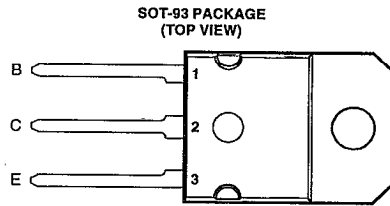


# TIP33, TIP33A, TIP33B, TIP33C NPN SILICON POWER TRANSISTORS

JULY 1968 - REVISED MAY 1995

- Designed for Complementary Use with the TIP34 Series
- 80 W at 25°C Case Temperature
- 10 A Continuous Collector Current
- 15 A Peak Collector Current
- Customer-Specified Selections Available



Pin 2 is in electrical contact with the mounting base.

MDTRAA

## absolute maximum ratings at 25°C case temperature (unless otherwise noted)

RATING		SYMBOL	VALUE	UNIT
Collector-base voltage ( $I_E = 0$ )	TIP33	$V_{CBO}$	80	V
	TIP33A		100	
	TIP33B		120	
	TIP33C		140	
Collector-emitter voltage ( $I_B = 0$ )	TIP33	$V_{CEO}$	40	V
	TIP33A		60	
	TIP33B		80	
	TIP33C		100	
Emitter-base voltage		$V_{EBO}$	5	V
Continuous collector current		$I_C$	10	A
Peak collector current (see Note 1)		$I_{CM}$	15	A
Continuous base current		$I_B$	3	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		$P_{tot}$	80	W
Continuous device dissipation at (or below) 25°C free air temperature (see Note 3)		$P_{tot}$	3.5	W
Unclamped inductive load energy (see Note 4)		$\frac{1}{2}LI_C^2$	62.5	mJ
Operating junction temperature range		$T_J$	-65 to +150	°C
Storage temperature range		$T_{stg}$	-65 to +150	°C
Lead temperature 3.2 mm from case for 10 seconds		$T_L$	250	°C

NOTES: 1. This value applies for  $t_p \leq 0.3$  ms, duty cycle  $\leq 10\%$ .

2. Derate linearly to 150°C case temperature at the rate of 0.64 W/°C.

3. Derate linearly to 150°C free air temperature at the rate of 28 mW/°C.

4. This rating is based on the capability of the transistor to operate safely in a circuit of:  $L = 20$  mH,  $I_{B(on)} = 0.4$  A,  $R_{BE} = 100 \Omega$ ,  $V_{BE(off)} = 0$ ,  $R_B = 0.1 \Omega$ ,  $V_{CC} = 20$  V.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all the parameters.

TEXAS  
INSTRUMENTS

Copyright © 1995 Texas Instruments Limited

4-115

**TIP33, TIP33A, TIP33B, TIP33C**  
**NPN SILICON POWER TRANSISTORS**

JULY 1968 - REVISED MAY 1995

**electrical characteristics at 25°C case temperature**

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$ Collector-emitter breakdown voltage	$I_C = 30 \text{ mA}$ (see Note 5)	$I_B = 0$	TIP33	40		V
			TIP33A	60		
			TIP33B	80		
			TIP33C	100		
$I_{CES}$ Collector-emitter cut-off current	$V_{CE} = 80 \text{ V}$	$V_{BE} = 0$	TIP33		0.4	mA
	$V_{CE} = 100 \text{ V}$	$V_{BE} = 0$	TIP33A		0.4	
	$V_{CE} = 120 \text{ V}$	$V_{BE} = 0$	TIP33B		0.4	
	$V_{CE} = 140 \text{ V}$	$V_{BE} = 0$	TIP33C		0.4	
$I_{CEO}$ Collector cut-off current	$V_{CE} = 30 \text{ V}$	$I_B = 0$	TIP33/33A		0.7	mA
	$V_{CE} = 60 \text{ V}$	$I_B = 0$	TIP33B/33C		0.7	
$I_{EBO}$ Emitter cut-off current	$V_{EB} = 5 \text{ V}$	$I_C = 0$			1	mA
$h_{FE}$ Forward current transfer ratio	$V_{CE} = 4 \text{ V}$	$I_C = 1 \text{ A}$	(see Notes 5 and 6)	40		
	$V_{CE} = 4 \text{ V}$	$I_C = 3 \text{ A}$		20	100	
$V_{CE(sat)}$ Collector-emitter saturation voltage	$I_B = 0.3 \text{ A}$ $I_B = 2.5 \text{ A}$	$I_C = 3 \text{ A}$	(see Notes 5 and 6)		1	V
		$I_C = 10 \text{ A}$			4	
$V_{BE}$ Base-emitter voltage	$V_{CE} = 4 \text{ V}$ $V_{CE} = 4 \text{ V}$	$I_C = 3 \text{ A}$	(see Notes 5 and 6)		1.6	V
		$I_C = 10 \text{ A}$			3	
$h_{fe}$ Small signal forward current transfer ratio	$V_{CE} = 10 \text{ V}$	$I_C = 0.5 \text{ A}$	$f = 1 \text{ kHz}$	20		
$ h_{fe} $ Small signal forward current transfer ratio	$V_{CE} = 10 \text{ V}$	$I_C = 0.5 \text{ A}$	$f = 1 \text{ MHz}$	3		

NOTES: 5. These parameters must be measured using pulse techniques,  $t_p = 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 6. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.

**thermal characteristics**

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$ Junction to case thermal resistance			1.56	°C/W
$R_{\theta JA}$ Junction to free air thermal resistance			35.7	°C/W

**resistive-load-switching characteristics at 25°C case temperature**

PARAMETER	TEST CONDITIONS †			MIN	TYP	MAX	UNIT
$t_{on}$ Turn-on time	$I_C = 6 \text{ A}$	$I_{B(on)} = 0.6 \text{ A}$	$I_{B(off)} = -0.6 \text{ A}$		0.6		$\mu\text{s}$
$t_{off}$ Turn-off time	$V_{BE(off)} = -4 \text{ V}$	$R_L = 5 \Omega$	$t_p = 20 \mu\text{s}$ , dc $\leq 2\%$		1		$\mu\text{s}$

† Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

TIP33, TIP33A, TIP33B, TIP33C  
NPN SILICON POWER TRANSISTORS

JULY 1968 - REVISED MAY 1995

TYPICAL CHARACTERISTICS

TYPICAL DC CURRENT GAIN  
vs  
COLLECTOR CURRENT

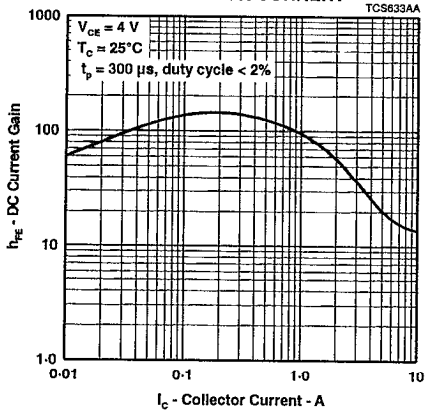


Figure 1.

COLLECTOR-EMITTER SATURATION VOLTAGE  
vs  
BASE CURRENT

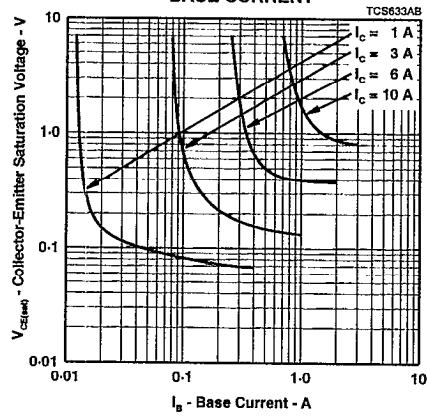


Figure 2.

BASE-EMITTER VOLTAGE  
vs  
COLLECTOR CURRENT

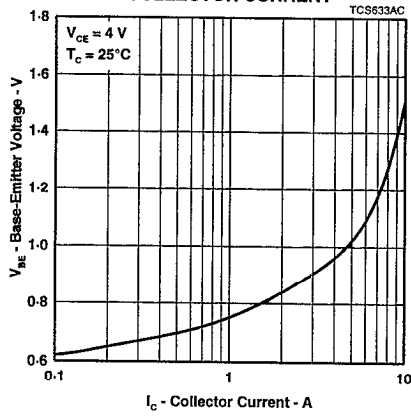


Figure 3.

**TIP33, TIP33A, TIP33B, TIP33C**  
**NPN SILICON POWER TRANSISTORS**

JULY 1968 - REVISED MAY 1995

**MAXIMUM SAFE OPERATING REGIONS**

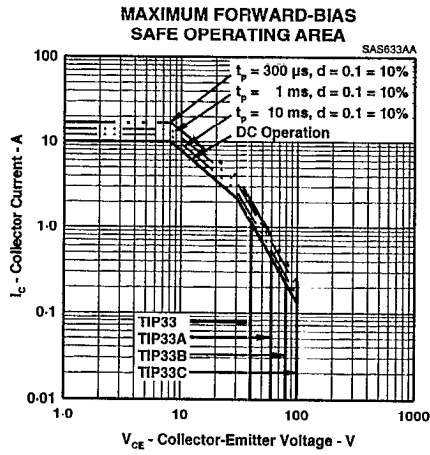


Figure 4.

**THERMAL INFORMATION**

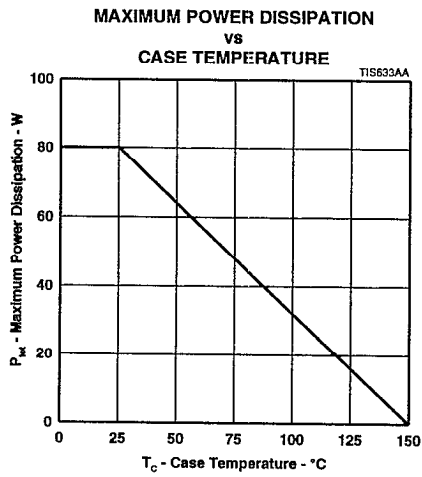
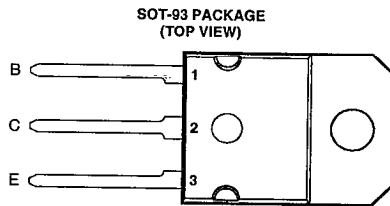


Figure 5.

# TIP34, TIP34A, TIP34B, TIP34C PNP SILICON POWER TRANSISTORS

JULY 1968 - REVISED MAY 1995

- Designed for Complementary Use with the TIP33 Series
- 80 W at 25°C Case Temperature
- 10 A Continuous Collector Current
- 15 A Peak Collector Current
- Customer-Specified Selections Available



Pin 2 is in electrical contact with the mounting base.

MDTRAA

## absolute maximum ratings at 25°C case temperature (unless otherwise noted)

RATING		SYMBOL	VALUE	UNIT
Collector-base voltage ( $I_E = 0$ )	TIP34	$V_{CBO}$	-80	V
	TIP34A		-100	
	TIP34B		-120	
	TIP34C		-140	
Collector-emitter voltage ( $I_B = 0$ )	TIP34	$V_{CEO}$	-40	V
	TIP34A		-60	
	TIP34B		-80	
	TIP34C		-100	
Emitter-base voltage		$V_{EBO}$	-5	V
Continuous collector current		$I_C$	-10	A
Peak collector current (see Note 1)		$I_{CM}$	-15	A
Continuous base current		$I_B$	-3	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		$P_{tot}$	80	W
Continuous device dissipation at (or below) 25°C free air temperature (see Note 3)		$P_{tot}$	3.5	W
Unclamped inductive load energy (see Note 4)		$\frac{1}{2}LI_C^2$	62.5	mJ
Operating junction temperature range		$T_J$	-65 to +150	°C
Storage temperature range		$T_{stg}$	-65 to +150	°C
Lead temperature 3.2 mm from case for 10 seconds		$T_L$	250	°C

- NOTES: 1. This value applies for  $t_p \leq 0.3$  ms, duty cycle  $\leq 10\%$ .  
 2. Derate linearly to 150°C case temperature at the rate of 0.64 W/°C.  
 3. Derate linearly to 150°C free air temperature at the rate of 28 mW/°C.  
 4. This rating is based on the capability of the transistor to operate safely in a circuit of:  $L = 20$  mH,  $I_{B(on)} = -0.4$  A,  $R_{BE} = 100 \Omega$ ,  $V_{BE(on)} = 0$ ,  $R_S = 0.1 \Omega$ ,  $V_{CC} = -20$  V.

PRODUCTION DATA Information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all the parameters.

TEXAS  
INSTRUMENTS

Copyright © 1995 Texas Instruments Limited

4-119

**TIP34, TIP34A, TIP34B, TIP34C**  
**PNP SILICON POWER TRANSISTORS**

JULY 1968 - REVISED MAY 1995

**electrical characteristics at 25°C case temperature**

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	TIP34			-40			V
		TIP34A			-60			
		TIP34B			-80			
		TIP34C			-100			
$I_{CES}$	Collector-emitter cut-off current	$V_{CE} = -80\text{ V}$	$V_{BE} = 0$	TIP34			-0.4	mA
		$V_{CE} = -100\text{ V}$	$V_{BE} = 0$	TIP34A			-0.4	
		$V_{CE} = -120\text{ V}$	$V_{BE} = 0$	TIP34B			-0.4	
		$V_{CE} = -140\text{ V}$	$V_{BE} = 0$	TIP34C			-0.4	
$I_{CEO}$	Collector cut-off current	$V_{CE} = -30\text{ V}$	$I_B = 0$	TIP34/34A			-0.7	mA
		$V_{CE} = -60\text{ V}$	$I_B = 0$	TIP34B/34C			-0.7	
$I_{EBO}$	Emitter cut-off current	$V_{EB} = -5\text{ V}$	$I_C = 0$				-1	mA
$h_{FE}$	Forward current transfer ratio	$V_{CE} = -4\text{ V}$	$I_C = -1\text{ A}$	(see Notes 5 and 6)	40			
		$V_{CE} = -4\text{ V}$	$I_C = -3\text{ A}$		20		100	
$V_{CE(sat)}$	Collector-emitter saturation voltage	$I_B = -0.3\text{ A}$	$I_C = -3\text{ A}$	(see Notes 5 and 6)			-1	V
		$I_B = -2.5\text{ A}$	$I_C = -10\text{ A}$				-4	
$V_{BE}$	Base-emitter voltage	$V_{CE} = -4\text{ V}$	$I_C = -3\text{ A}$	(see Notes 5 and 6)			-1.6	V
		$V_{CE} = -4\text{ V}$	$I_C = -10\text{ A}$				-3	
$h_{ie}$	Small signal forward current transfer ratio	$V_{CE} = -10\text{ V}$	$I_C = -0.5\text{ A}$	$f = 1\text{ kHz}$	20			
$ h_{ie} $	Small signal forward current transfer ratio	$V_{CE} = -10\text{ V}$	$I_C = -0.5\text{ A}$	$f = 1\text{ MHz}$	3			

NOTES: 5. These parameters must be measured using pulse techniques,  $t_p = 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 6. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.

**thermal characteristics**

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to case thermal resistance			1.56	°C/W
$R_{\theta JA}$	Junction to free air thermal resistance			35.7	°C/W

**resistive-load-switching characteristics at 25°C case temperature**

PARAMETER		TEST CONDITIONS †			MIN	TYP	MAX	UNIT
$t_{on}$	Turn-on time	$I_C = -6\text{ A}$	$I_{B(on)} = -0.6\text{ A}$	$I_{B(off)} = 0.6\text{ A}$		0.4		$\mu\text{s}$
$t_{off}$	Turn-off time	$V_{BE(off)} = 4\text{ V}$	$R_L = 5\text{ }\Omega$	$t_p = 20\text{ }\mu\text{s}$ , dc $\leq 2\%$		0.7		$\mu\text{s}$

† Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

TIP34, TIP34A, TIP34B, TIP34C  
PNP SILICON POWER TRANSISTORS

JULY 1968 - REVISED MAY 1995

TYPICAL CHARACTERISTICS

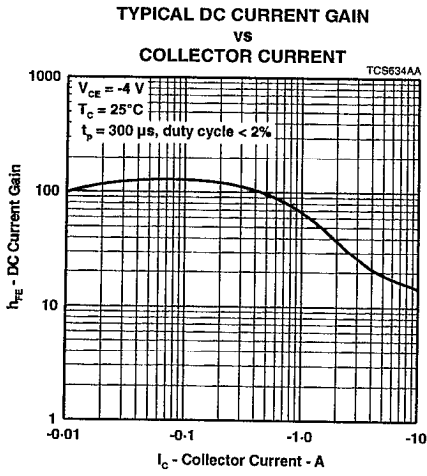


Figure 1.

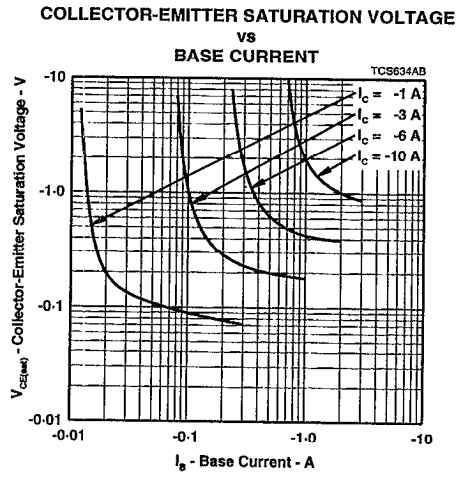


Figure 2.

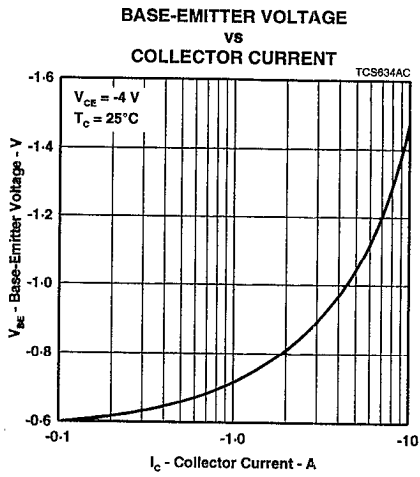


Figure 3.

TIP34, TIP34A, TIP34B, TIP34C  
PNP SILICON POWER TRANSISTORS

JULY 1968 - REVISED MAY 1995

MAXIMUM SAFE OPERATING REGIONS

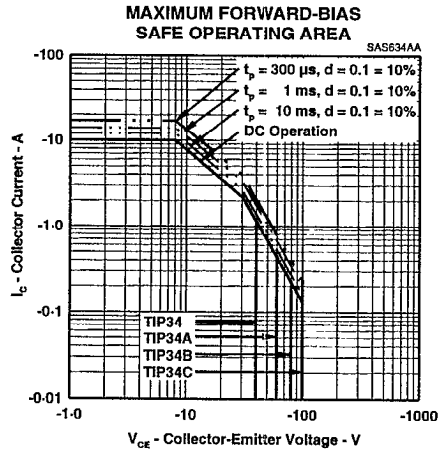


Figure 4.

THERMAL INFORMATION

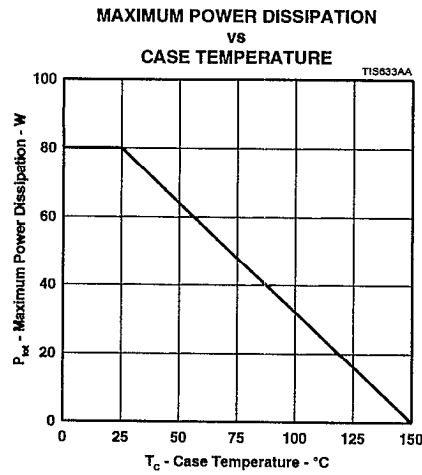


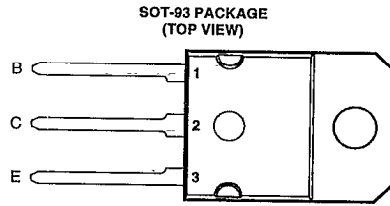
Figure 5.



# TIP35, TIP35A, TIP35B, TIP35C NPN SILICON POWER TRANSISTORS

JULY 1968 - REVISED MAY 1995

- Designed for Complementary Use with the TIP36 Series
- 125 W at 25°C Case Temperature
- 25 A Continuous Collector Current
- 40 A Peak Collector Current
- Customer-Specified Selections Available



Pin 2 is in electrical contact with the mounting base.

MDTRAA

## absolute maximum ratings at 25°C case temperature (unless otherwise noted)

RATING		SYMBOL	VALUE	UNIT
Collector-base voltage ( $I_E = 0$ )	TIP35	$V_{CBO}$	80	V
	TIP35A		100	
	TIP35B		120	
	TIP35C		140	
Collector-emitter voltage ( $I_B = 0$ )	TIP35	$V_{CEO}$	40	V
	TIP35A		60	
	TIP35B		80	
	TIP35C		100	
Emitter-base voltage		$V_{EBO}$	5	V
Continuous collector current		$I_C$	25	A
Peak collector current (see Note 1)		$I_{CM}$	40	A
Continuous base current		$I_B$	5	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		$P_{tot}$	125	W
Continuous device dissipation at (or below) 25°C free air temperature (see Note 3)		$P_{tot}$	3.5	W
Unclamped inductive load energy (see Note 4)		$\frac{1}{2}LI_C^2$	90	mJ
Operating junction temperature range		$T_J$	-65 to +150	°C
Storage temperature range		$T_{stg}$	-65 to +150	°C
Lead temperature 3.2 mm from case for 10 seconds		$T_L$	250	°C

- NOTES: 1. This value applies for  $t_p \leq 0.3$  ms, duty cycle  $\leq 10\%$ .
2. Derate linearly to 150°C case temperature at the rate of 1 W/°C.
3. Derate linearly to 150°C free air temperature at the rate of 28 mW/°C.
4. This rating is based on the capability of the transistor to operate safely in a circuit of:  $L = 20$  mH,  $I_{B(on)} = 0.4$  A,  $R_{BE} = 100 \Omega$ ,  $V_{BE(off)} = 0$ ,  $R_B = 0.1 \Omega$ ,  $V_{CC} = 20$  V.

PRODUCTION DATA Information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all the parameters.

 **TEXAS  
INSTRUMENTS**

Copyright © 1995 Texas Instruments Limited

4-123

**TIP35, TIP35A, TIP35B, TIP35C**  
**NPN SILICON POWER TRANSISTORS**

JULY 1968 - REVISED MAY 1995

**electrical characteristics at 25°C case temperature**

PARAMETER	TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$ Collector-emitter breakdown voltage	$I_C = 30 \text{ mA}$ (see Note 5)	$I_B = 0$	TIP35 TIP35A TIP35B TIP35C	40 60 80 100			V
$I_{CES}$ Collector-emitter cut-off current	$V_{CE} = 80 \text{ V}$ $V_{CE} = 100 \text{ V}$ $V_{CE} = 120 \text{ V}$ $V_{CE} = 140 \text{ V}$	$V_{BE} = 0$ $V_{BE} = 0$ $V_{BE} = 0$ $V_{BE} = 0$	TIP35 TIP35A TIP35B TIP35C			0.7 0.7 0.7 0.7	mA
$I_{CEO}$ Collector cut-off current	$V_{CE} = 30 \text{ V}$ $V_{CE} = 60 \text{ V}$	$I_B = 0$ $I_B = 0$	TIP35/35A TIP35B/35C			1 1	mA
$I_{EBO}$ Emitter cut-off current	$V_{EB} = 5 \text{ V}$	$I_C = 0$				1	mA
$h_{FE}$ Forward current transfer ratio	$V_{CE} = 4 \text{ V}$ $V_{CE} = 4 \text{ V}$	$I_C = 1.5 \text{ A}$ $I_C = 15 \text{ A}$	(see Notes 5 and 6)	25 10		50	
$V_{CE(sat)}$ Collector-emitter saturation voltage	$I_B = 1.5 \text{ A}$ $I_B = 5 \text{ A}$	$I_C = 15 \text{ A}$ $I_C = 25 \text{ A}$	(see Notes 5 and 6)			1.8 4	V
$V_{BE}$ Base-emitter voltage	$V_{CE} = 4 \text{ V}$ $V_{CE} = 4 \text{ V}$	$I_C = 15 \text{ A}$ $I_C = 25 \text{ A}$	(see Notes 5 and 6)			2 4	V
$h_{ie}$ Small signal forward current transfer ratio	$V_{CE} = 10 \text{ V}$	$I_C = 1 \text{ A}$	$f = 1 \text{ kHz}$	25			
$ h_{ie} $ Small signal forward current transfer ratio	$V_{CE} = 10 \text{ V}$	$I_C = 1 \text{ A}$	$f = 1 \text{ MHz}$	3			

NOTES: 5. These parameters must be measured using pulse techniques,  $t_p = 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 6. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.

**thermal characteristics**

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$ Junction to case thermal resistance			1	°C/W
$R_{\theta JA}$ Junction to free air thermal resistance			35.7	°C/W

**resistive-load-switching characteristics at 25°C case temperature**

PARAMETER	TEST CONDITIONS †			MIN	TYP	MAX	UNIT
$t_{on}$ Turn-on time	$I_C = 15 \text{ A}$	$I_{B(on)} = 1.5 \text{ A}$	$I_{B(off)} = -1.5 \text{ A}$		1.2		$\mu\text{s}$
$t_{off}$ Turn-off time	$V_{BE(off)} = -4.15 \text{ V}$	$R_L = 2 \Omega$	$t_p = 20 \mu\text{s}$ , $d_c \leq 2\%$		0.9		$\mu\text{s}$

† Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

TIP35, TIP35A, TIP35B, TIP35C  
NPN SILICON POWER TRANSISTORS

JULY 1968 - REVISED MAY 1995

TYPICAL CHARACTERISTICS

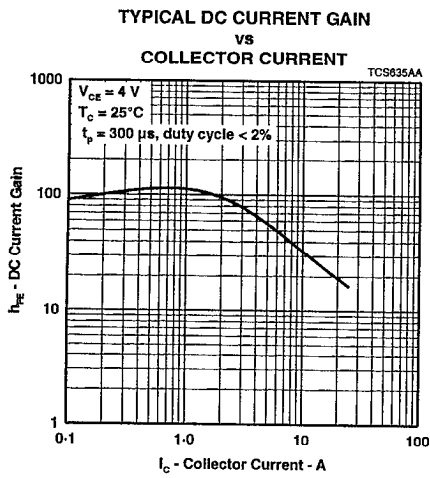


Figure 1.

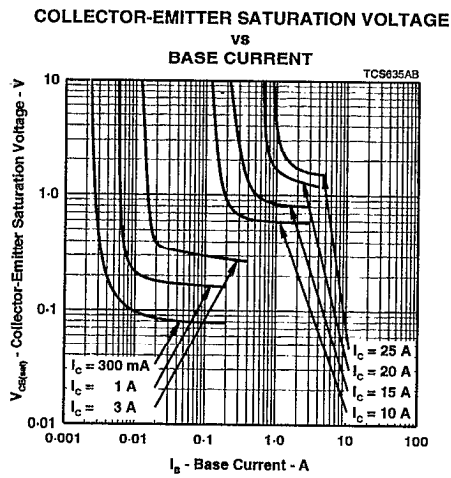


Figure 2.

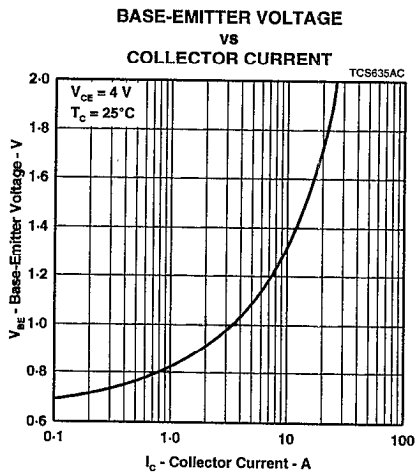


Figure 3.

**TIP35, TIP35A, TIP35B, TIP35C**  
**NPN SILICON POWER TRANSISTORS**

JULY 1968 - REVISED MAY 1995

**MAXIMUM SAFE OPERATING REGIONS**

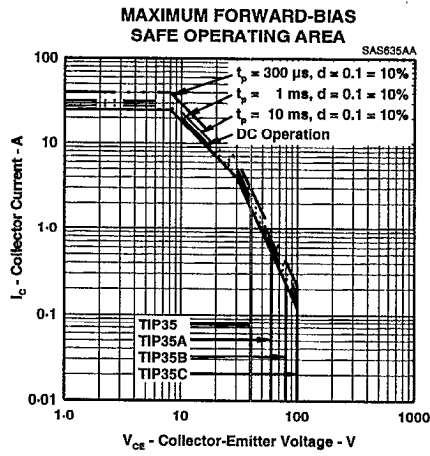


Figure 4.

**THERMAL INFORMATION**

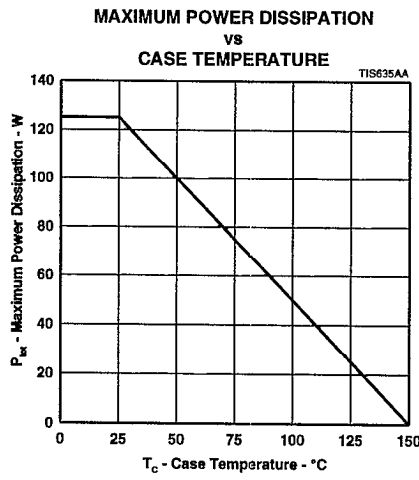
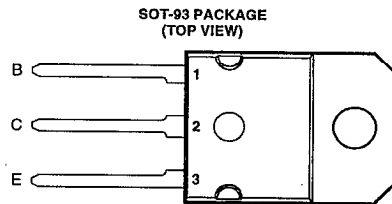


Figure 5.

# TIP36, TIP36A, TIP36B, TIP36C PNP SILICON POWER TRANSISTORS

JULY 1968 - REVISED MAY 1995

- Designed for Complementary Use with the TIP35 Series
- 125 W at 25°C Case Temperature
- 25 A Continuous Collector Current
- 40 A Peak Collector Current
- Customer-Specified Selections Available



Pin 2 is in electrical contact with the mounting base.

MDTRAA

## absolute maximum ratings at 25°C case temperature (unless otherwise noted)

RATING		SYMBOL	VALUE	UNIT
Collector-base voltage ( $I_E = 0$ )	TIP36	$V_{CBO}$	-80	V
	TIP36A		-100	
	TIP36B		-120	
	TIP36C		-140	
Collector-emitter voltage ( $I_B = 0$ )	TIP36	$V_{CEO}$	-40	V
	TIP36A		-60	
	TIP36B		-80	
	TIP36C		-100	
Emitter-base voltage		$V_{EBO}$	-5	V
Continuous collector current		$I_C$	-25	A
Peak collector current (see Note 1)		$I_{CM}$	-40	A
Continuous base current		$I_B$	-5	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		$P_{tot}$	125	W
Continuous device dissipation at (or below) 25°C free air temperature (see Note 3)		$P_{tot}$	3.5	W
Unclamped inductive load energy (see Note 4)		$\frac{1}{2}LI_C^2$	90	mJ
Operating junction temperature range		$T_J$	-65 to +150	°C
Storage temperature range		$T_{stg}$	-65 to +150	°C
Lead temperature 3.2 mm from case for 10 seconds		$T_L$	250	°C

- NOTES: 1. This value applies for  $t_p \leq 0.3$  ms, duty cycle  $\leq 10\%$ .  
 2. Derate linearly to 150°C case temperature at the rate of 1 W/°C.  
 3. Derate linearly to 150°C free air temperature at the rate of 28 mW/°C.  
 4. This rating is based on the capability of the transistor to operate safely in a circuit of:  $L = 20$  mH,  $I_{B(on)} = -0.4$  A,  $R_{BE} = 100 \Omega$ ,  $V_{BE(on)} = 0$ ,  $R_S = 0.1 \Omega$ ,  $V_{CC} = -20$  V.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all the parameters.



Copyright © 1995 Texas Instruments Limited

4-127

**TIP36, TIP36A, TIP36B, TIP36C**  
**PNP SILICON POWER TRANSISTORS**

JULY 1968 - REVISED MAY 1995

**electrical characteristics at 25°C case temperature**

PARAMETER	TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$ Collector-emitter breakdown voltage	$I_C = -30$ mA (see Note 5)	$I_B = 0$	TIP36 TIP36A TIP36B TIP36C	-40 -60 -80 -100			V
$I_{CES}$ Collector-emitter cut-off current	$V_{CE} = -80$ V $V_{CE} = -100$ V $V_{CE} = -120$ V $V_{CE} = -140$ V	$V_{BE} = 0$ $V_{BE} = 0$ $V_{BE} = 0$ $V_{BE} = 0$	TIP36 TIP36A TIP36B TIP36C			-0.7 -0.7 -0.7 -0.7	mA
$I_{CEO}$ Collector cut-off current	$V_{CE} = -30$ V $V_{CE} = -60$ V	$I_B = 0$ $I_B = 0$	TIP36/36A TIP36B/36C			-1 -1	mA
$I_{EBO}$ Emitter cut-off current	$V_{EB} = -5$ V	$I_C = 0$				-1	mA
$h_{FE}$ Forward current transfer ratio	$V_{CE} = -4$ V $V_{CE} = -4$ V	$I_C = -1.5$ A $I_C = -15$ A	(see Notes 5 and 6)	25 10		50	
$V_{CE(sat)}$ Collector-emitter saturation voltage	$I_B = -1.5$ A $I_B = -5$ A	$I_C = -15$ A $I_C = -25$ A	(see Notes 5 and 6)			-1.8 -4	V
$V_{BE}$ Base-emitter voltage	$V_{CE} = -4$ V $V_{CE} = -4$ V	$I_C = -15$ A $I_C = -25$ A	(see Notes 5 and 6)			-2 -4	V
$h_{fe}$ Small signal forward current transfer ratio	$V_{CE} = -10$ V	$I_C = -1$ A	$f = 1$ kHz	25			
$ h_{fe} $ Small signal forward current transfer ratio	$V_{CE} = -10$ V	$I_C = -1$ A	$f = 1$ MHz	3			

NOTES: 5. These parameters must be measured using pulse techniques,  $t_p = 300$   $\mu$ s, duty cycle  $\leq$  2%.  
 6. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.

**thermal characteristics**

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$ Junction to case thermal resistance			1	°C/W
$R_{\theta JA}$ Junction to free air thermal resistance			35.7	°C/W

**resistive-load-switching characteristics at 25°C case temperature**

PARAMETER	TEST CONDITIONS †			MIN	TYP	MAX	UNIT
$t_{on}$ Turn-on time	$I_C = -15$ A	$I_{B(on)} = -1.5$ A	$I_{B(off)} = 1.5$ A		1.1		$\mu$ s
$t_{off}$ Turn-off time	$V_{BE(off)} = 4.15$ V	$R_L = 2$ $\Omega$	$t_p = 20$ $\mu$ s, dc $\leq$ 2%		0.8		$\mu$ s

† Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

TIP36, TIP36A, TIP36B, TIP36C  
PNP SILICON POWER TRANSISTORS

JULY 1968 - REVISED MAY 1995

TYPICAL CHARACTERISTICS

TYPICAL DC CURRENT GAIN  
vs  
COLLECTOR CURRENT

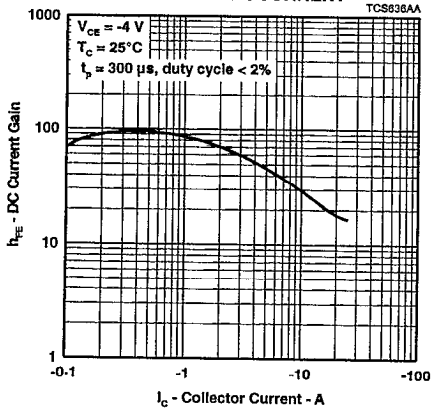


Figure 1.

COLLECTOR-EMITTER SATURATION VOLTAGE  
vs  
BASE CURRENT

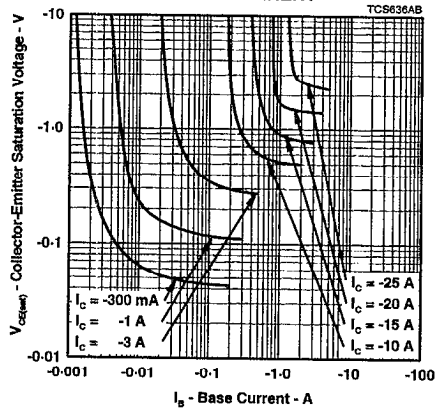


Figure 2.

BASE-EMITTER VOLTAGE  
vs  
COLLECTOR CURRENT

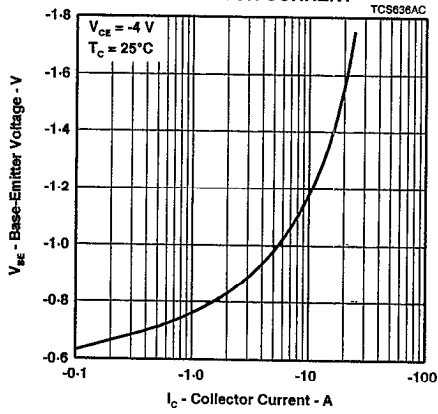
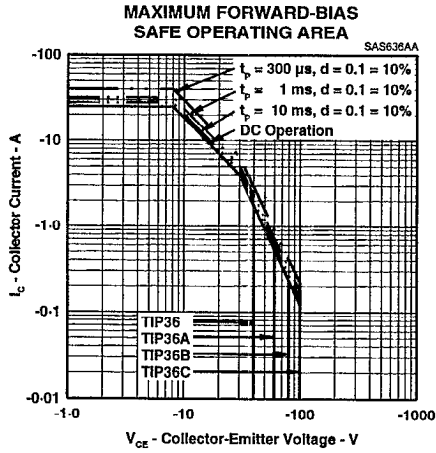


Figure 3.

TIP36, TIP36A, TIP36B, TIP36C  
PNP SILICON POWER TRANSISTORS

JULY 1968 - REVISED MAY 1995

MAXIMUM SAFE OPERATING REGIONS



THERMAL INFORMATION

