5-A SwitchMax Power Transistors

High-Voltage N-P-N Types for 240 V Off-Line Power Supplies and Other High-Voltage Switching Applications

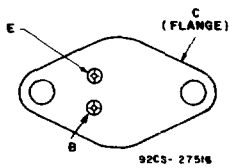
Features:

- *High-temperature parameters guaranteed*
- *Fast switching speed*
- *High voltage ratings:* V_{CEX} *= 450 V — 550 V*
- *Low* V_{CE} *(sat) at* I_C *= 5 A*
- *Steel hermetic TO-204AA package*

Applications:

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

TERMINAL DESIGNATIONS



JEDEC TO-204AA

(200 mil diameter pin isolation)

The 2N6751, 2N6752, 2N6753, and 2N6754 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 and are also well suited for use in a wide range of inverter or 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 guaranteed at 100°C to provide information necessary for worst-case design.

The 2N6751, 2N6752, 2N6753, and 2N6754 transistors are supplied in steel JEDEC TO-204AA hermetic packages.

*Formerly TA9153, TA9153A, TA9153B,

MAXIMUM RATINGS, *Absolute-Maximum Values:*

	2N6751	2N6752	2N6753	2N6754	
* V_{CEV}					
* V_{BE} = −1.5 V	800	850	900	1000	V
* V_{CEX}(Clamped)					
* V_{BE} = −1.5 V	450	500	550	550	V
* V_{CEO}	400	450	500	500	V
* V_{EBO}	8				V
* I_C(sat)	5				A
I_C	10				A
* I_{CM}	10				A
* I_B	5				A
P_T					
$T_C \leq 25°C$	150				W
* $T_C \geq 25°C$, derate linearly	1				W/°C
* T_J	−65 to 175				°C
* T_{stg}	−65 to 200				°C
T_L					
At distance ≥ 1/16 in. (1.58 mm) from seating plane for 10 s max.	235				°C

* In accordance with JEDEC registration data.

ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	TEST CONDITIONS				LIMITS				UNITS
	VOLTAGE V dc		CURRENT A dc		2N6751		2N6752		
	V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
T_C = 25°C									
* I_{CEV}	800	−1.5			—	0.1	—	—	mA
	850	−1.5			—	—	—	0.1	
* I_{EBO}		−8	0		—	2	—	2	mA
* $V_{CEO(sus)}$[b]			0.2[a]	0	400	—	450	—	V
* h_{FE}	3		5[a]		8	40	8	40	
* $V_{BE(sat)}$			5[a]	1	—	1.3	—	1.3	V
* $V_{CE(sat)}$			5[a]	1	—	1	—	1	V
			10[a]	3	—	3	—	3	
V_{CEX}[b] (Clamped $E_{S/b}$) L = 170 μH		−6	5	1[c]	450	—	500	—	V
$I_{S/b}$	30		5		1	—	1	—	s
* $\|h_{fe}\|$ f = 5 MHz	10		0.2		3	12	3	12	
f_T	10		0.2		15	60	15	60	MHz
* C_{obo} f = 0.1 MHz	10[d]				50	250	50	250	pF
* t_d[e]		−6	5	1	—	0.1	—	0.1	μs
* t_r[e]		−6	5	1	—	0.4	—	0.4	μs
* t_s[e]		−6	5	1[c]	—	3	—	3	μs
* t_f[e]		−6	5	1[c]	—	0.4	—	0.4	μs
* t_c V_{CC} = 250 V, L = 170 μH, R_C = 50 Ω, Collector clamped to V_{CEX}		−6	5	1[c]	—	0.4	—	0.4	μs
T_C = 100°C									
* I_{CEV}	800	−1.5			—	1	—	—	mA
	850	−1.5			—	—	—	1	
* $V_{CE(sat)}$			5[a]	1	—	1.5	—	1.5	V
* t_r[e]		−6	5	1	—	0.6	—	0.6	μs
* t_s[e]		−6	5	1[c]	—	5	—	5	μs
* t_f[e]		−6	5	1[c]	—	0.7	—	0.7	μs
* t_c V_{CC} = 250 V, L = 170 μH, R_C = 50 Ω, Collector clamped to V_{CEX}		−6	5	1[c]	—	0.7	—	0.7	μs
* $R_{\theta JC}$	10		5		—	1	—	1	°C/W

* In accordance with JEDEC registration data.

[a] Pulsed 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.

[c] $I_{B_1} = -I_{B_2}$ [d] V_{CB} value [e] V_{CC} = 250 V, tp = 20 μs

ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	TEST CONDITIONS				LIMITS				UNITS
	VOLTAGE V dc		CURRENT A dc		2N6753		2N6754		
	V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
T_C = 25°C									
* I_{CEV}	900 1000	−1.5 −1.5			— —	0.1 —	— —	— 0.1	mA
* I_{EBO}		−8	0		—	2	—	2	
* $V_{CEO(sus)}$[b]			0.2[a]	0	500	—	500	—	V
* h_{FE}	3		5[a]		8	40	8	40	
* $V_{BE(sat)}$			5[a]	1	—	1.3	—	1.3	
* $V_{CE(sat)}$			5[a] 10[a]	1 3	— —	1 3	— —	1 3	V
V_{CEX}[b] (Clamped $E_{S/b}$) L = 170 μH		−6	5	1[c]	550	—	550	—	
$I_{S/b}$	30		5		1	—	1	—	s
* $\|h_{fe}\|$ f = 5 MHz	10		0.2		3	12	3	12	
f_T	10		0.2		15	60	15	60	MHz
* C_{obo} f = 0.1 MHz	10[d]				50	250	50	250	pF
* t_d[e]		−6	5	1	—	0.1	—	0.1	
* t_r[e]		−6	5	1	—	0.4	—	0.4	
* t_s[e]		−6	5	1[c]	—	3	—	3	
* t_f[e]		−6	5	1[c]	—	0.4	—	0.4	μs
* t_c V_{CC} = 250 V, L = 170 μH, R_C = 50 Ω, Collector clamped to V_{CEX}		−6	5	1[c]	—	0.4	—	0.4	
T_C = 100°C									
* I_{CEV}	900 1000	−1.5 −1.5			— —	1 —	— —	— 1	mA
* $V_{CE(sat)}$			5[a]	1	—	1.5	—	1.5	V
* t_r[e]		−6	5	1	—	0.6	—	0.6	
* t_s[e]		−6	5	1[c]	—	5	—	5	
* t_f[e]		−6	5	1[c]	—	0.7	—	0.7	μs
* t_c V_{CC} = 250 V, L = 170 μH, R_C = * 50 Ω, Collector clamped to V_{CEX}		−6	5	1[c]	—	0.7	—	0.7	
* $R_{\theta JC}$	10		5		—	1	—	1	°C/W

* In accordance with JEDEC registration data.

[a] Pulsed 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.

[c] $I_{B_1} = -I_{B_2}$ [d] V_{CB} value [e] V_{CC} = 250 V, t_p = 20 μs

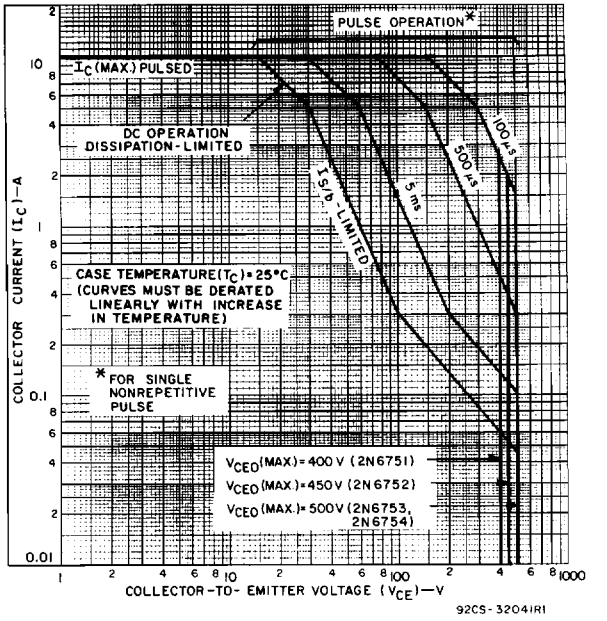


Fig. 1 — Maximum operating areas for all type (TcC).

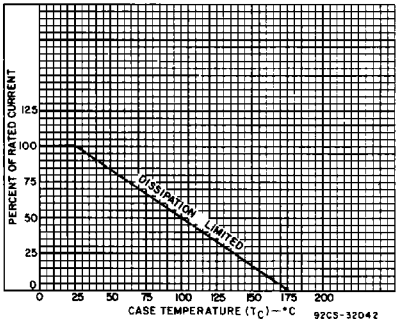


Fig. 2 — Dissipation derating curves for all types.

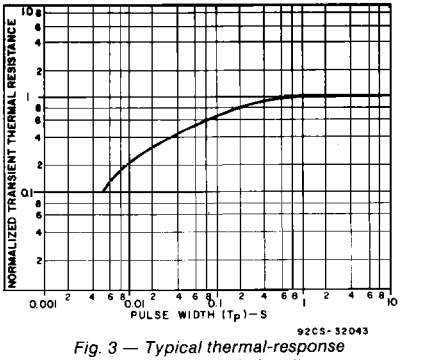


Fig. 3 — Typical thermal-response characteristic for all types.

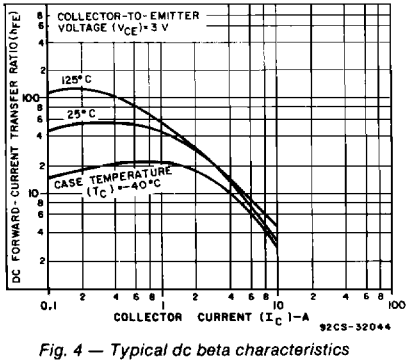


Fig. 4 — Typical dc beta characteristics for all types.

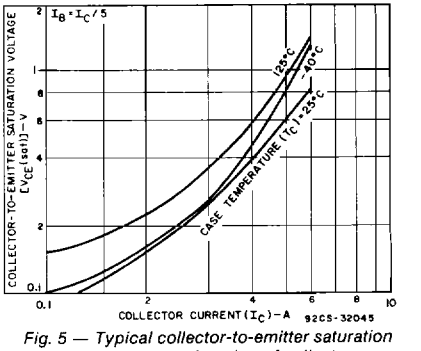


Fig. 5 — Typical collector-to-emitter saturation voltage as a function of collector current for all types.

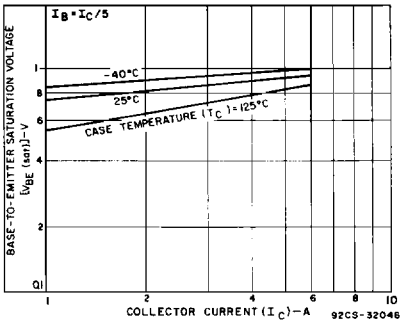


Fig. 6 — Typical base-to-emitter saturation voltage as a function of collector current for all types.

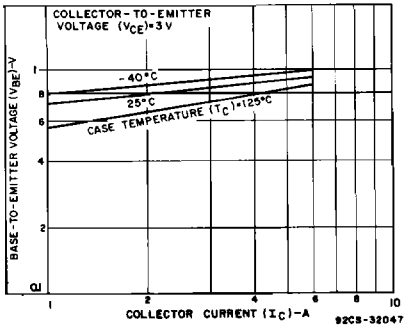


Fig. 7 — Typical base-to-emitter voltage as a function of collector current for all types.

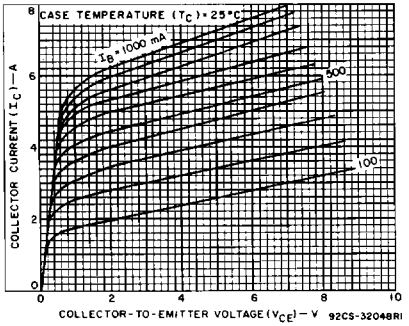


Fig. 8 — Typical output characteristics for all types.

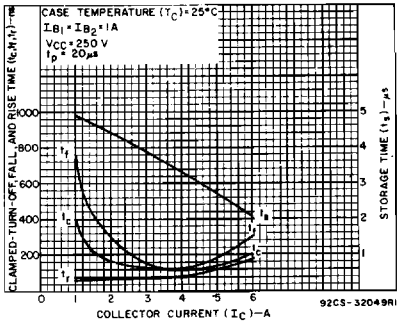


Fig. 9 — Typical saturated switching time characteristics for all types.

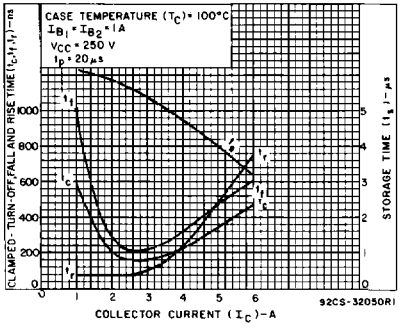


Fig. 10 — Typical saturated switching time characteristics for all types.

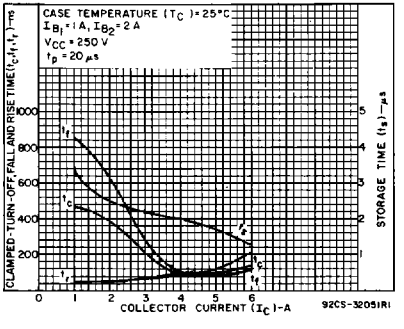


Fig. 11 — Typical saturated switching time characteristics for all types.

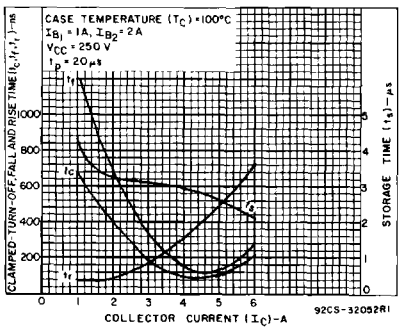


Fig. 12 — Typical saturated switching time characteristics for all types.

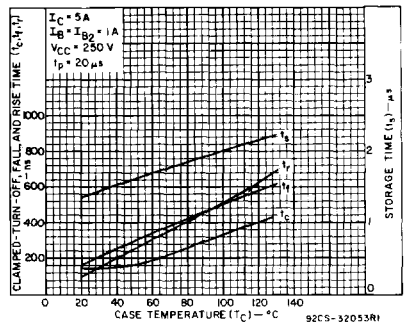


Fig. 13 — Typical saturated switching time characteristics as a function of case temperature for all types.

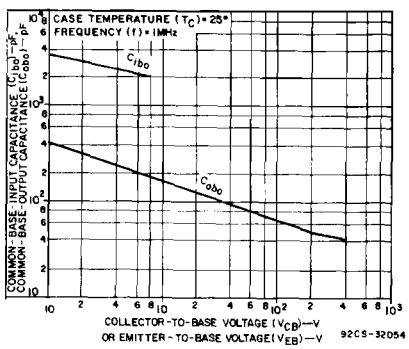


Fig. 14 — Typical common-base input or output capacitance characteristics as a function of collector-to-base voltage or emitter-to-base voltage for all types.

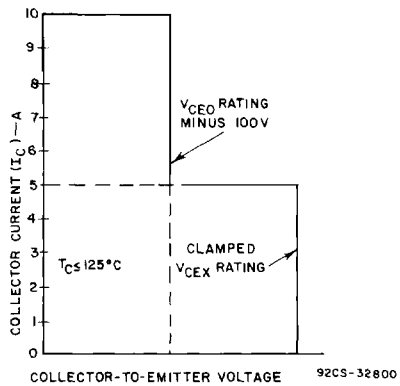


Fig. 15 — Maximum operating conditions for switching between saturation and cutoff.

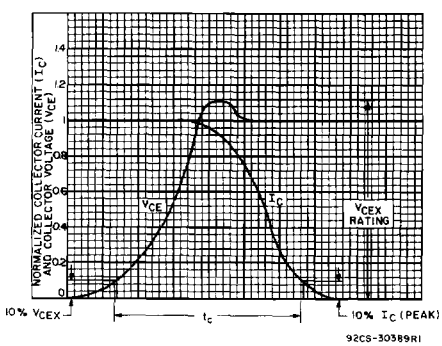


Fig. 16 — Oscilloscope display for measurement of clamped induction switching time (t_c).

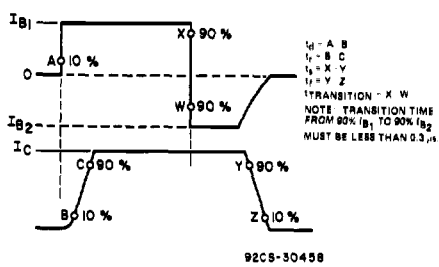


Fig. 17 — Phase relationship between input and output currents showing reference points for specification of switching times.

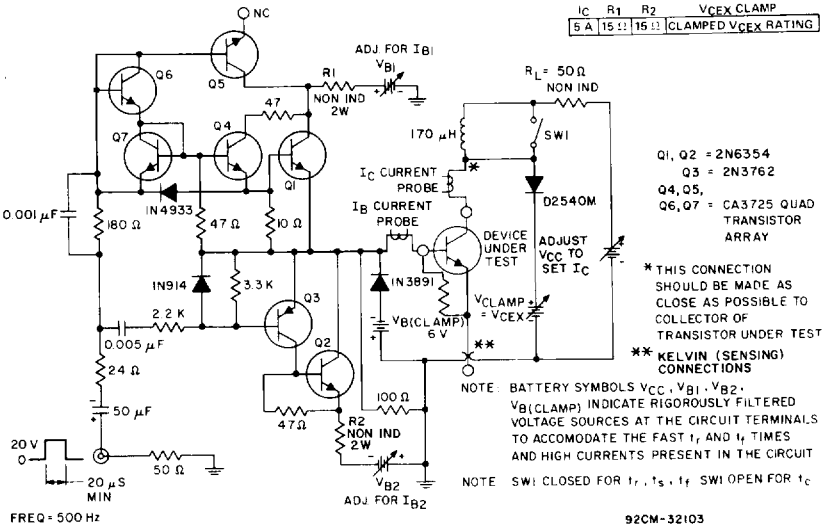


Fig. 18 — Circuit for measuring switching times.