

To all our customers

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Renesas Technology Corp.  
Customer Support Dept.  
April 1, 2003

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Keep safety first in your circuit designs!

1. Renesas Technology Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.

Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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# H7N0203AB

Silicon N Channel MOS FET  
High Speed Power Switching

**RENESAS**

ADE-208-1490C (Z)

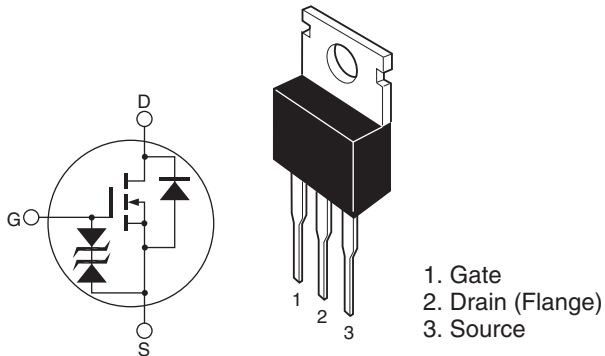
4th. Edition  
Aug. 2002

## Features

- Low on-resistance
- $R_{DS(on)} = 2.4 \text{ m}\Omega$  typ.
- Low drive current
- 4.5 V gate drive device can be driven from 5 V source

## Outline

TO-220AB



## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DSS}$	20	V
Gate to source voltage	$V_{GSS}$	±20	V
Drain current	$I_D$	90	A
Drain peak current	$I_{D(pulse)}$ <sup>Note 1</sup>	360	A
Body-drain diode reverse drain current	$I_{DR}$	90	A
Avalanche current	$I_{AP}$ <sup>Note2</sup>	20	A
Avalanche energy	$E_{AR}$ <sup>Note2</sup>	40	mJ
Channel dissipation	$P_{ch}$ <sup>Note 3</sup>	100	W
Channel to Case Thermal Impedance	$\theta_{ch-c}$	1.25	°C/W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

Notes: 1.  $PW \leq 10 \mu s$ , duty cycle  $\leq 1\%$

2. Value at Tch = 25°C, Rg  $\geq 50 \Omega$

3. Value at Tc = 25°C

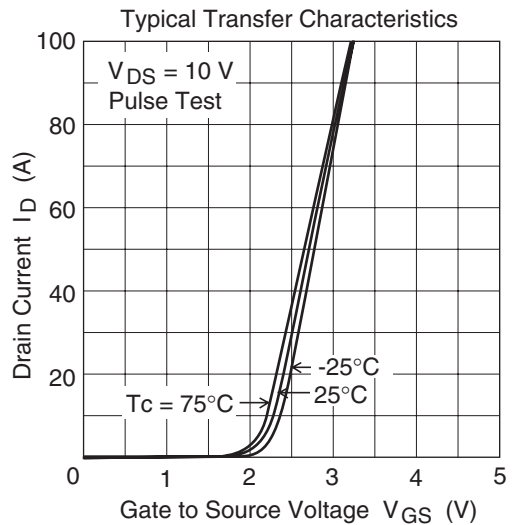
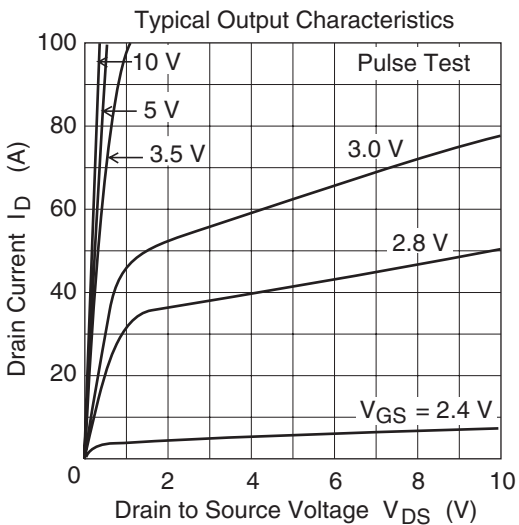
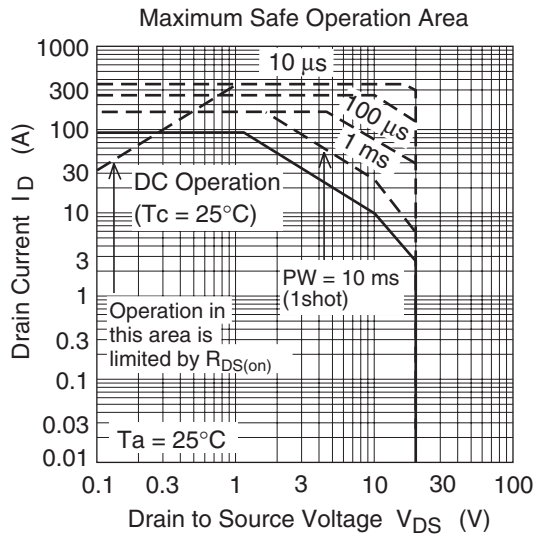
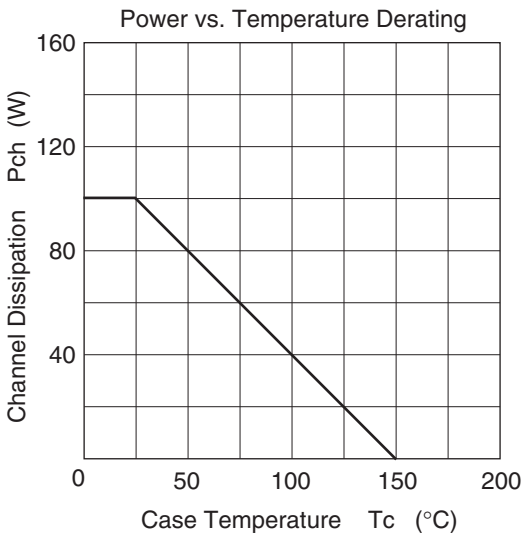
## Electrical Characteristics

(Ta = 25°C)

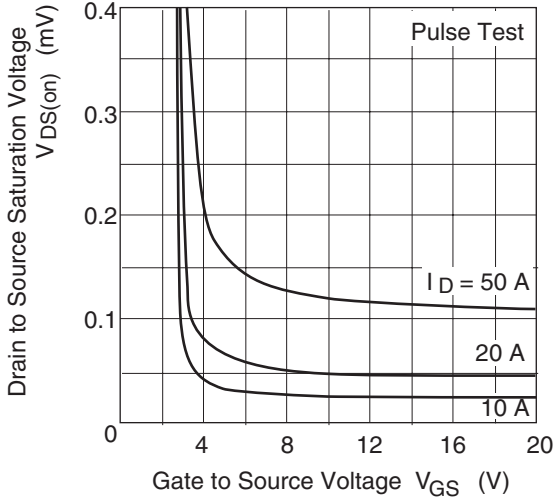
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	20	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—		$I_G = \pm 100 \text{ }\mu\text{A}$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	10	$\mu\text{A}$	$V_{DS} = 20 \text{ V}$ , $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.5	V	$I_D = 1 \text{ mA}$ , $V_{DS} = 10 \text{ V}^{*1}$
Static drain to source on state resistance	$R_{DS(on)}$	—	2.4	3.0	$\text{m}\Omega$	$I_D = 45 \text{ A}$ , $V_{GS} = 10 \text{ V}^{*1}$
		—	3.5	5.1	$\text{m}\Omega$	$I_D = 45 \text{ A}$ , $V_{GS} = 4.5 \text{ V}^{*1}$
Forward transfer admittance	$ y_{fs} $	80	140	—	S	$I_D = 45 \text{ A}$ , $V_{DS} = 10 \text{ V}^{*1}$
Input capacitance	Ciss	—	6800	—	pF	$V_{DS} = 10 \text{ V}$
Output capacitance	Coss	—	1850	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	Crss	—	750	—	pF	$f = 1 \text{ MHz}$
Total gate charge	Qg	—	110	—	nc	$V_{DD} = 10 \text{ V}$
Gate to source charge	Qgs	—	22	—	nc	$V_{GS} = 10 \text{ V}$
Gate to drain charge	Qgd	—	20	—	nc	$I_D = 90 \text{ A}$
Turn-on delay time	$t_{d(on)}$	—	32	—	ns	$V_{GS} = 10 \text{ V}$ , $I_D = 45 \text{ A}$
Rise time	$t_r$	—	380	—	ns	$R_L = 0.22 \text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	—	110	—	ns	$R_g = 4.7 \text{ }\Omega$
Fall time	$t_f$	—	35	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	0.90	—	V	$I_F = 90 \text{ A}$ , $V_{GS} = 0$
Body-drain diode reverse recovery time	$t_{rr}$	—	60	—	ns	$I_F = 90 \text{ A}$ , $V_{GS} = 0$ $diF/dt = 50 \text{ A}/\mu\text{s}$

Note: 1. Pulse test

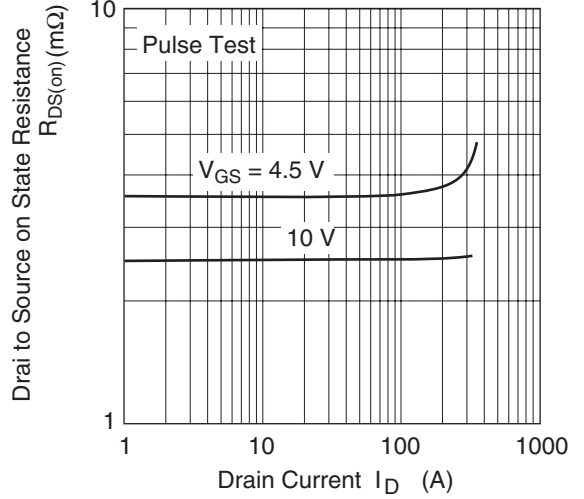
## Main Characteristics



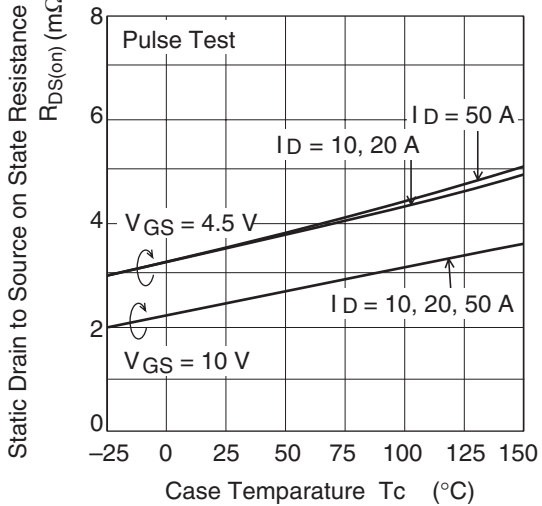
Drain to Source Saturation Voltage VS. Gate to Source Voltage



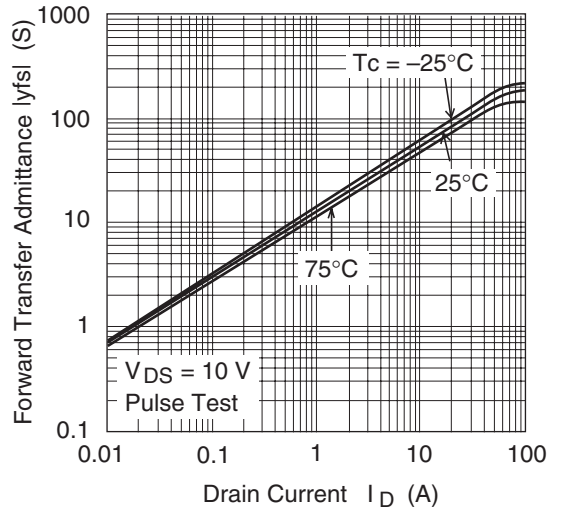
Static Drain to Source on State Resistance vs. Drain Current



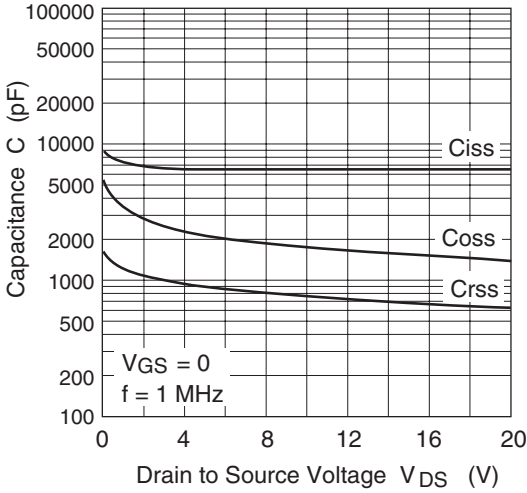
Static Drain to Source on State Resistance vs. Temperature



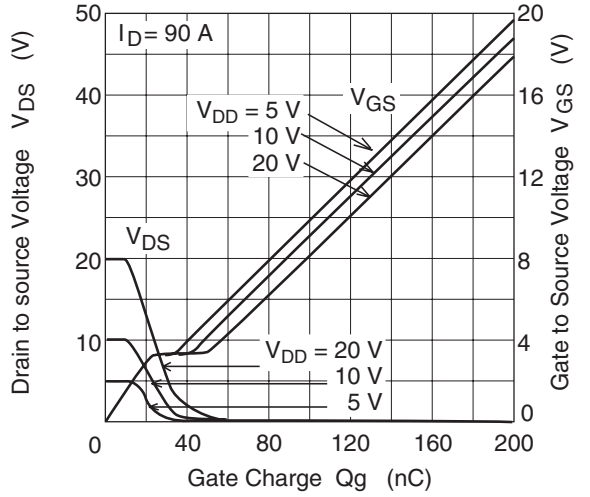
Forward Transfer Admittance vs. Drain Current



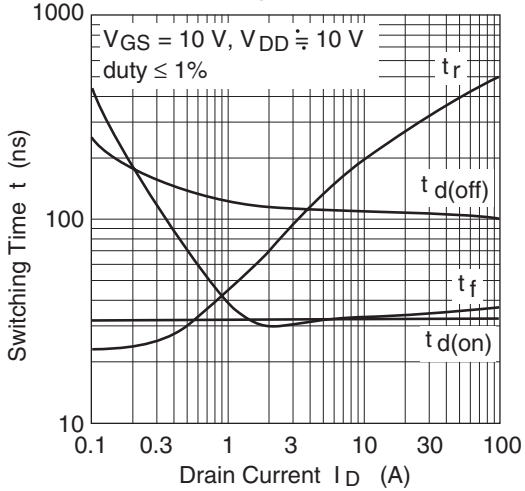
Typical Capacitance vs. Drain to Source Voltage



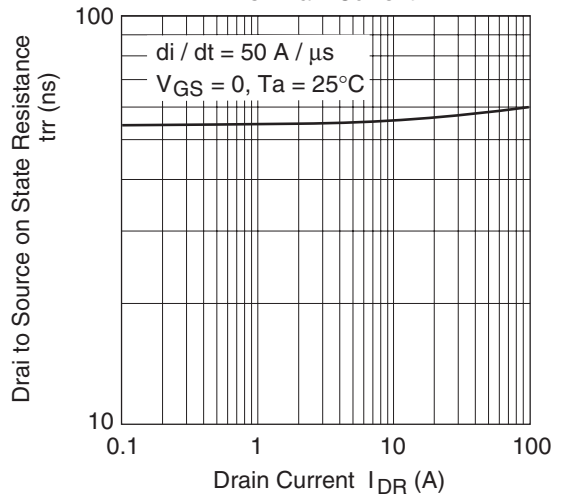
Dynamic Input Characteristics

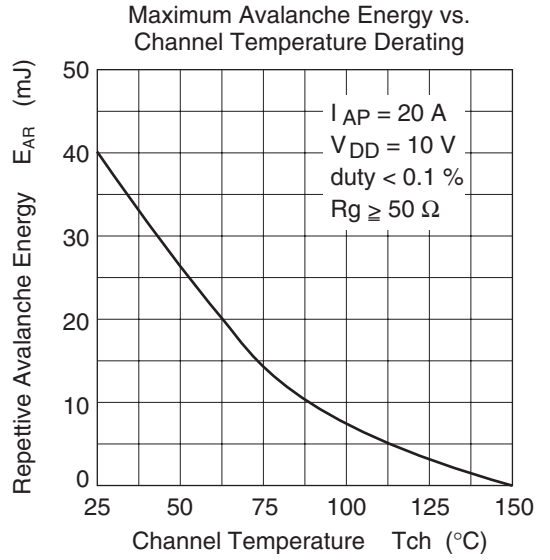
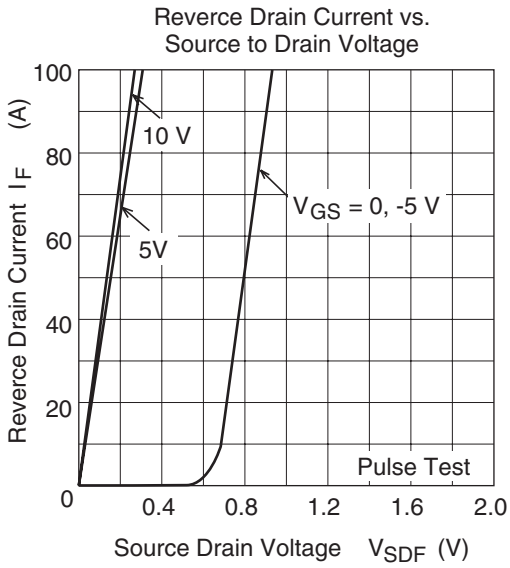


Switching Characteristics

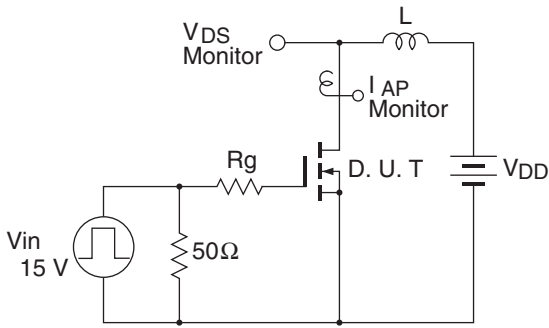


Static Drain to Source on State Resistance vs. Drain Current



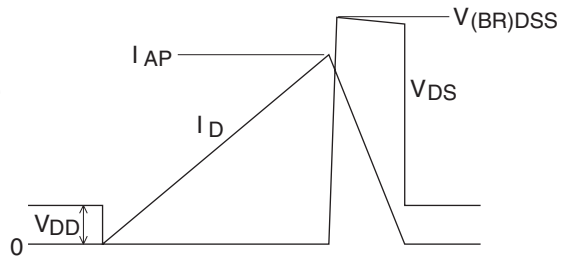


Avalanche Test Circuit

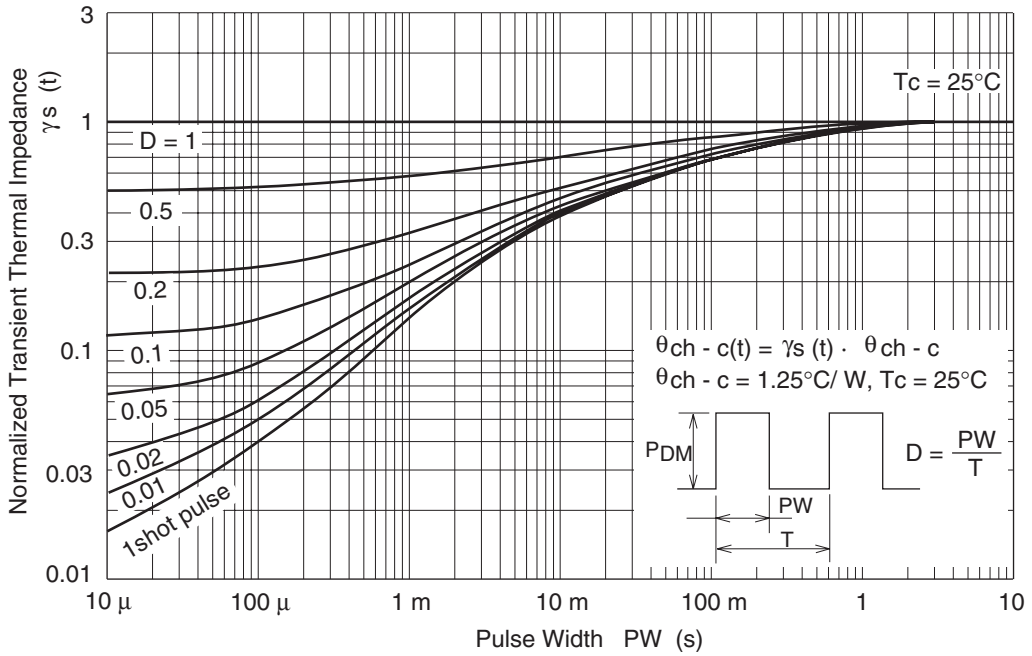


Avalanche Waveform

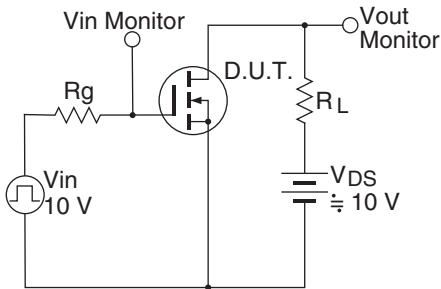
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



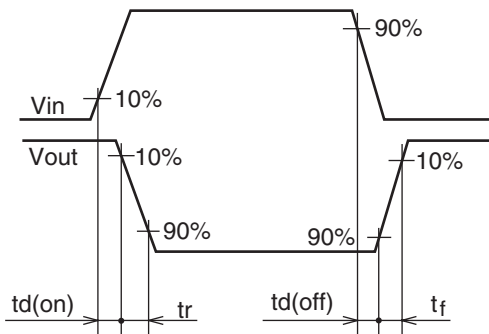
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit

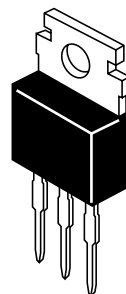
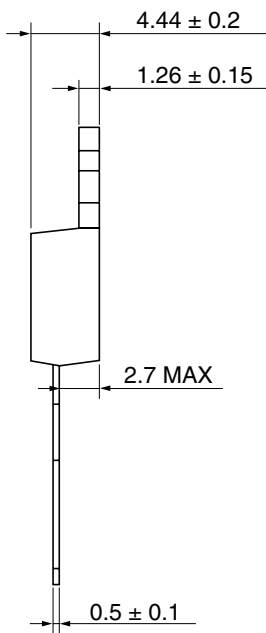
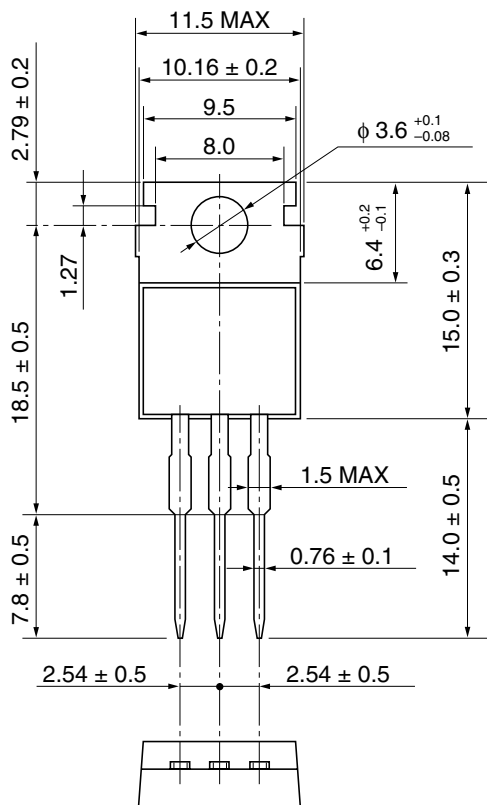


Switching Time Waveform



Package Dimensions

As of January, 2002  
Unit: mm



Hitachi Code	TO-220AB
JEDEC	Conforms
JEITA	Conforms
Mass (reference value)	1.8 g

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