

SOT-23 Plastic-Encapsulate Transistors

TRANSISTOR (PNP)

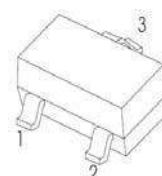
Features:

- Switching transistor
- Extremely low saturation voltage
- Complementary NPN type: FMMT619

Applications:

- Gate Driving MOSFETs and IGBTs
- DC-DC converters
- Charging circuit
- Power switches

SOT - 23



1. BASE
2. EMITTER
3. COLLECTOR

MARKING: 720 and ZD

MAXIMUM RATINGS ($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-Base Voltage	-50	V
V_{CEO}	Collector-Emitter Voltage	-50	V
V_{EBO}	Emitter-Base Voltage	-5	V
I_B	Base Current	-0.5	A
I_{C^*}	Collector Current -Continuous	-2.0	A
I_{CM}	Peak Pulse Current	-5	A
P_C	Total Collector Dissipation	480	mW
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	417	$^{\circ}\text{C/W}$
T_J, T_{stg}	Operation Junction and Storage Temperature Range	-55~+150	$^{\circ}\text{C}$

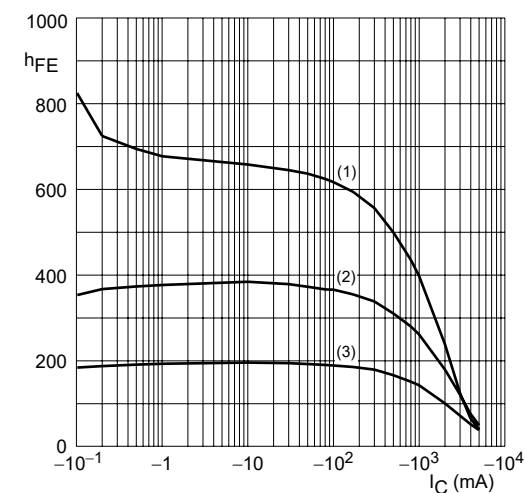
■ Electrical Characteristics $T_a = 25^\circ\text{C}$

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector- base breakdown voltage	V_{CBO}	$I_C = -100\ \mu\text{A}, I_E = 0$	-50			V
Collector- emitter breakdown voltage	V_{CEO}	$I_C = -1\ \text{mA}, I_B = 0$	-50			
Emitter - base breakdown voltage	V_{EBO}	$I_E = -100\ \mu\text{A}, I_C = 0$	-5			
Collector-base cut-off current	I_{CBO}	$V_{CB} = -50\ \text{V}, I_E = 0$			-0.1	μA
		$V_{CB} = -50\ \text{V}, I_E = 0, T_J = 150^\circ\text{C}$			-50	
Emitter cut-off current	I_{EBO}	$V_{EB} = -5\ \text{V}, I_C = 0$			-0.1	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -500\ \text{mA}, I_B = -50\ \text{mA}$			-90	mV
		$I_C = -1\ \text{A}, I_B = -50\ \text{mA}$			-180	
		$I_C = -2\ \text{A}, I_B = -100\ \text{mA}$ (Note.1)			-320	
		$I_C = -2\ \text{A}, I_B = -200\ \text{mA}$ (Note.1)			-270	
		$I_C = -3\ \text{A}, I_B = -300\ \text{mA}$ (Note.1)			-390	
Base - emitter saturation voltage	$V_{BE(sat)}$	$I_C = -2\ \text{A}, I_B = -100\ \text{mA}$ (Note.1)			-1.1	V
		$I_C = -3\ \text{A}, I_B = -300\ \text{mA}$ (Note.1)			-1.2	
Base - emitter turn on voltage	$V_{BE(on)}$	$V_{CE} = -2\ \text{V}, I_C = -1\ \text{A}$ (Note.1)			-1.2	
Equivalent on-resistance	$R_{CE(sat)}$	$I_C = -2\ \text{A}, I_B = -200\ \text{mA}$ (Note.1)			135	$\text{m}\Omega$
DC current gain	h_{FE}	$V_{CE} = -2\ \text{V}, I_C = -100\ \text{mA}$	200			
		$V_{CE} = -2\ \text{V}, I_C = -500\ \text{mA}$	200			
		$V_{CE} = -2\ \text{V}, I_C = -1\ \text{A}$ (Note.1)	200			
		$V_{CE} = -2\ \text{V}, I_C = -2\ \text{A}$ (Note.1)	130			
		$V_{CE} = -2\ \text{V}, I_C = -3\ \text{A}$ (Note.1)	80			
Collector output capacitance	C_{ob}	$V_{CB} = -10\ \text{V}, I_E = I_C = 0, f = 1\ \text{MHz}$			35	pF
Transition frequency	f_T	$V_{CE} = -5\ \text{V}, I_C = -100\ \text{mA}, f = 100\ \text{MHz}$	100			MHz

Note.1: Pulse test: $t_p \leq 300\ \mu\text{s}$; $\delta \leq 0.02$.

Typical Characteristics

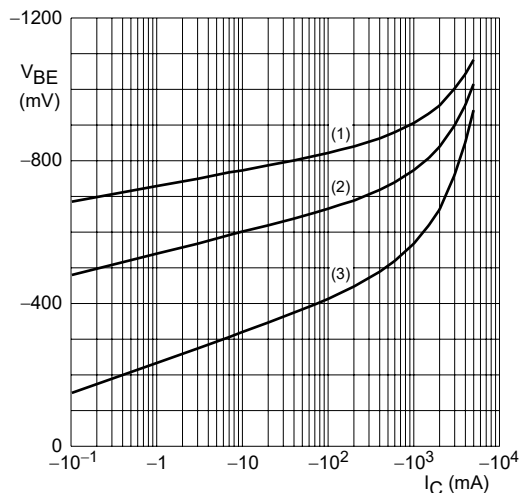
■ Typical Characteristics



$V_{CE} = -2\ \text{V}$.

- (1) $T_{amb} = 150^\circ\text{C}$.
- (2) $T_{amb} = 25^\circ\text{C}$.
- (3) $T_{amb} = -55^\circ\text{C}$.

Fig.1 DC current gain as a function of collector current; typical values.



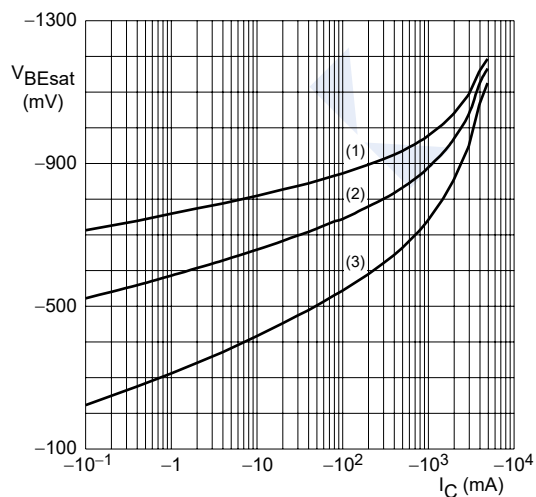
$V_{CE} = -2\ \text{V}$.

- (1) $T_{amb} = -55^\circ\text{C}$.
- (2) $T_{amb} = 25^\circ\text{C}$.
- (3) $T_{amb} = 150^\circ\text{C}$.

Fig.2 Base-emitter voltage as a function of collector current; typical values.

Typical Characteristics

■ Electrical Characteristics $T_a = 25^\circ\text{C}$



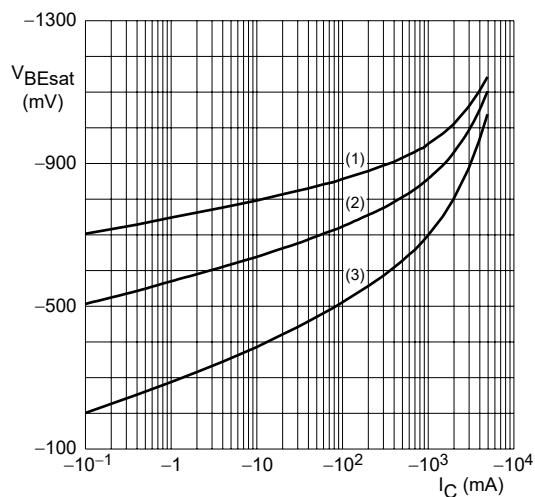
$I_C/I_B = 10$.

(1) $T_{amb} = -55^\circ\text{C}$.

(2) $T_{amb} = 25^\circ\text{C}$.

(3) $T_{amb} = 150^\circ\text{C}$.

Fig.3 Base-emitter saturation voltage as a function of collector current; typical values.



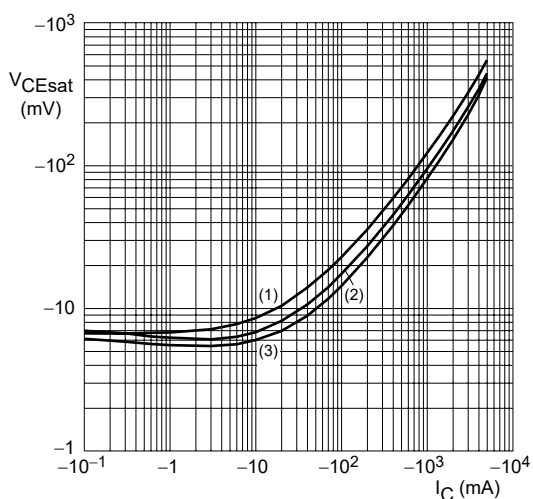
$I_C/I_B = 20$.

(1) $T_{amb} = -55^\circ\text{C}$.

(2) $T_{amb} = 25^\circ\text{C}$.

(3) $T_{amb} = 150^\circ\text{C}$.

Fig.4 Base-emitter saturation voltage as a function of collector current; typical values.



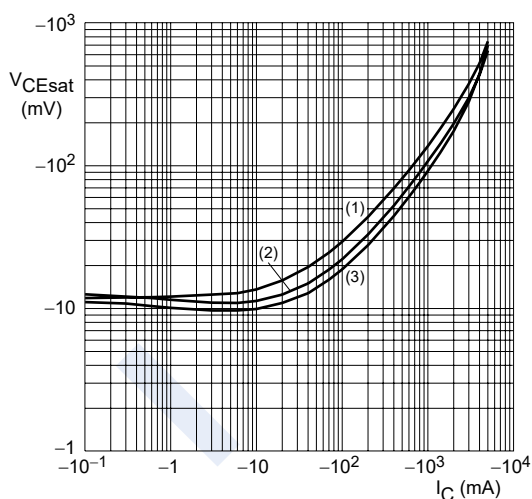
$I_C/I_B = 10$.

(1) $T_{amb} = 150^\circ\text{C}$.

(2) $T_{amb} = 25^\circ\text{C}$.

(3) $T_{amb} = -55^\circ\text{C}$.

Fig.5 Collector-emitter saturation voltage as a function of collector current; typical values.



$I_C/I_B = 20$.

(1) $T_{amb} = 150^\circ\text{C}$.

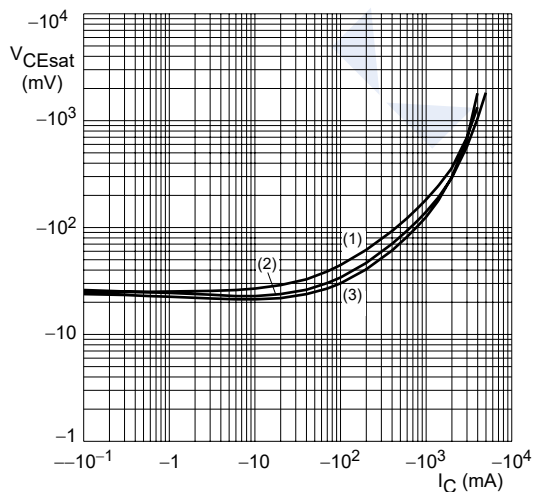
(2) $T_{amb} = 25^\circ\text{C}$.

(3) $T_{amb} = -55^\circ\text{C}$.

Fig.6 Collector-emitter saturation voltage as a function of collector current; typical values.

Typical Characteristics

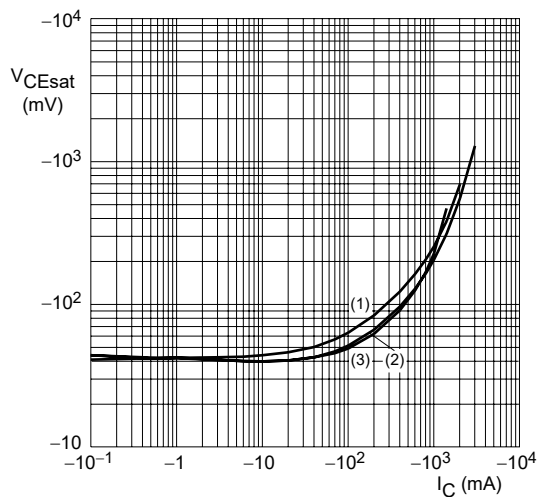
■ Electrical Characteristics $T_a = 25^\circ\text{C}$



$I_C/I_B = 50$.

- (1) $T_{amb} = 150^\circ\text{C}$.
- (2) $T_{amb} = 25^\circ\text{C}$.
- (3) $T_{amb} = -55^\circ\text{C}$.

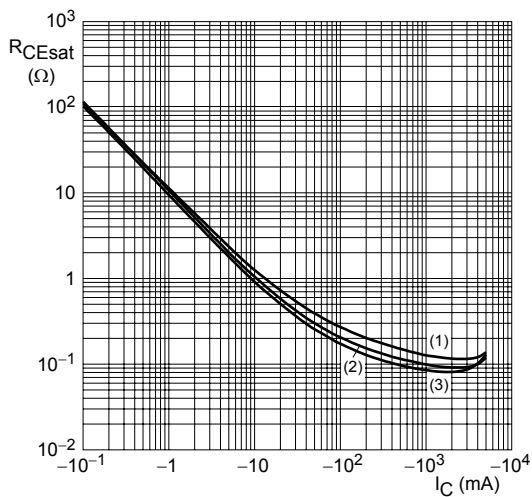
Fig. 7 Collector-emitter saturation voltage as a function of collector current; typical values.



$I_C/I_B = 100$.

- (1) $T_{amb} = 150^\circ\text{C}$.
- (2) $T_{amb} = 25^\circ\text{C}$.
- (3) $T_{amb} = -55^\circ\text{C}$.

Fig. 8 Collector-emitter saturation voltage as a function of collector current; typical values.

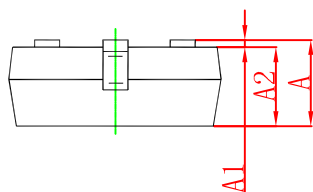
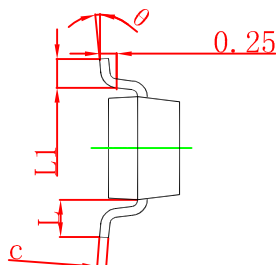
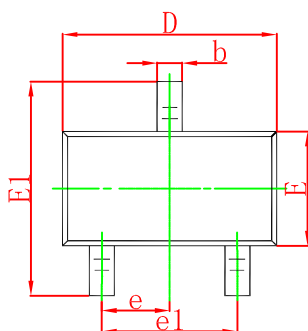


$I_C/I_B = 20$.

- (1) $T_{amb} = 150^\circ\text{C}$.
- (2) $T_{amb} = 25^\circ\text{C}$.
- (3) $T_{amb} = -55^\circ\text{C}$.

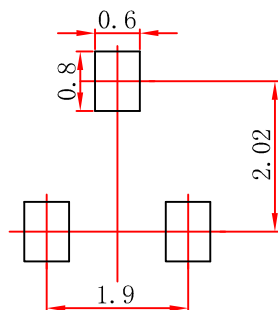
Fig. 9 Equivalent on-resistance as a function of collector current; typical values.

SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

SOT-23 Suggested Pad Layout

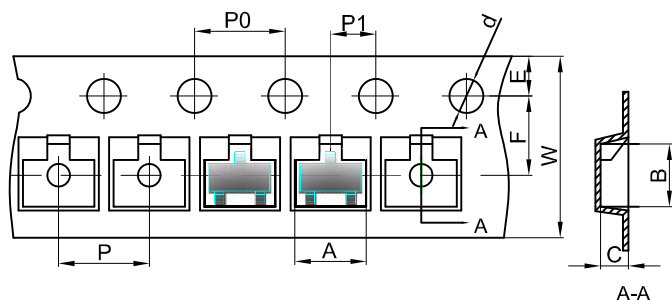


Note:

1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.

SOT-23 Tape and Reel

SOT-23 Embossed Carrier Tape



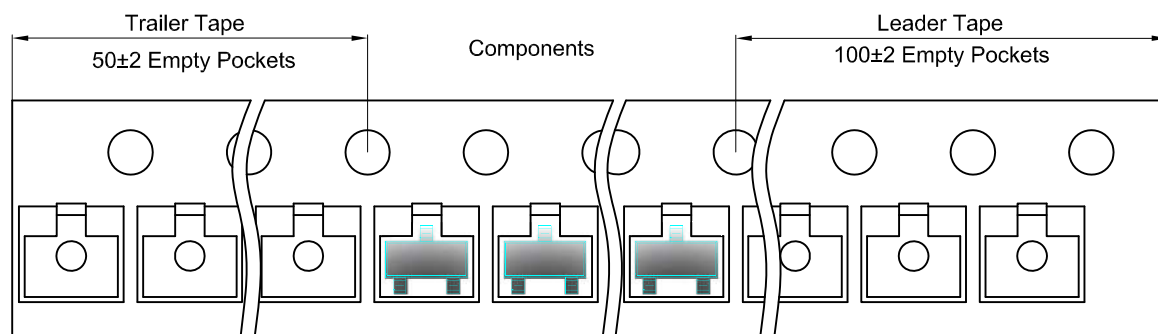
Packaging Description:

SOT-23 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 17.8cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

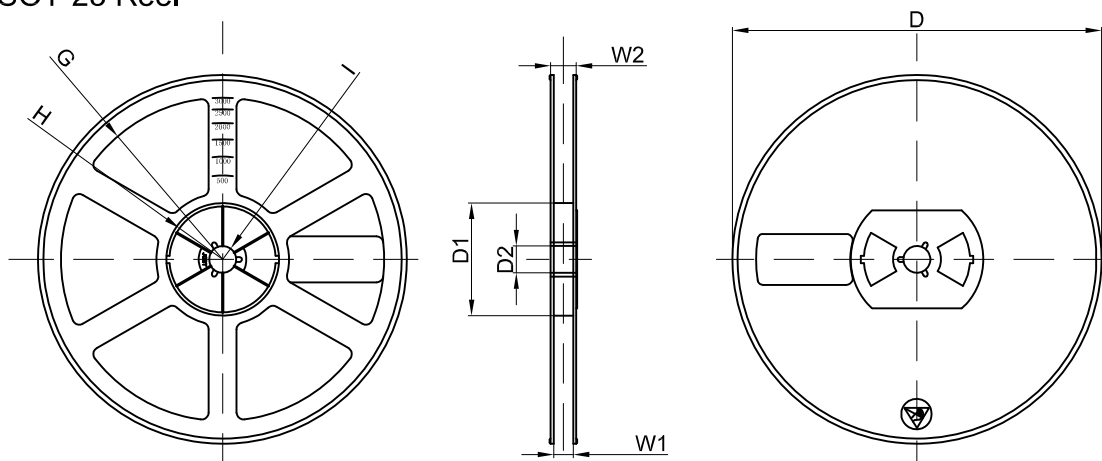
Dimensions are in millimeter

Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-23	3.15	2.77	1.22	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-23 Tape Leader and Trailer



SOT-23 Reel



Dimensions are in millimeter

Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø178.00	54.40	13.00	R78.00	R25.60	R6.50	9.50	12.30

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3000 pcs	7 inch	45,000 pcs	203×203×195	180,000 pcs	438×438×220	