

# SILICON POWER TRANSISTOR 2SA1649, 2SA1649-Z

### PNP SILICON EPITAXIAL POWER TRANSISTOR FOR HIGH-SPEED SWITCHING

The 2SA1649 is a mold power transistor developed for high-speed switching and features a very low collector-to-emitter saturation voltage.

This transistor is ideal for use in switching regulators, DC/DC converters, motor drivers, solenoid drivers, and other low-voltage power supply devices, as well as for high-current switching.

#### FEATURES

- Available for high-current control in small dimension
- Z type is a lead processed product and is deal for mounting a hybrid IC.
- Mold package that does not require an insulating board or insulation bushing
- Low collector saturation voltage:  
 $V_{CE(sat)} = -0.3 \text{ V MAX. (@ } I_c = -3 \text{ A)}$
- Fast switching speed:  
 $t_f = 0.3 \mu\text{s MAX. (@ } I_c = -3 \text{ A)}$
- High DC current amplifiers and excellent linearity

#### ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

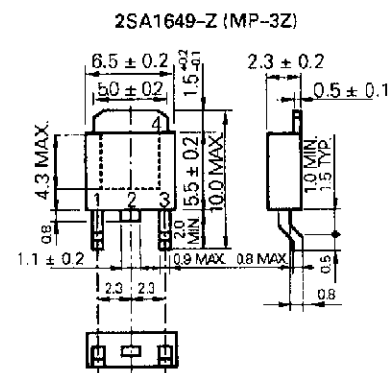
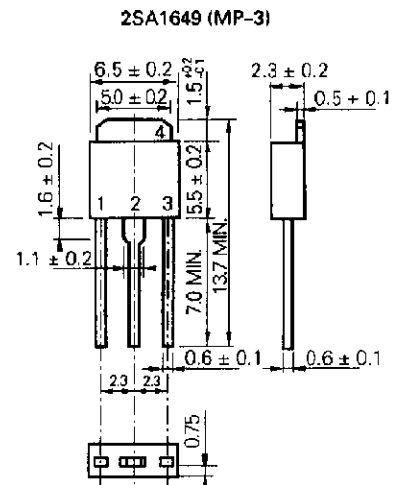
Parameter	Symbol	Ratings	Unit
Collector to base voltage	$V_{CBO}$	-40	V
Collector to emitter voltage	$V_{CEO}$	-30	V
Emitter to base voltage	$V_{EBO}$	-7.0	V
Collector current (DC)	$I_{C(DC)}$	-10	A
Collector current (pulse)	$I_{C(pulse)^*}$	-20	A
Base current (DC)	$I_{B(DC)}$	-3.5	A
Total power dissipation	$P_T (T_c = 25^\circ\text{C})$	15	W
Total power dissipation	$P_T (T_a = 25^\circ\text{C})$	1.0**, 2.0***	W
Junction temperature	$T_j$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

\*:  $PW \leq 300 \mu\text{s}$ , duty cycle  $\leq 10\%$

\*\* : Printing board mounted

\*\*\*:  $7.5 \text{ mm}^2 \times 0.7 \text{ mm}$  ceramic board mounted

#### PACKAGE DRAWING (UNIT: mm)



Electrode Connection  
 1. Base  
 2. Collector  
 3. Emitter  
 4. Fin (collector)

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**ELECTRICAL CHARACTERISTICS (Ta = 25°C)**

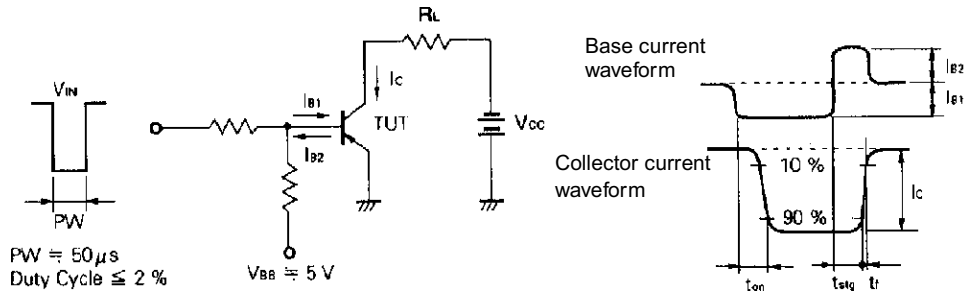
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector to emitter voltage	$V_{CEO(SUS)}$	$I_C = -4.0\text{ A}$ , $I_B = -0.4\text{ A}$ , $L = 1\text{ mH}$	-30			V
Collector to emitter voltage	$V_{CEX(SUS)}$	$I_C = -4.0\text{ A}$ , $I_{B2} = -I_{B1} = -0.4\text{ A}$ , $V_{BE(OFF)} = 1.5\text{ V}$ , $L = 180\text{ }\mu\text{H}$ , clamped	-40			V
Collector cutoff current	$I_{CBO}$	$V_{CE} = -30\text{ V}$ , $I_E = 0$			-10	$\mu\text{A}$
Collector cutoff current	$I_{CER}$	$V_{CE} = -30\text{ V}$ , $R_{BE} = 50\text{ }\Omega$ , $T_a = 125^\circ\text{C}$			-1.0	mA
Collector cutoff current	$I_{CEX1}$	$V_{CE} = -30\text{ V}$ , $V_{BE(OFF)} = 1.5\text{ V}$			-10	$\mu\text{A}$
Collector cutoff current	$I_{CEX2}$	$V_{CE} = -30\text{ V}$ , $V_{BE(OFF)} = 1.5\text{ V}$ , $T_a = 125^\circ\text{C}$			-1.0	mA
Emitter cutoff current	$I_{EBO}$	$V_{EB} = -5.0\text{ V}$ , $I_C = 0$			-10	$\mu\text{A}$
DC current gain	$h_{FE1}^*$	$V_{CE} = -2.0\text{ V}$ , $I_C = -0.5\text{ A}$	100			-
DC current gain	$h_{FE2}^*$	$V_{CE} = -2.0\text{ V}$ , $I_C = -2.0\text{ A}$	100	200	400	-
DC current gain	$h_{FE3}^*$	$V_{CE} = -2.0\text{ V}$ , $I_C = -4.0\text{ A}$	60			-
Collector saturation voltage	$V_{CE(sat)1}^*$	$I_C = -3.0\text{ A}$ , $I_B = -0.2\text{ A}$			-0.3	V
Collector saturation voltage	$V_{CE(sat)2}^*$	$I_C = -4.0\text{ A}$ , $I_B = -0.3\text{ A}$			-0.5	V
Base saturation voltage	$V_{BE(sat)1}^*$	$I_C = -3.0\text{ A}$ , $I_B = -0.2\text{ A}$			-1.2	V
Base saturation voltage	$V_{BE(sat)2}^*$	$I_C = -4.0\text{ A}$ , $I_B = -0.3\text{ A}$			-1.5	V
Collector capacitance	$C_{ob}$	$V_{CB} = -10\text{ V}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$		250		pF
Gain bandwidth product	$f_T$	$V_{CE} = -10\text{ V}$ , $I_C = -0.5\text{ A}$		120		MHz
Turn-on time	$t_{on}$	$I_C = -4.0\text{ A}$ , $R_L = 5\text{ }\Omega$ , $I_{B1} = -I_{B2} = -0.15\text{ A}$ , $V_{CC} \cong -20\text{ V}$ Refer to the test circuit.			0.3	$\mu\text{s}$
Storage time	$t_{stg}$				1.5	$\mu\text{s}$
Fall time	$t_f$				0.3	$\mu\text{s}$

\* Pulse test  $PW \leq 350\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ /pulsed

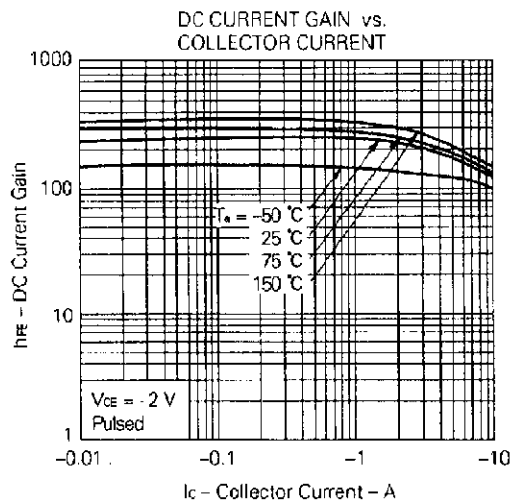
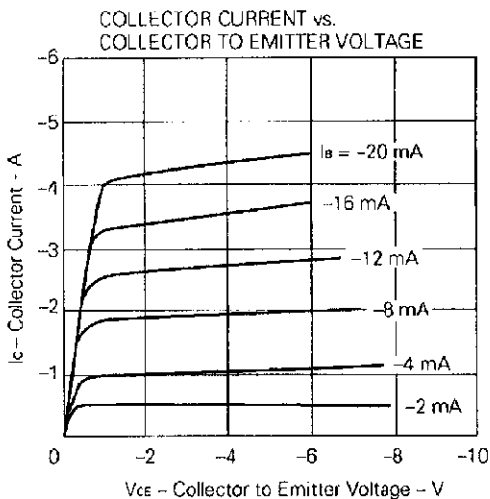
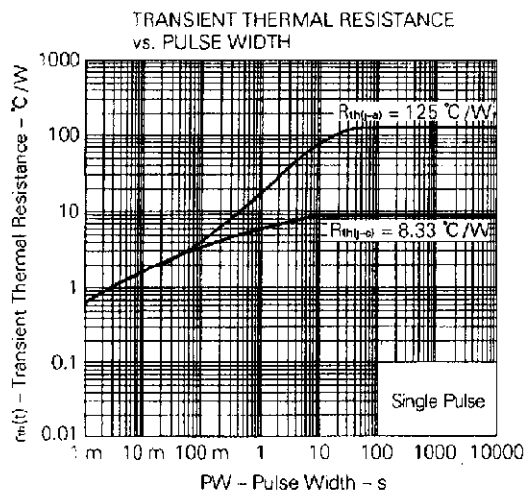
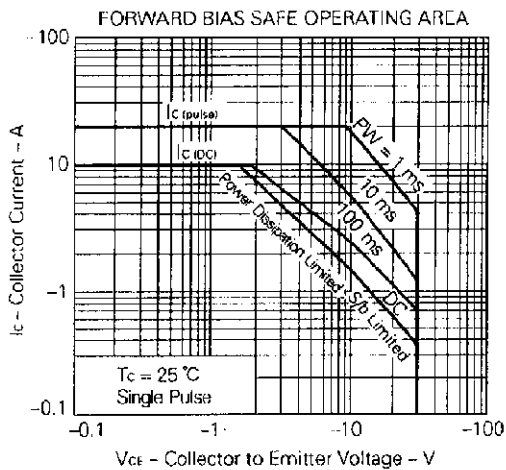
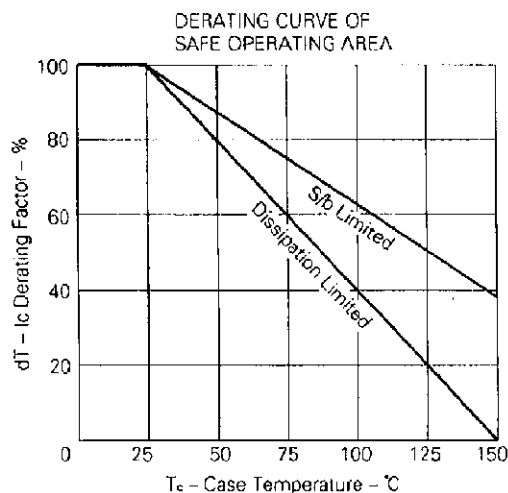
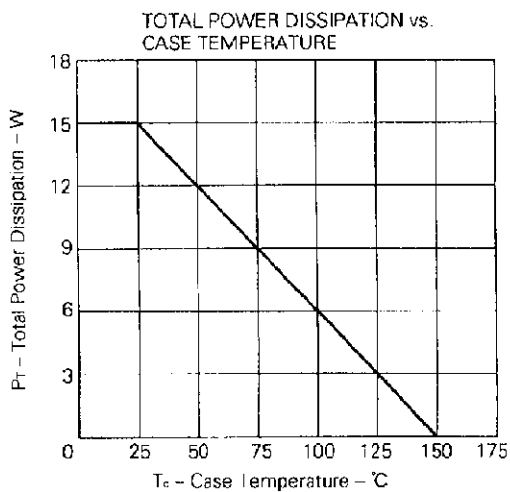
**$h_{FE}$  CLASSIFICATION**

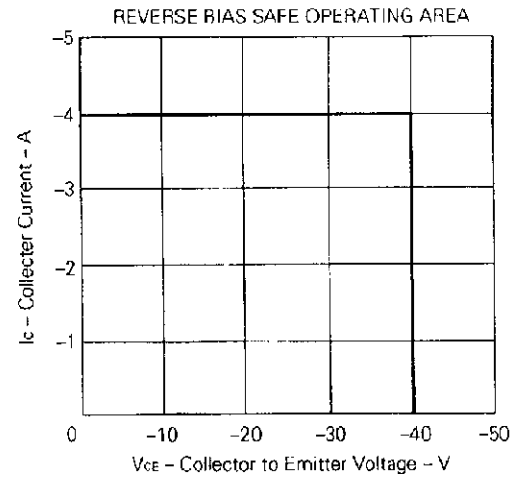
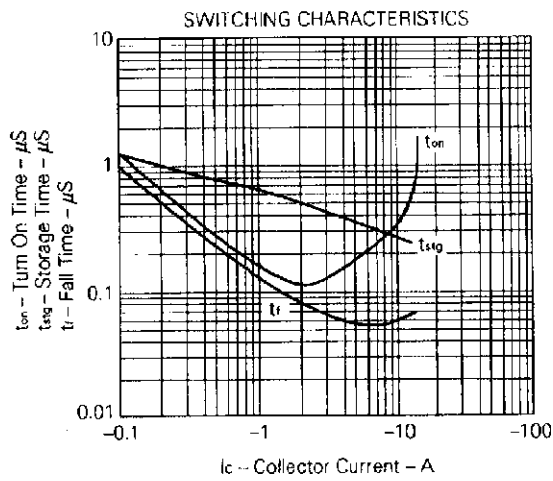
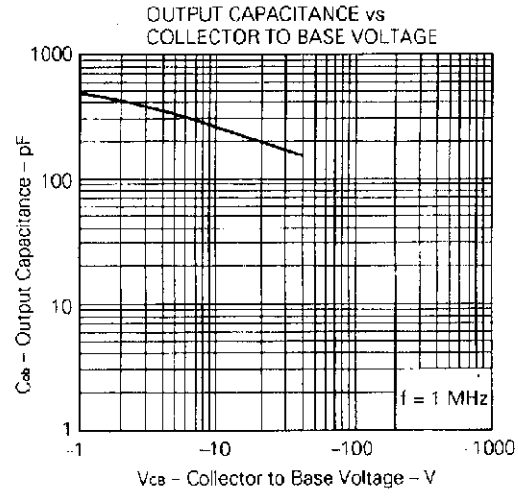
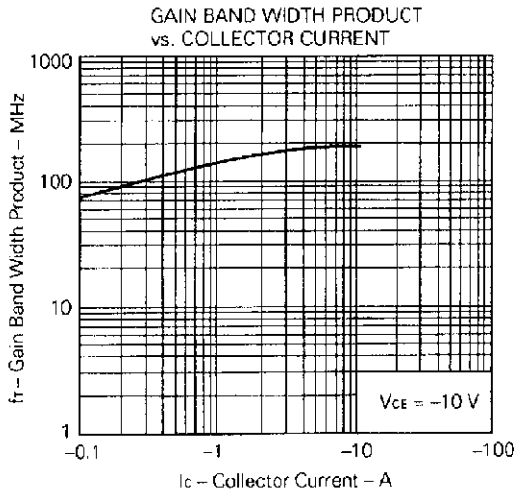
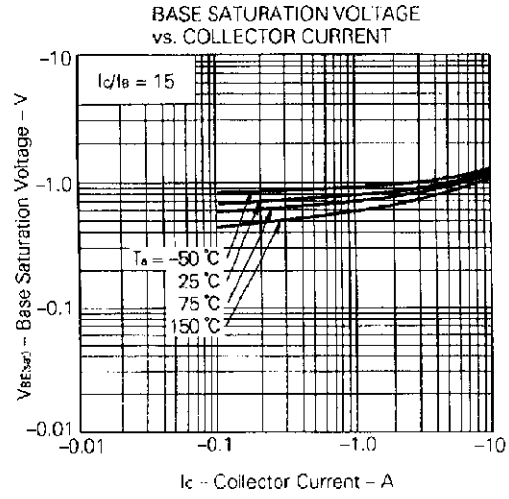
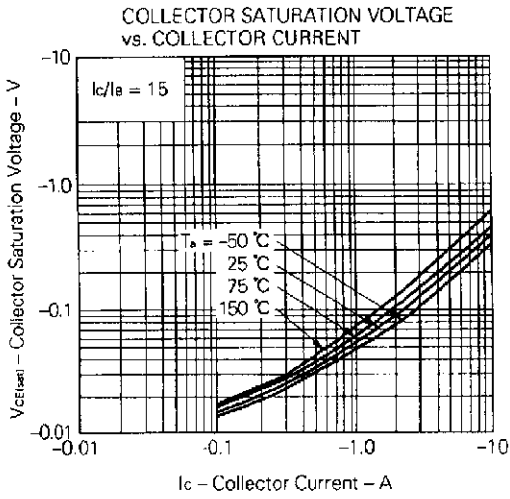
Marking	M	L	K
$h_{FE2}$	100 to 200	150 to 300	200 to 400

**SWITCHING TIME ( $t_{on}$ ,  $t_{stg}$ ,  $t_f$ ) TEST CIRCUIT**



TYPICAL CHARACTERISTICS (Ta = 25°C)





[MEMO]

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