

NPN POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/464

DEVICES

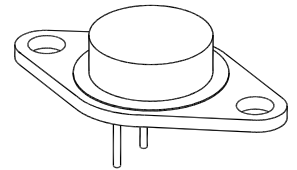
2N5685 2N5686

LEVELS

**JAN
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ABSOLUTE MAXIMUM RATINGS ($T_C = +25^\circ\text{C}$ unless otherwise noted)

Parameters / Test Conditions	Symbol	2N5685	2N5686	Unit
Collector-Emitter Voltage	V_{CEO}	60	80	Vdc
Collector-Base Voltage	V_{CBO}	60	80	Vdc
Emitter-Base Voltage	V_{EBO}	5.0	5.0	Vdc
Base Current	I_B	15	15	Adc
Collector Current	I_C	50	50	Adc
Total Power Dissipation @ $T_C = +25^\circ\text{C}$ ⁽¹⁾ @ $T_C = +100^\circ\text{C}$ ⁽¹⁾	P_T	300 171	300 171	W W
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-55 to +200		$^\circ\text{C}$


TO-3 (TO-204AE)
THERMAL CHARACTERISTICS

Parameters / Test Conditions	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$.0584	$^\circ\text{C}/\text{W}$

Note:

- Derate linearly 1.715 W/ $^\circ\text{C}$ between $T_C = 25^\circ\text{C}$ and $T_C = 200^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, unless otherwise noted)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS ⁽¹⁾				
Collector-Emitter Breakdown Voltage $I_C = 100\text{mA}$	$V_{(BR)CEO}$	60 80		Vdc
Collector-Emitter Cutoff Current $V_{CE} = 30\text{Vdc}$ $V_{CE} = 40\text{Vdc}$	I_{CEO}		500 500	μAdc
Collector-Emitter Cutoff Current $V_{CE} = 60\text{Vdc}, V_{BE} = 1.5\text{Vdc}$ $V_{CE} = 80\text{Vdc}, V_{BE} = 1.5\text{Vdc}$	I_{CEX}		10 10	μAdc
Collector-Base Cutoff Current $V_{CE} = 60\text{Vdc}$ $V_{CE} = 80\text{Vdc}$	I_{CBO}		2.0 2.0	mAdc
Emitter-Base Cutoff Current $V_{EB} = 5.0\text{Vdc}$	I_{EBO}		1.0	mAdc

ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, unless otherwise noted)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
ON CHARACTERISTICS ⁽²⁾				
Forward-Current Transfer Ratio $I_C = 5.0\text{A dc}$, $V_{CE} = 2.0\text{V dc}$ $I_C = 25\text{A dc}$, $V_{CE} = 2.0\text{V dc}$ $I_C = 50\text{A dc}$, $V_{CE} = 5.0\text{V dc}$	h_{FE}	30 15 5.0	60	
Collector-Emitter Saturation Voltage $I_C = 25\text{A dc}$, $I_B = 2.5\text{A dc}$ $I_C = 50\text{A dc}$, $I_B = 10\text{A dc}$	$V_{CE(sat)}$		1.0 5.0	Vdc
Base-Emitter Saturation Voltage $I_C = 25\text{A dc}$, $I_B = 2.5\text{A dc}$	$V_{BE(sat)}$		2.0	Vdc
Base-Emitter Voltage $I_C = 25\text{A dc}$, $V_{CE} = 2.0\text{A dc}$	$V_{BE(ON)}$		2.0	Vdc

DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small-Signal Short-Circuit, Forward Current Transfer Ratio $I_C = 5.0\text{A dc}$, $V_{CE} = 10\text{V dc}$, $f = 1.0\text{MHz}$	$ h_{fe} $	2.0	20	
Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 10\text{A dc}$, $V_{CE} = 5.0\text{V dc}$, $f = 1.0\text{kHz}$	h_{fe}	15		
Output Capacitance $V_{CB} = 10\text{V dc}$, $I_E = 0$, $0.1\text{MHz} \leq f \leq 1.0\text{MHz}$	C_{obo}		1200	pF

SWITCHING CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Turn-On Time $V_{CC} = 30\text{V dc}$; $I_C = 25\text{A dc}$; $I_{B1} = 2.5\text{A dc}$	t_{on}		1.5	μs
Turn-Off Time $V_{CC} = 30\text{V dc}$; $I_C = 25\text{A dc}$; $I_{B1} = -I_{B2} = 2.5\text{A dc}$	t_{off}		3.0	μs

SAFE OPERATING AREA

DC Tests

$T_C = +25^\circ\text{C}$, 1 Cycle, $t = 1.0\text{s}$

Test 1

$V_{CE} = 6.0\text{V dc}$, $I_C = 50\text{A dc}$

Test 2

$V_{CE} = 30\text{V dc}$, $I_C = 10\text{A dc}$

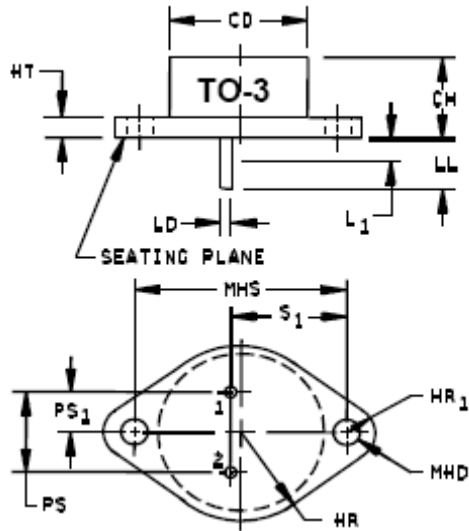
Test 3

$V_{CE} = 50\text{V dc}$, $I_C = 560\text{m dc}$ 2N5685

$V_{CE} = 60\text{V dc}$, $I_C = 640\text{m dc}$ 2N5686

(2) Pulse Test: Pulse Width = $300\mu\text{s}$, Duty Cycle $\leq 2.0\%$

PACKAGE DIMENSIONS



Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD		.875		22.22	3
CH	.250	.450	6.35	11.43	
HR	.495	.525	12.57	13.34	
HR ₁	.131	.188	3.33	4.78	6
HT	.060	.135	1.52	3.43	
LD	.057	.063	1.45	1.60	4, 5, 9
LL	.312	.500	7.92	12.70	4, 5, 9
L ₁		.050		1.27	5, 9
MHD	.151	.165	3.84	4.19	7
MHS	1.177	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	
PS ₁	.205	.225	5.21	5.72	5
S ₁	.655	.675	16.64	17.15	

NOTE:

- Dimensions are in inches.
- Millimeters are given for general information only.
- Body contour is optional within zone defined by CD.
- These dimensions shall be measured at points .050 inch (1.27 mm) to .055 inch (1.40 mm) below seating plane. When gauge is not used, measurement shall be made at seating plane.
- Both terminals.
- At both ends.
- Two holes.
- The collector shall be electrically connected to the case.
- LD applies between L₁ and LL. Lead diameter shall not exceed twice LD within L₁.
- In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.
- * Terminal 1 is emitter; terminal 2 is base; case is collector.

* **FIGURE 1.** Physical dimensions (TO-3)