

5-A *SwitchMax* Power Transistors

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

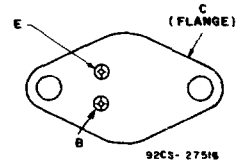
Features:

- High-temperature parameters guaranteed
- Fast switching speed
- High voltage ratings:
 $V_{CEX} = 450\text{ V} - 550\text{ V}$
- Low $V_{CE(sat)}$ at $I_C = 5\text{ A}$
- 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} $V_{BE} = -1.5\text{ V}$	800	850	900	1000	V
* $V_{CEX}(\text{Clamped})$ $V_{BE} = -1.5\text{ V}$	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 $T_C \leq 25^\circ\text{C}$	_____	150	_____	_____	W
* $T_C \geq 25^\circ\text{C}$, derate linearly	_____	1	_____	_____	W/°C
* T_J	_____	-65 to 175	_____	_____	°C
* T_{stg}	_____	-65 to 200	_____	_____	°C
* T_L At distance $\geq 1/16$ 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}	800 850	-1.5 -1.5			— —	0.1 —	— —	— 0.1	mA
I _{EBO}		-8	0		—	2	— 2		
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 10 ^a	1 3	— —	1 3	— —	1 3	
V _{CEX} ^b (Clamped E _{S/b}) L = 170 μH		-6	5	1 ^c	450	—	500	—	
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	
t _s ^e		-6	5	1 ^c	—	3	—	3	
t _f ^e		-6	5	1 ^c	—	0.4	—	0.4	
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}	800 850	-1.5 -1.5			— —	1 —	— —	— 1	mA
V _{CE(sat)}			5 ^a	1	—	1.5	—	1.5	
t _r ^e		-6	5	1	—	0.6	—	0.6	μs
t _s ^e		-6	5	1 ^c	—	5	—	5	
t _f ^e		-6	5	1 ^c	—	0.7	—	0.7	
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 _{θJC}	10		5		—	1	—	1	°C/W
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* 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_{B1} = -I_{B2} ^d V_{CB} value ^e V_{CC} = 250 V, t_p = 20 μs

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POWER TRANSISTORS

2N6751, 2N6752, 2N6753, 2N6754

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	—	—	mA
I _{EBO}		-8	0		—	2	—	2	
V _{CE0(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
V _{CE(sat)}			5 ^a 10 ^a	1 3	— —	1 3	— —	1 3	
V _{CEX} ^b (Clamped E _{S/b}) L = 170 μH		-6	5	1c	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	μs
t _r ^e		-6	5	1	—	0.4	—	0.4	
t _s ^e		-6	5	1c	—	3	—	3	
t _f ^e		-6	5	1c	—	0.4	—	0.4	
t _c V _{CC} = 250 V, L = 170 μH, R _C = 50 Ω, Collector clamped to V _{CEX}		-6	5	1c	—	0.4	—	0.4	

T_C = 100°C

I _{CEV}	900 1000	-1.5 -1.5			—	1	—	—	mA
V _{CE(sat)}			5 ^a	1	—	1.5	—	1.5	
t _r ^e		-6	5	1	—	0.6	—	0.6	μs
t _s ^e		-6	5	1c	—	5	—	5	
t _f ^e		-6	5	1c	—	0.7	—	0.7	
t _c V _{CC} = 250 V, L = 170 μH, R _C = 50 Ω, Collector clamped to V _{CEX}		-6	5	1c	—	0.7	—	0.7	

R _{θJC}	10		5		—	1	—	1	°C/W
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* In accordance with JEDEC registration data.

^a Pulsed duration = 300 μs, duty factor < 2%.

^b **CAUTION:** The sustaining voltage V_{CE0(sus)} and V_{CEX} *MUST NOT* be measured on a curve tracer.

^c I_{B1} = -I_{B2} ^d V_{CB} value ^e V_{CC} = 250 V, t_p = 20 μs

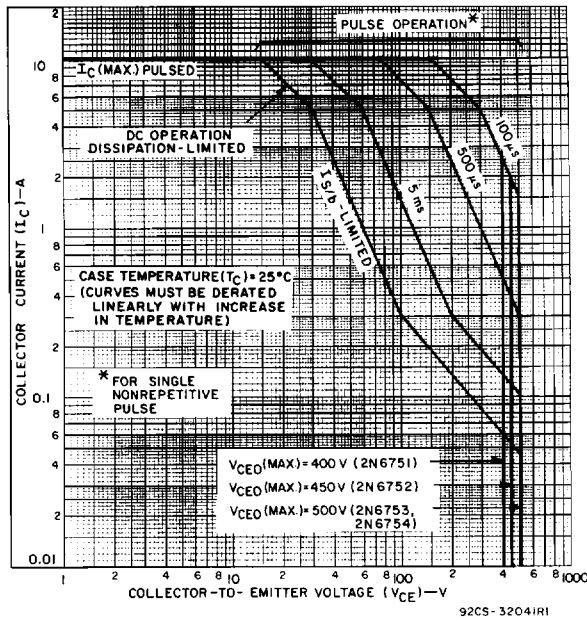


Fig. 1 — Maximum operating areas for all type (T_cC).

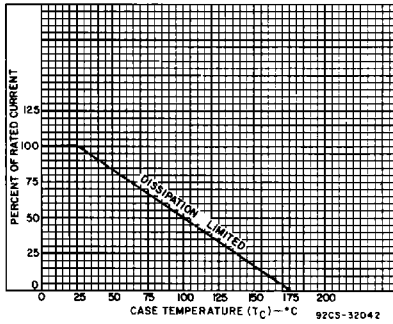


Fig. 2 — Dissipation derating curves for all types.

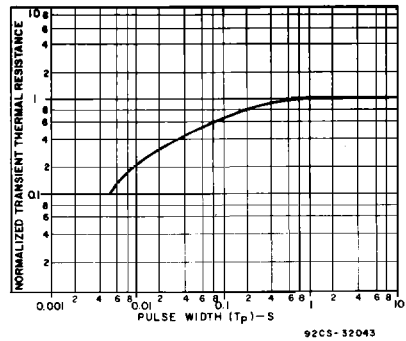


Fig. 3 — Typical thermal-response characteristic for all types.

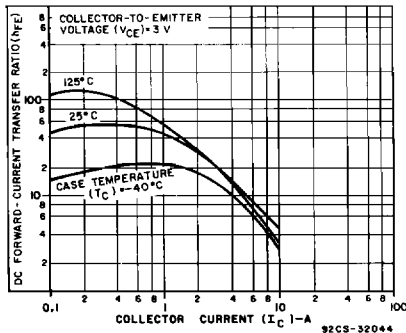


Fig. 4 — Typical dc beta characteristics for all types.

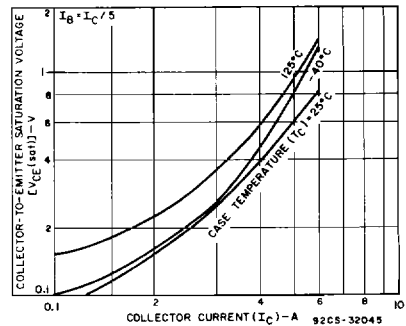


Fig. 5 — Typical collector-to-emitter saturation voltage as a function of collector current for all types.

2N6751, 2N6752, 2N6753, 2N6754

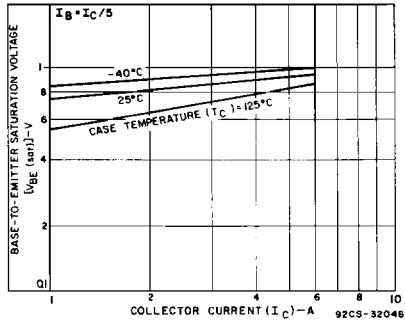


Fig. 6 — Typical base-to-emitter saturation voltage as a function of collector current for all types.

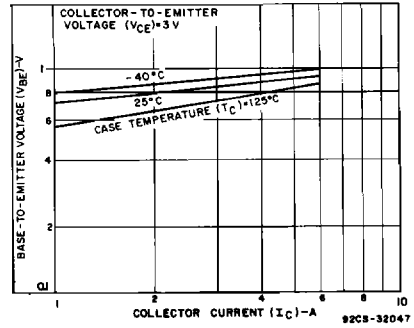


Fig. 7 — Typical base-to-emitter voltage as a function of collector current for all types.

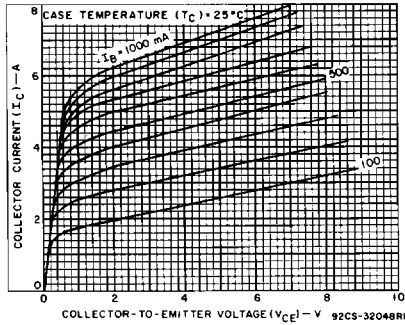


Fig. 8 — Typical output characteristics for all types.

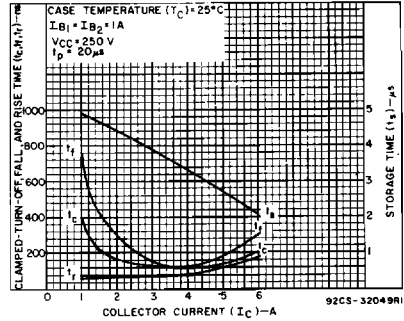


Fig. 9 — Typical saturated switching time characteristics for all types.

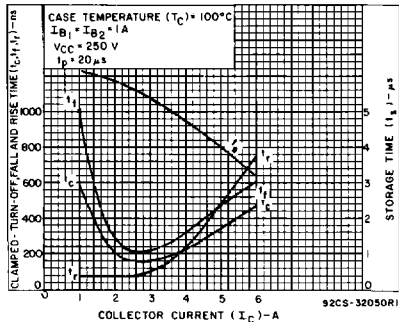


Fig. 10 — Typical saturated switching time characteristics for all types.

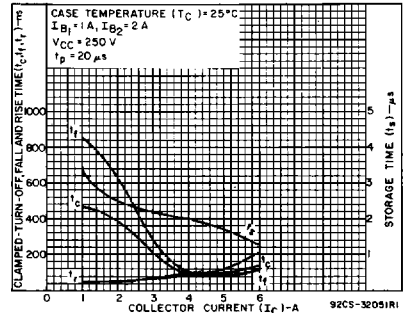


Fig. 11 — Typical saturated switching time characteristics for all types.

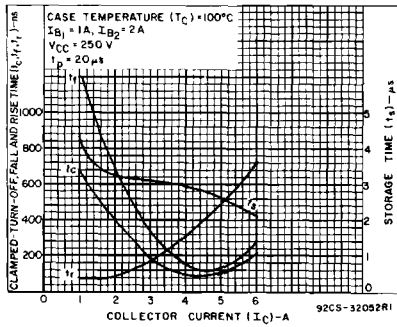


Fig. 12 — Typical saturated switching time characteristics for all types.

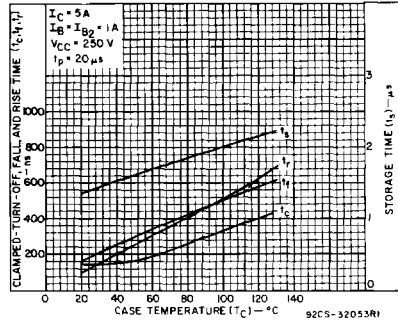


Fig. 13 — Typical saturated switching time characteristics as a function of case temperature for all types.

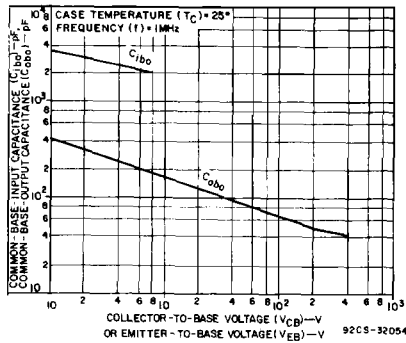


Fig. 14 — Typical common-base input or output capacitance characteristics as a function of collector-to-base voltage or emitter-to-base voltage for all types.

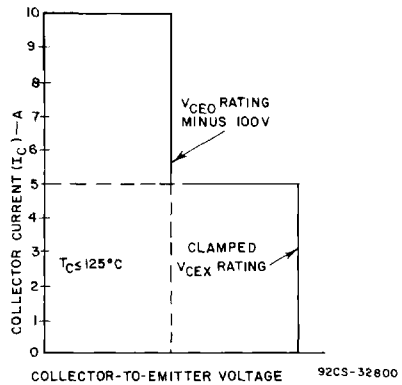


Fig. 15 — Maximum operating conditions for switching between saturation and cutoff.

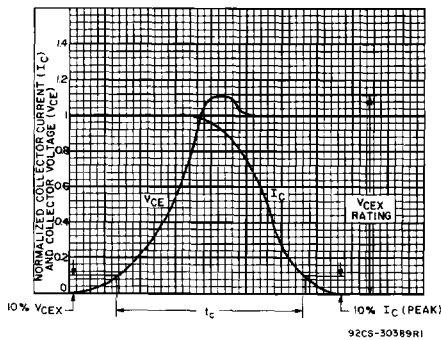


Fig. 16 — Oscilloscope display for measurement of clamped induction switching time (t_c).

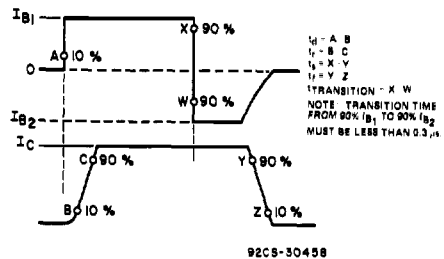


Fig. 17 — Phase relationship between input and output currents showing reference points for specification of switching times.

2N6751, 2N6752, 2N6753, 2N6754

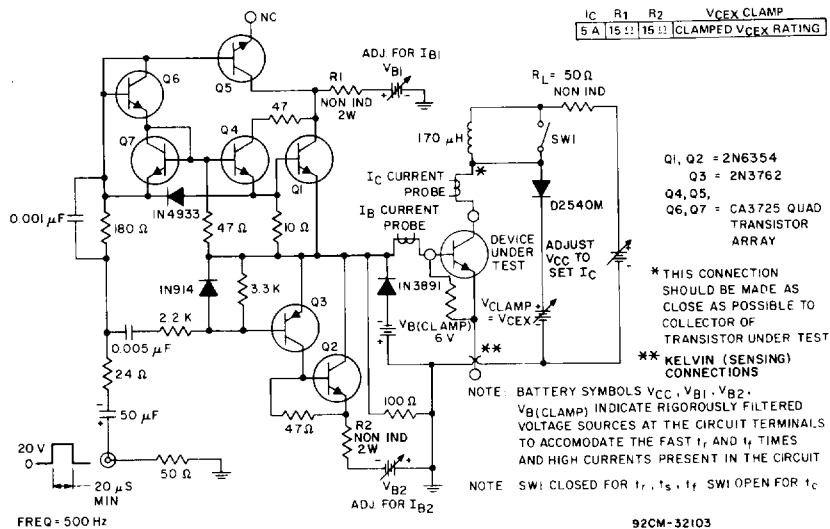


Fig. 18 — Circuit for measuring switching times.