2N6674, 2N6675, RJH6674, RJH6675

File Number **1164**

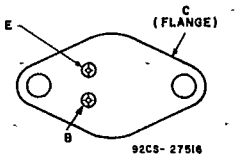
10-A *SwitchMax* Power Transistors

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=10 A*

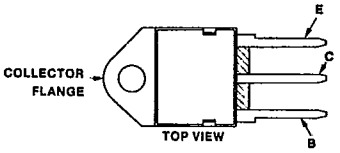
Applications:
- *Off-line power supplies*
- *High-voltage inverters*
- *Switching regulators*

TERMINAL DESIGNATIONS



2N6674
2N6675

JEDEC TO-204AA



RJH6674
RJH6675

JEDEC TO-218AC

92CS-40257

The 2N6674, 2N6675, RJH6674, and RJH6675 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 2N6674 and 2N6675 transistors are supplied in steel JEDEC TO-204AA hermetic packages. The RJH6674 and RJH6675 transistors are supplied in JEDEC TO-218AC plastic packages.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

	RJH6674	RJH6675		2N6674	2N6675	
*V_{CEV}						
V_{BE}=-1.5 V	450	650		450	650	V
*V_{CEX}(Clamped)						
V_{BE}=-1.5 V	350	450		350	450	V
*V_{CEO}	300	400		300	400	V
*V_{EBO}			7			V
I_C(sat)			10			A
*I_C			15			A
I_{CM}			20			A
*I_B			5			A
*P_T						
T_C up to 25° C			175			W
T_C above 25°C, derate linearly	1.4	1.4		1	1	W/°C
*T_{stg}, T_J	-65 to 150			-65 to 200		°C
*T_L At distance ≥ 1/16 in. (1.58 mm) from seating plane for 10 s max				235		°C
TL At distance ≥ 1/8" in (3.17 mm) from seating plane for 10 s max	235					°C

*In accordance with JEDEC registration data (2N6674, 2N6675 only).

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ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	TEST CONDITIONS				LIMITS				UNITS
	VOLTAGE V dc		CURRENT A dc		2N6674 RJH6674		2N6675 RJH6675		
	V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
T_C=25° C									
• I_{CEV}	450	-1.5			—	0.1	—	—	mA
	650	-1.5			—	—	—	0.1	
• I_{EBO}		-7	0		—	2	—	2	
• $V_{CEO}(sus)$[b]			0.2[a]	0	300	—	400	—	V
• h_{FE}	2		10[a]		8	20	8	20	
• $V_{BE}(sat)$			10[a]	2	—	1.5	—	1.5	V
• $V_{CE}(sat)$			10[a]	2	—	1	—	1	
			15[a]	5	—	5	—	5	
V_{CEX}[b] (Clamped $E_{S\,b}$) L=50 μH, R_{BB}=2 Ω		-4	10	2	350	—	450	—	
$I_{S\,b}$	30		5.9		1	—	1	—	s
	100		0.25		1	—	1	—	
• $\|h_{fe}\|$ f=5 MHz	10		1		3	10	3	10	
f_T	10		1		15	50	15	50	MHz
• C_{obo} f=0.1 MHz	10[c]				150	500	150	500	pF
• t_d[d]		-6	10	2	—	0.1	—	0.1	μs
• t_r[d]		-6	10	2	—	0.6	—	0.6	
• t_s[d]		-6	10	2[e]	—	2.5	—	2.5	
• t_f[d]		-6	10	2[e]	—	0.5	—	0.5	
• t_c V_{CC}=135 V, L=50 μH, $R_C \leq$ 13.5 Ω, Collector clamped to V_{CEX}		-6	10	2[e]	—	0.5	—	0.5	
T_C=100° C									
• I_{CEV}	450	-1.5			—	1	—	—	mA
	650	-1.5			—	—	—	1	
• $V_{CE}(sat)$			10[a]	2	—	2	—	2	V
• t_r[d]		-6	10	2	—	1	—	1	μs
• t_s[d]		-6	10	2[e]	—	4	—	4	
• t_f[d]		-6	10	2[e]	—	1	—	1	
• t_c V_{CC}=135 V, L=50 μH, $R_C \leq$ 13.5 Ω, Collector clamped to V_{CEX}		-6	10	2[e]	—	0.8	—	0.8	
• $R\theta_{JC}$ 2N6674, 2N6675	10		5		—	1	—	1	°C/W
$R\theta_{JC}$ RJH6674, RJH6675	10		5		—	0.71	—	0.71	°C/W

[a]Pulsed: pulse duration=300 μs, duty factor ≤ 2%.

[b]CAUTION: The sustaining voltage $V_{CEO}(sus)$ and V_{CEX} MUST NOT be measured on a curve tracer.

*In accordance with JEDEC registration data (2N6674, 2N6675 only).

[c]V_{CB} value.

[d]V_{CC}=135 V, t_p=20 μs.

[e]I_{B1}=-I_{B2}.

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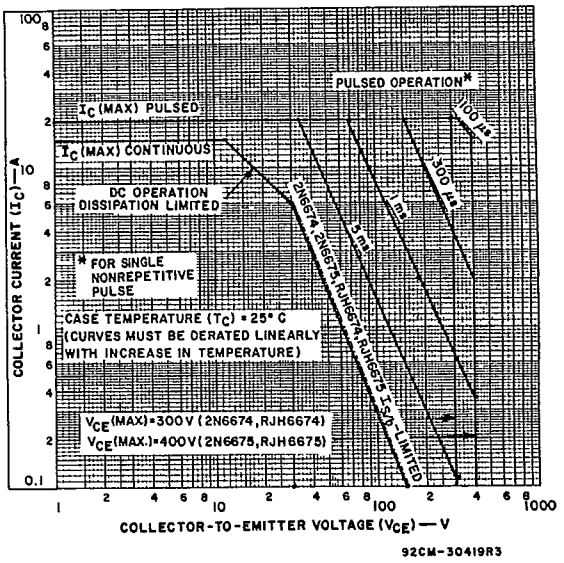

Fig. 1 - Maximum operating areas for all types (T_C=25° C).

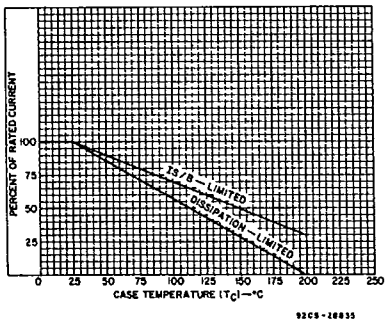

Fig. 2 — Dissipation and $I_{s,b}$ derating curves for 2N6674 and 2N6675.

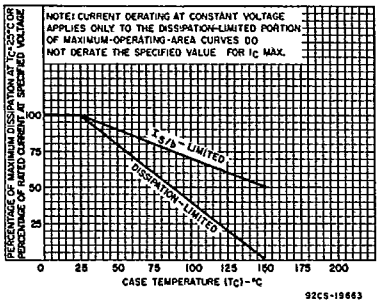

Fig. 3 — Dissipation and $I_{S/b}$ derating curves for RJH6674 and RJH6675.

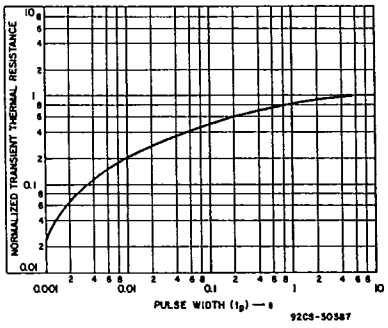

Fig. 4 - Typical thermal-response characteristic for all types.

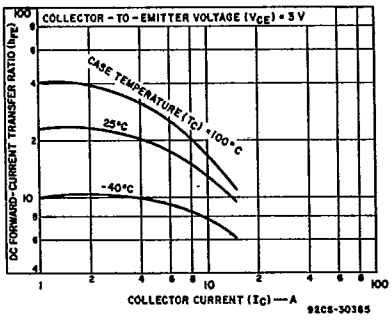

Fig. 5 - Typical dc beta characteristics for all types.

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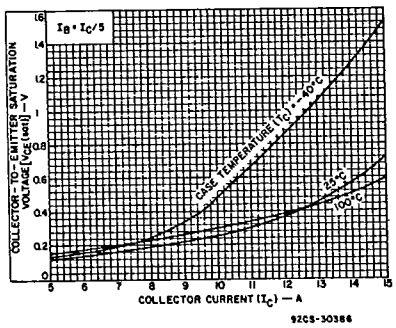

Fig. 6 - Typical collector-to-emitter saturation voltage characteristics for all types.

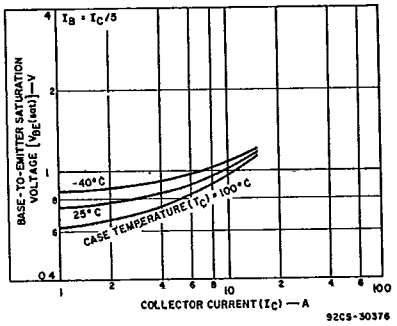

Fig. 7 - Typical base-to-emitter saturation voltage characteristics for all types.

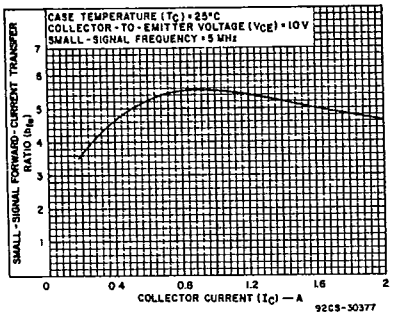

Fig. 8 - Typical small-signal forward current transfer ratio characteristic for all types (f=5 MHz).

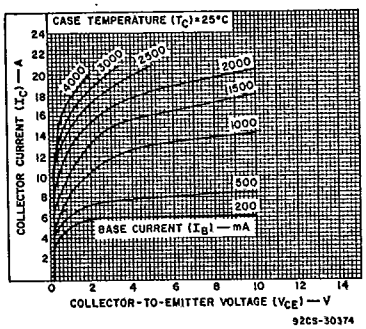

Fig. 9 - Typical output characteristics for all types.

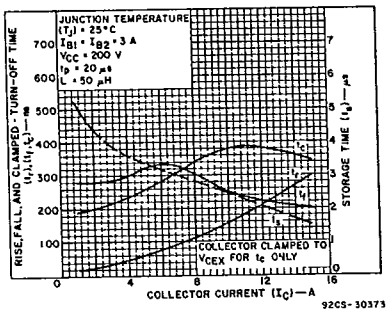

Fig. 10 - Typical saturated-switching-time characteristics at T_J=25°C as a function of collector current for all types.

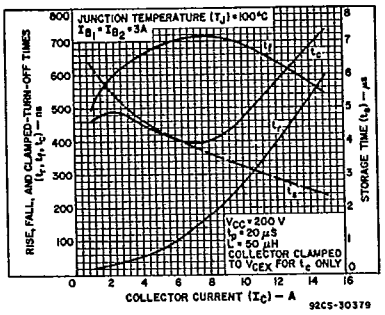

Fig. 11 - Typical saturated-switching-time characteristics at T_J=100°C as a function of collector current for all types.

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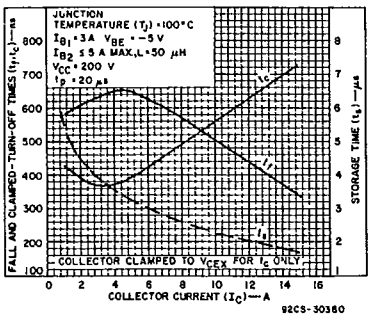

Fig. 12 - Typical saturated-switching-time characteristics at T_J=100°C as a function of collector current for all types.

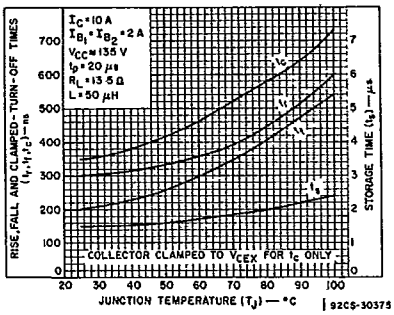

Fig. 13 - Typical saturated-switching-time characteristics as a function of junction temperature for all types.

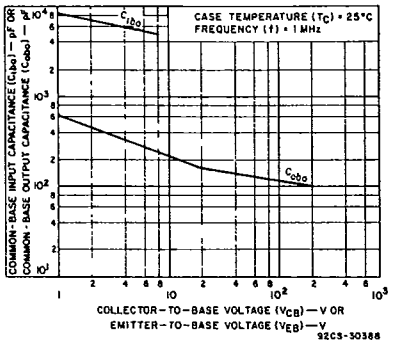

Fig. 14 - Typical common-base input (C_{ibo}) or output (C_{obo}) capacitance characteristics for all types.

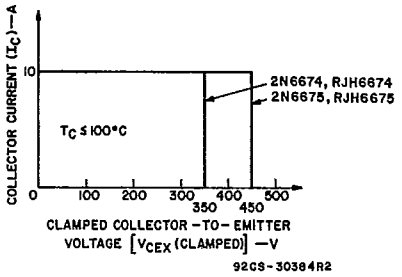

Fig. 15 - Maximum operating conditions for switching between saturation and cutoff for all types.

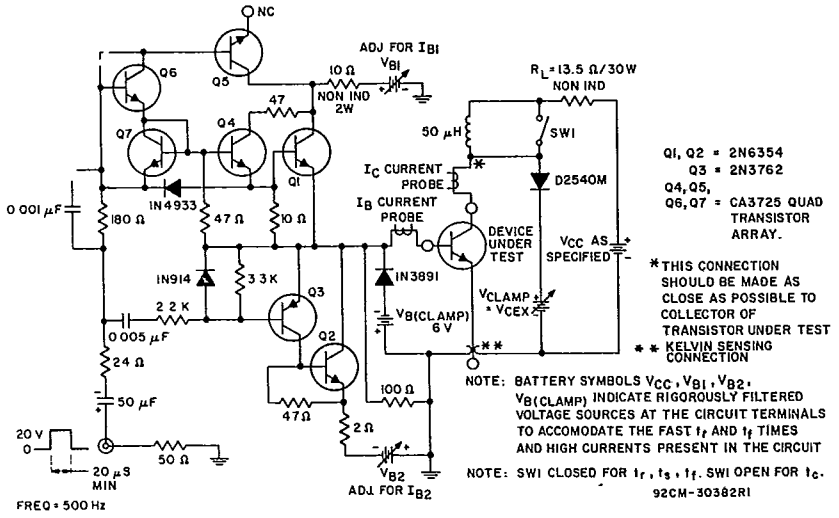

Fig. 16 - Circuit for measuring switching times.

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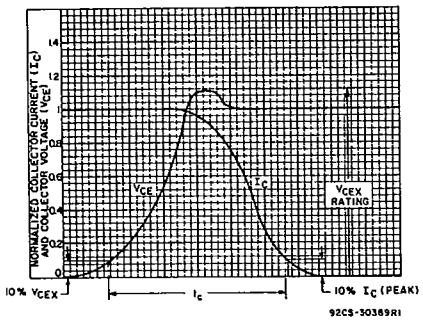

Fig. 17 - Oscilloscope display for normalized measurement of clamped inductive switching time (t_c).

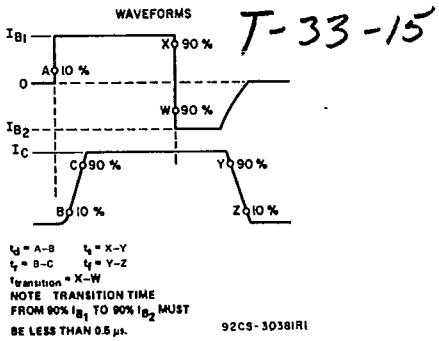

Fig. 18 - Phase relationship between input and output currents showing reference points for specification of switching times.