

# 2SK3156

Silicon N Channel MOS FET  
High Speed Power Switching

# HITACHI

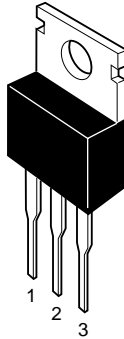
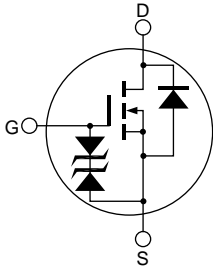
ADE-208-683A (Z)  
2nd. Edition  
February 1999

## Features

- Low on-resistance  
 $R_{DS} = 50 \text{ m}\Omega$  typ.
- High speed switching
- 4 V gate drive device can be driven from 5 V source

## Outline

TO-220AB



1. Gate
2. Drain(Flange)
3. Source

## Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DSS}$	150	V
Gate to source voltage	$V_{GSS}$	±20	V
Drain current	$I_D$	20	A
Drain peak current	$I_{D(pulse)}$ <sup>Note1</sup>	80	A
Body-drain diode reverse drain current	$I_{DR}$	20	A
Avalanche current	$I_{AP}$ <sup>Note3</sup>	20	A
Avalanche energy	$E_{AR}$ <sup>Note3</sup>	30	mJ
Channel dissipation	$P_{ch}$ <sup>Note2</sup>	75	W
Channel temperature	$T_{ch}$	150	°C
Storage temperature	$T_{stg}$	-55 to +150	°C

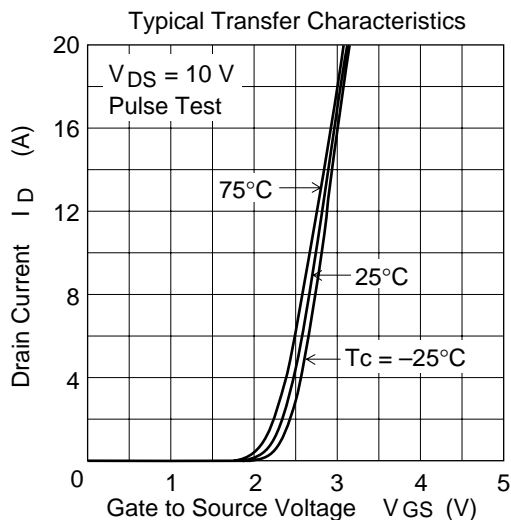
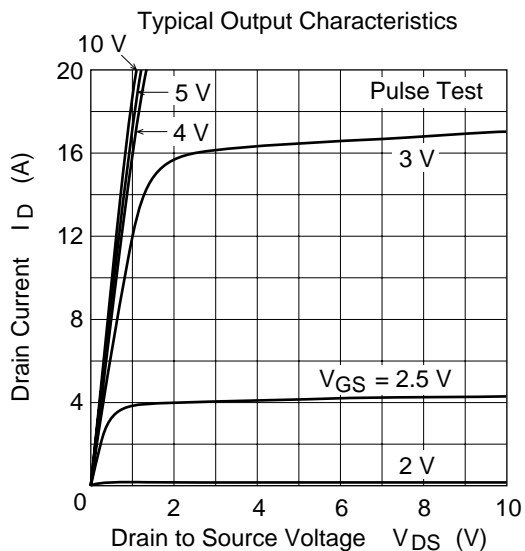
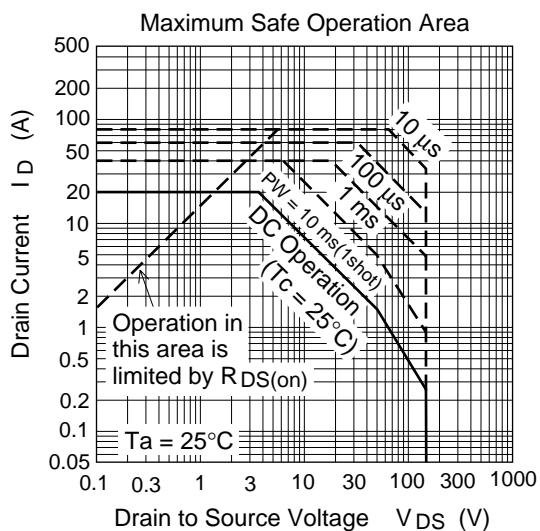
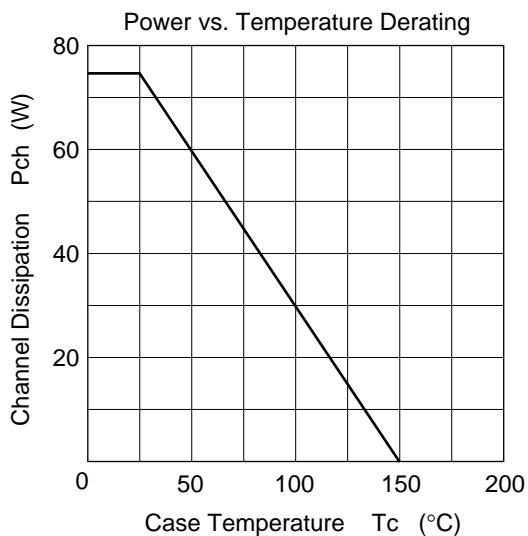
Note: 1.  $PW \leq 10 \mu s$ , duty cycle  $\leq 1\%$   
 2. Value at  $T_c = 25^\circ C$   
 3. Value at  $T_{ch} = 25^\circ C$ ,  $R_g \geq 50 \Omega$

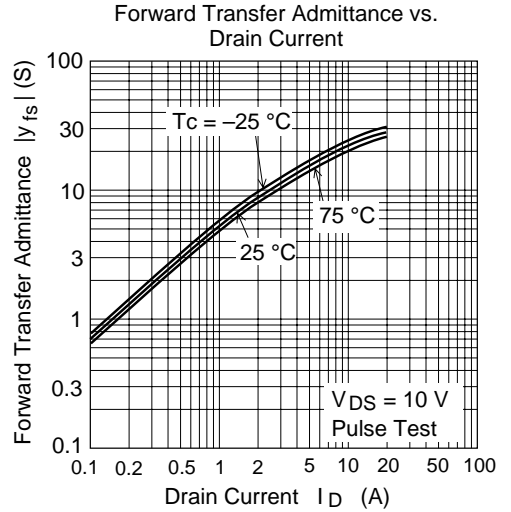
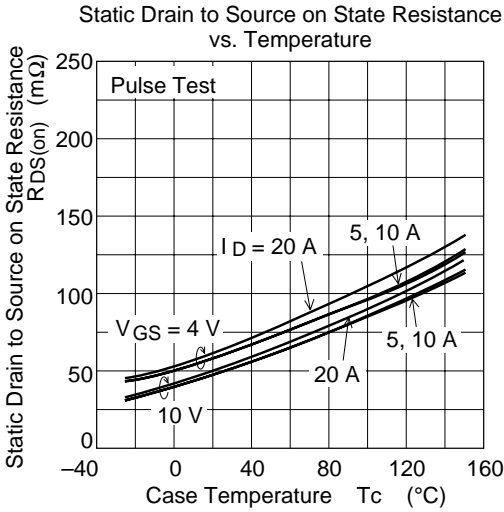
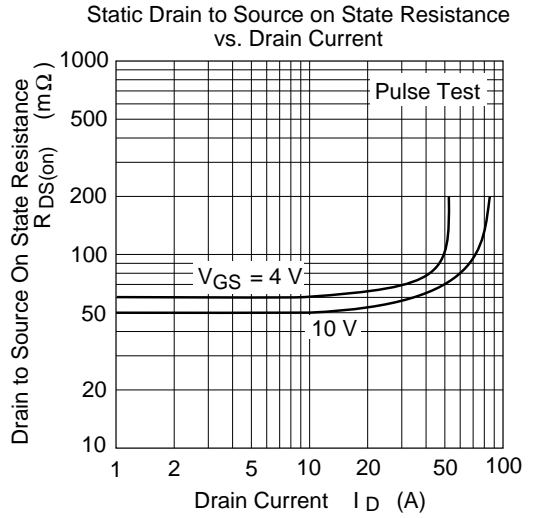
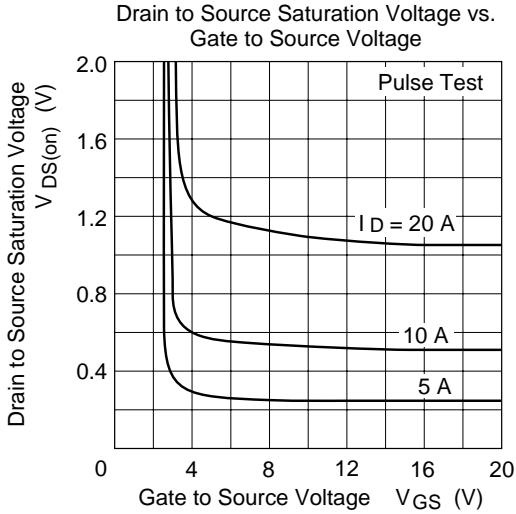
## Electrical Characteristics (Ta = 25°C)

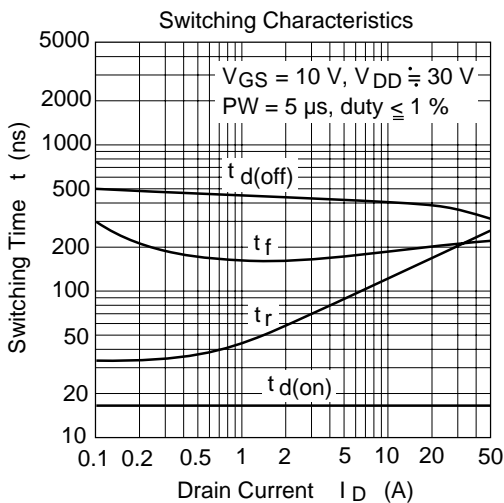
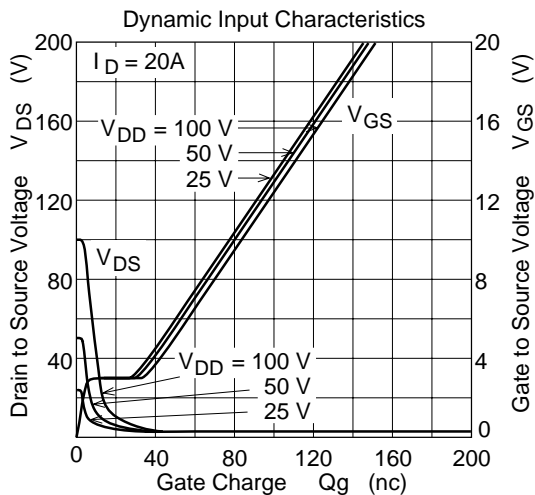
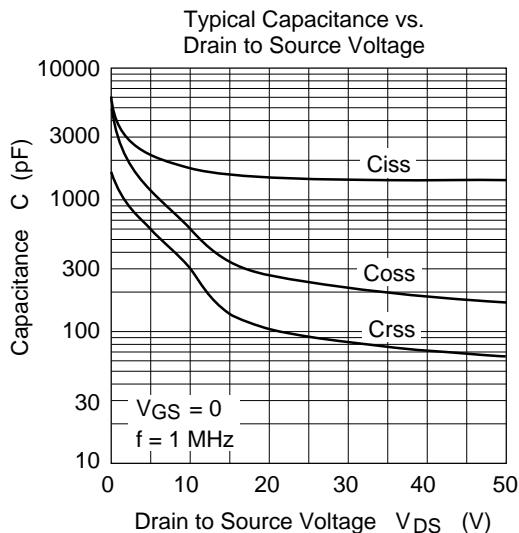
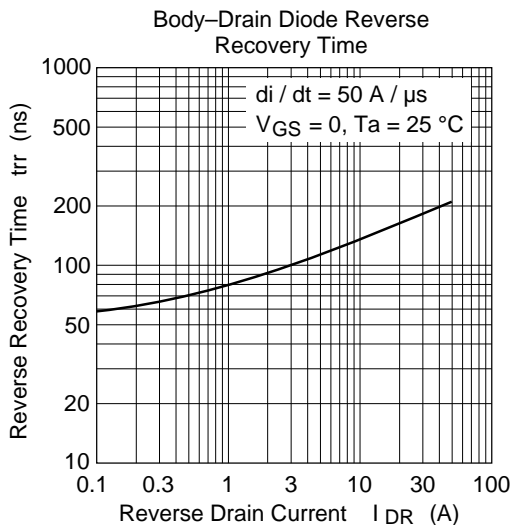
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	150	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	V	$I_G = \pm 100 \mu A$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	±10	μA	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	10	μA	$V_{DS} = 150 \text{ V}$ , $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.5	V	$I_D = 1 \text{ mA}$ , $V_{DS} = 10 \text{ V}$
Static drain to source on state resistance	$R_{DS(on)}$	—	50	70	mΩ	$I_D = 10 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note4</sup>
	$R_{DS(on)}$	—	60	80	mΩ	$I_D = 10 \text{ A}$ , $V_{GS} = 4 \text{ V}$ <sup>Note4</sup>
Forward transfer admittance	$ y_{fs} $	13	22	—	S	$I_D = 10 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note4</sup>
Input capacitance	$C_{iss}$	—	1750	—	pF	$V_{DS} = 10 \text{ V}$
Output capacitance	$C_{oss}$	—	600	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	300	—	pF	$f = 1 \text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	18	—	ns	$I_D = 10 \text{ A}$ , $V_{GS} = 10 \text{ V}$
Rise time	$t_r$	—	125	—	ns	$R_L = 3 \Omega$
Turn-off delay time	$t_{d(off)}$	—	400	—	ns	
Fall time	$t_f$	—	190	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	0.9	—	V	$I_F = 20 \text{ A}$ , $V_{GS} = 0$
Body-drain diode reverse recovery time	$t_{rr}$	—	170	—	ns	$I_F = 20 \text{ A}$ , $V_{GS} = 0$ $diF/dt = 50 \text{ A}/\mu s$

Note: 4. Pulse test

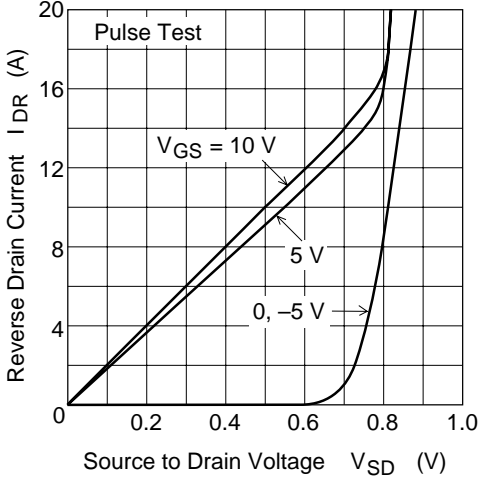
### Main Characteristics



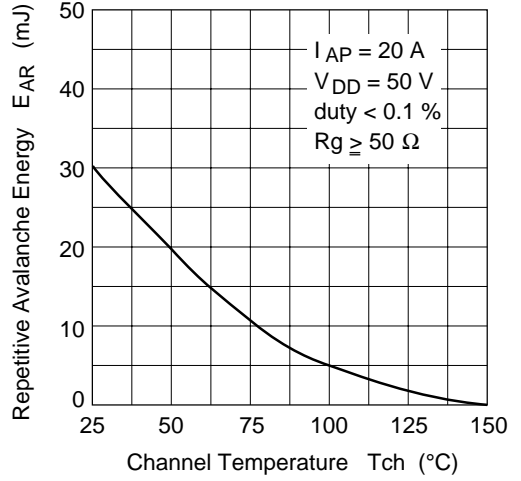




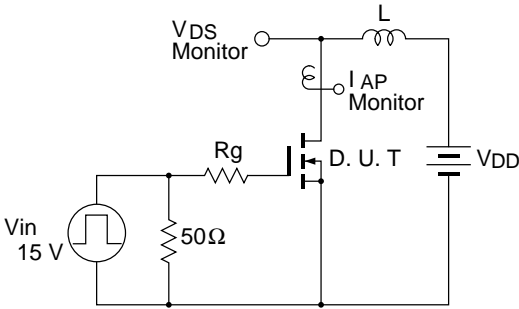
Reverse Drain Current vs. Source to Drain Voltage



Maximum Avalanche Energy vs. Channel Temperature Derating

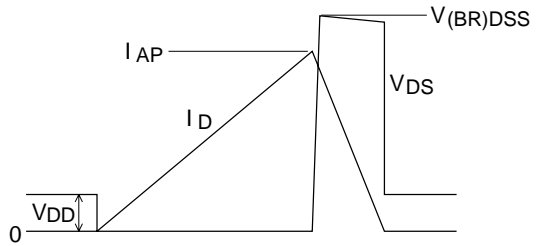


Avalanche Test Circuit

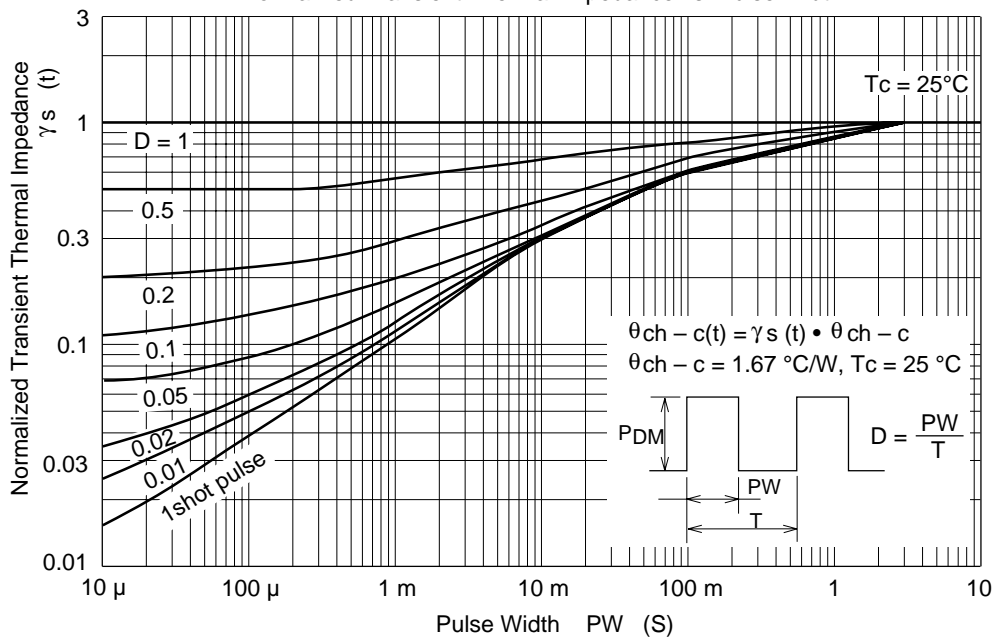


Avalanche Waveform

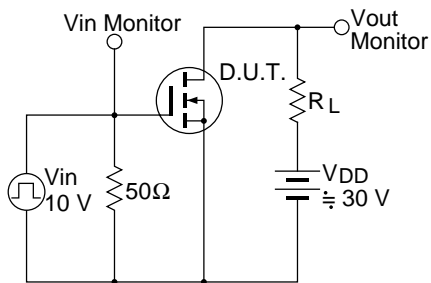
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



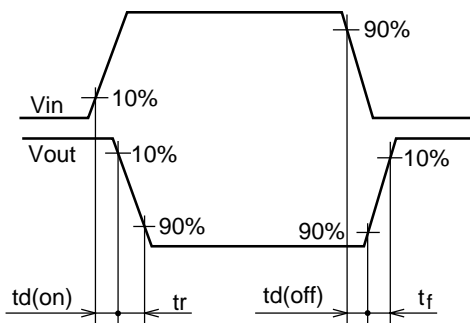
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit

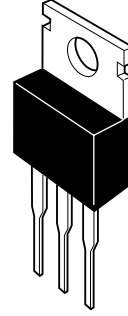
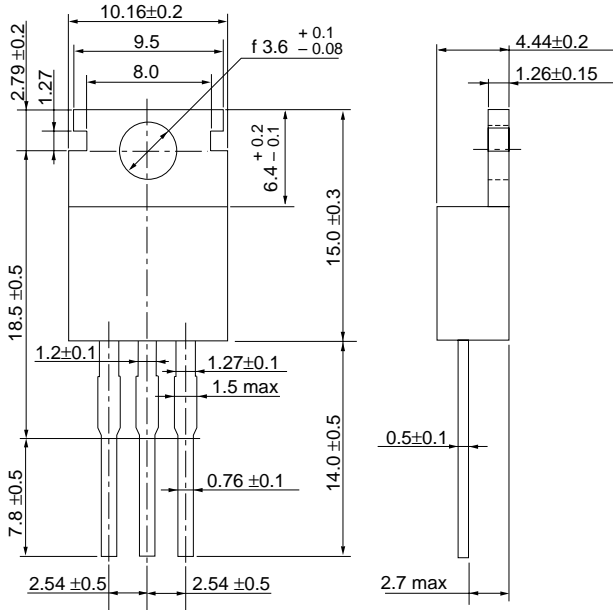


Waveform



Package Dimensions

Unit: mm



Hitachi Code	TO-220AB
EIAJ	SC-46
JEDEC	—



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