH, R _{BB} =2 Ω		-6	15	3	350	—	400	—	450	—	V
I _{S B}	30 100		5.9 0.25		1 1	—	1 1	—	1 1	—	s
h _{FE} f=5 MHz	10		1		3	10	3	10	3	10	
f _T	10		1		15	50	15	50	15	50	MHz
C _{ob0} f=0.1 MHz	10 ^c				150	500	150	500	150	500	pF
t _{d^d}		-6	15	3	—	0.1	—	0.1	—	0.1	μs
t _{r^d}		-6	15	3	—	0.6	—	0.6	—	0.6	
t _{s^d}		-6	15	3 ^e	—	2.5	—	2.5	—	2.5	
t _{f^d}		-6	15	3 ^e	—	0.5	—	0.5	—	0.5	
t _{c^f} V _{CC} =200 V, L=50 μH, R _C ≤ 13.5 Ω		-6	15	3 ^e	—	0.5	—	0.5	—	0.5	

T_c=100°C

I _{CEV}	450 550 650	-1.5 -1.5 -1.5			— — —	1 — —	— — —	— 1 —	— — —	— — 1	mA
V _{CE(sat)}			15 ^a	3	—	2	—	2	—	2	V
t _{d^d}		-6	15	3	—	1	—	1	—	1	μs
t _{r^d}		-6	15	3 ^e	—	4	—	4	—	4	
t _{s^d}		-6	15	3 ^e	—	1	—	1	—	1	
t _{f^d}		-6	15	3 ^e	—	1	—	1	—	1	
t _{c^f} V _{CC} =200 V, L=50 μH, R _C ≤ 13.5 Ω		-6	15	3 ^e	—	0.8	—	0.8	—	0.8	
R _{θJC} 2N6676, 2N6677, 2N6678	10		5		—	1	—	1	—	1	°C/W
R _{θJC} RJH6676, RJH6677, RJH6678	10		5		—	0.71	—	0.71	—	0.71	°C/W

^aPulsed pulse duration=300 μs, duty factor ≤ 2%.

^bCAUTION The sustaining voltage V_{CE0(SUS)} and V_{CEX} MUST NOT be measured on a curve tracer.

^cIn accordance with JEDEC registration data (2N6676, 2N6677, 2N6678 only)

^dV_{CE} value

^eV_{CC}=200 V, t₀=20 μs

^fI_{B1}=-I_{B2}

^gCollector clamped to V_{CEX}

HARRIS SEMICONDUCTOR 27E D 430227J 002006J 4 HAS



2N6676, 2N6677, 2N6678, RJH6676, RJH6677, RJH6678

T-33-15

27E D 430227J 0020062 6 HAS HARRIS SEMICONDUCTOR

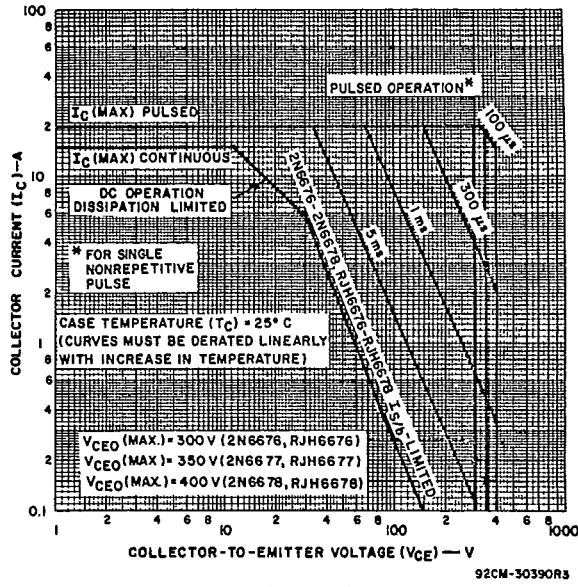


Fig. 1 - Maximum operating areas for all types ($T_c = 25^\circ C$).

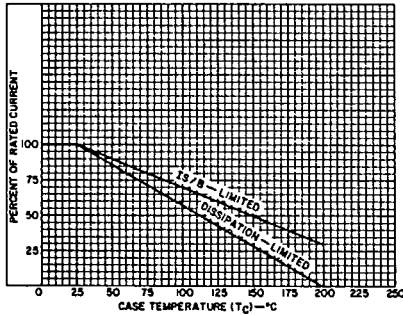


Fig. 2 - Dissipation and I_{sbo} derating curves for 2N6676, 2N6677, and 2N6678.

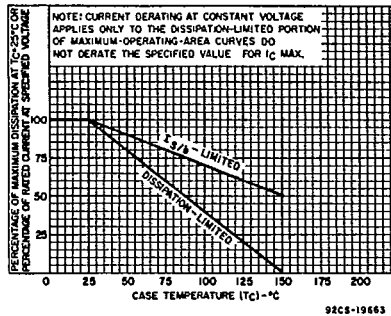


Fig. 3 - Dissipation and I_{sbo} derating curves for RJH6676, RJH6677, and RJH6678.

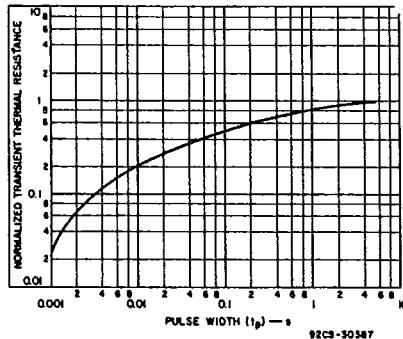


Fig. 4 - Typical thermal-response characteristic for all types.

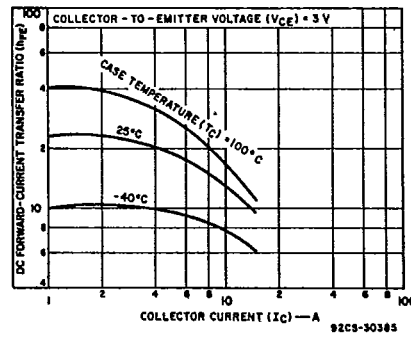


Fig. 5 - Typical dc beta characteristics for all types.

T-33-15

2N6676, 2N6677, 2N6678, RJH6676, RJH6677, RJH6678

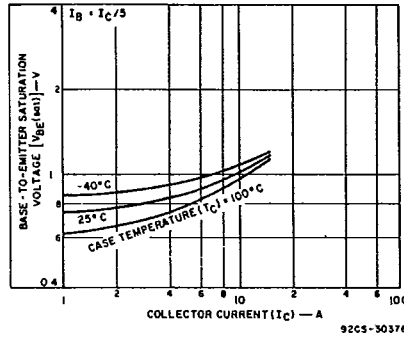
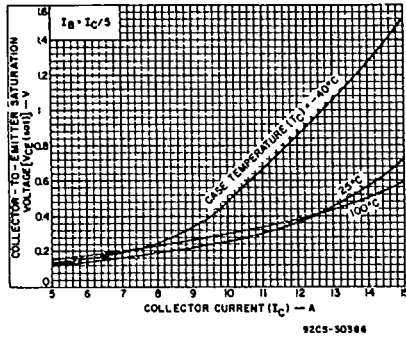


Fig. 6 - Typical collector-to-emitter saturation voltage characteristics for all types.

Fig. 7 - Typical base-to-emitter saturation voltage characteristics for all types.

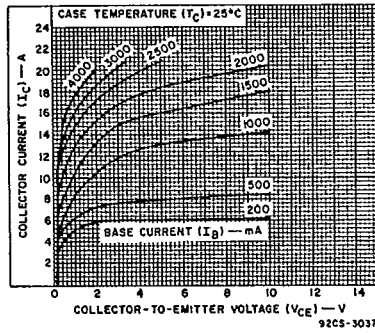
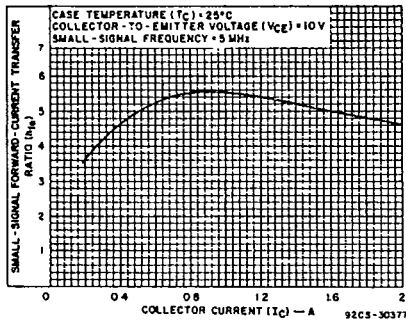


Fig. 8 - Typical small-signal forward current transfer ratio characteristic for all types ($f = 5\text{ MHz}$).

Fig. 9 - Typical output characteristics for all types.

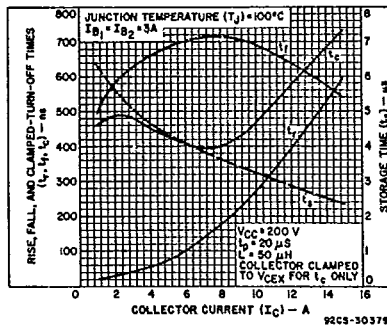
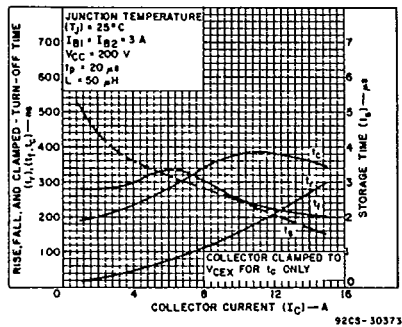


Fig. 10 - Typical saturated-switching-time characteristics at $T_J = 25^\circ\text{C}$ as a function of collector current for all types.

Fig. 11 - Typical saturated-switching-time characteristics at $T_J = 100^\circ\text{C}$ as a function of collector current for all types.



2N6676, 2N6677, 2N6678, RJH6676, RJH6677, RJH6678

T-33-15

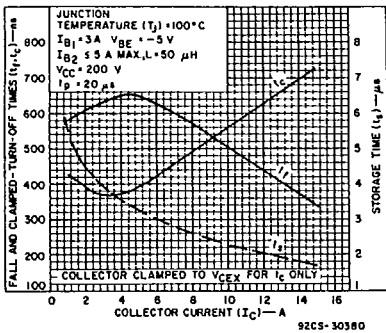


Fig. 12 - Typical saturated-switching-time characteristics at $T_j = 100^\circ\text{C}$ as a function of collector current for all types.

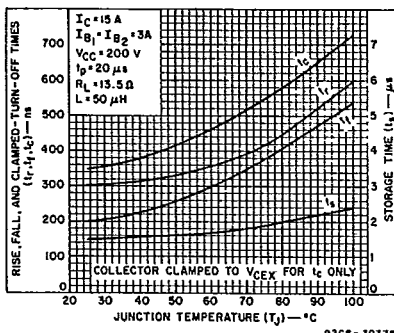


Fig. 13 - Typical saturated-switching-time characteristics as a function of junction temperature for all types.

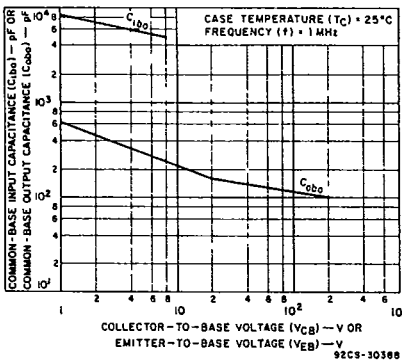


Fig. 14 - Typical common-base input (C_{ibo}) or output (C_{obo}) capacitance characteristics for all types.

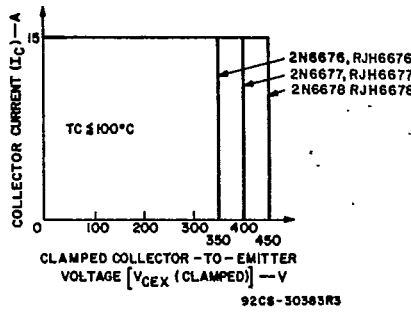


Fig. 15 - Maximum operating conditions for switching between saturation and cutoff for all types.

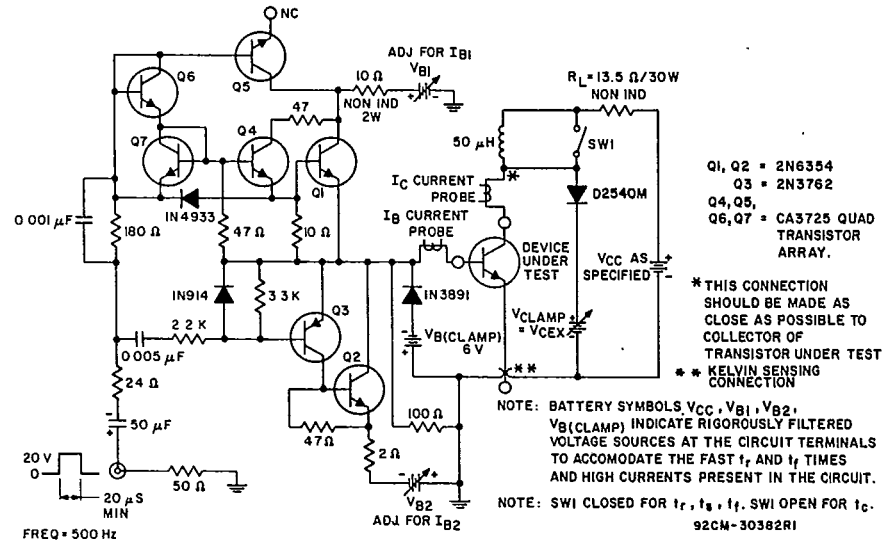


Fig. 16 - Circuit for measurement switching times.

HARRIS SEMICONDUCTOR SECTOR 27E D 430227J 0020064 T HAS

2N6676, 2N6677, 2N6678, RJH6676, RJH6677, RJH6678

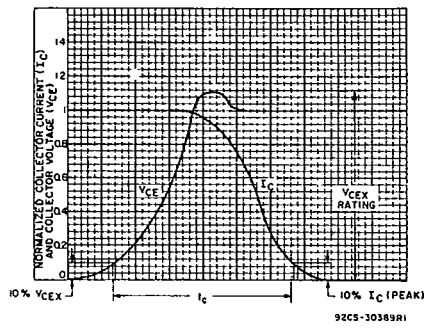


Fig. 17 - Oscilloscope display for normalized measurement of clamped inductive switching time (t_c).

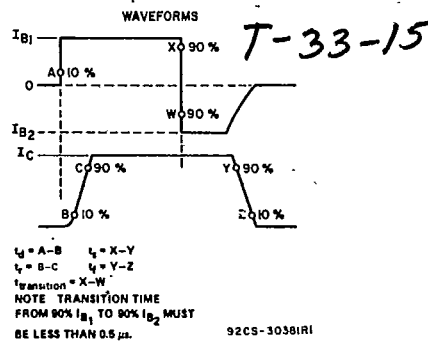


Fig. 18 - Phase relationship between input and output currents showing reference points for specification of switching times.



HARRIS SEMICONDUCTOR SECTOR 27E D 4302271 0020065 J HAS