To all our customers

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The semiconductor operations of Mitsubishi Electric and Hitachi were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Hitachi, Hitachi, Ltd., Hitachi Semiconductors, and other Hitachi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

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

Cautions

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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HAT2141H

Silicon N Channel Power MOS FET
Power Switching

ADE-208-1582E(Z)

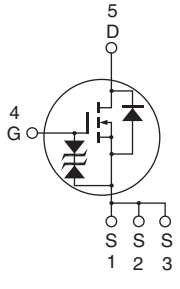
Preliminary
6th. Edition
Sep. 2002

Features

- Capable of 7 V gate drive
- Low drive current
- High density mounting
- Low on-resistance
  $R_{DS(on)}$ = 22 mΩ typ. (at V_{GS} = 10 V)

Outline

LFPAK



1, 2, 3	Source
4	Gate
5	Drain

Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DSS}	100	V
Gate to source voltage	V_{GSS}	±20	V
Drain current	I_D	15	A
Drain peak current	$I_{D(pulse)}$ Note1	60	A
Body-drain diode reverse drain current	I_{DR}	15	A
Avalanche current	I_{AP} Note 3	15	A
Avalanche energy	E_{AR} Note 3	22.5	mJ
Channel dissipation	Pch Note2	20	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to + 150	°C

Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%
2. Tc = 25°C
3. Value at Tch = 25°C, Rg ≥ 50 Ω

Electrical Characteristics

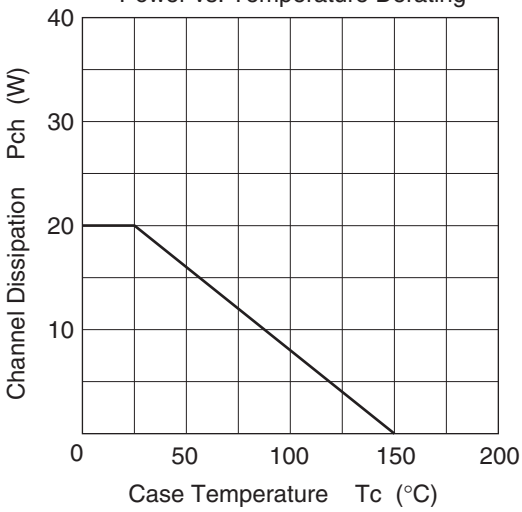
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	100	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	± 20	—	—	V	I_G = ±100 µA, V_{DS} = 0
Gate to source leak current	I_{GSS}	—	—	± 10	µA	V_{GS} = ±16 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	1	µA	V_{DS} = 100 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	2.0	—	3.5	V	V_{DS} = 10 V, I_D = 1 mA
Static drain to source on state resistance	$R_{DS(on)}$	—	22	27.5	mΩ	I_D = 7.5 A, V_{GS} = 10 V [Note4]
	$R_{DS(on)}$	—	23.5	32	mΩ	I_D = 7.5 A, V_{GS} = 7 V [Note4]
Forward transfer admittance	$\|y_{fs}\|$	15	25	—	S	I_D = 7.5 A, V_{DS} = 10 V [Note4]
Input capacitance	Ciss	—	3200	—	pF	V_{DS} = 10 V
Output capacitance	Coss	—	255	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	125	—	pF	f = 1 MHz
Total gate charge	Qg	—	46	—	nc	V_{DD} = 50 V
Gate to source charge	Qgs	—	11	—	nc	V_{GS} = 10 V
Gate to drain charge	Qgd	—	10	—	nc	I_D = 15 A
Turn-on delay time	$t_{d(on)}$	—	22	—	ns	V_{GS} = 10 V, I_D = 7.5 A
Rise time	t_r	—	13	—	ns	V_{DD} ≅ 30 V
Turn-off delay time	$t_{d(off)}$	—	70	—	ns	R_L = 4 Ω
Fall time	t_f	—	10	—	ns	Rg = 4.7 Ω
Body–drain diode forward voltage	V_{DF}	—	0.82	1.07	V	IF = 15 A, V_{GS} = 0 [Note4]
Body–drain diode reverse recovery time	t_{rr}	—	50	—	ns	IF = 15 A, V_{GS} = 0 diF/ dt = 100 A/ µs

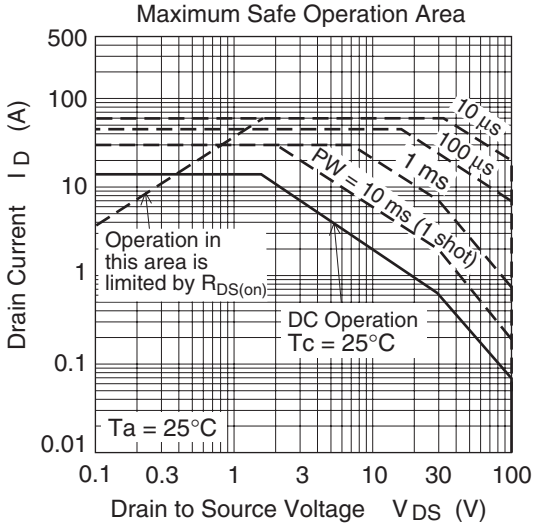
Notes: 4. Pulse test

Main Characteristics

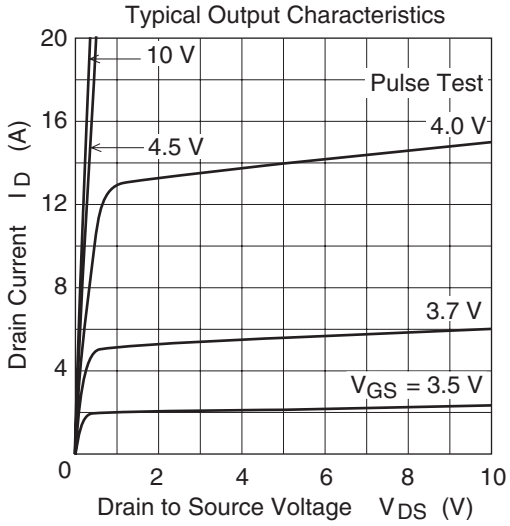
Power vs. Temperature Derating



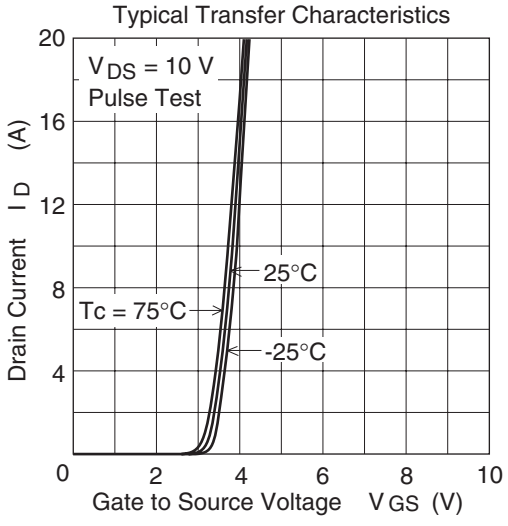
Maximum Safe Operation Area



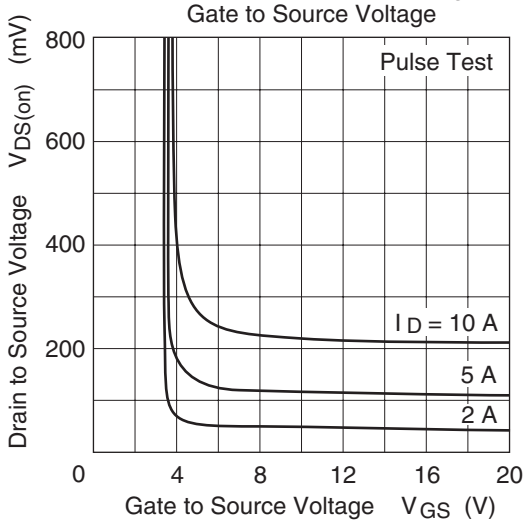
Typical Output Characteristics



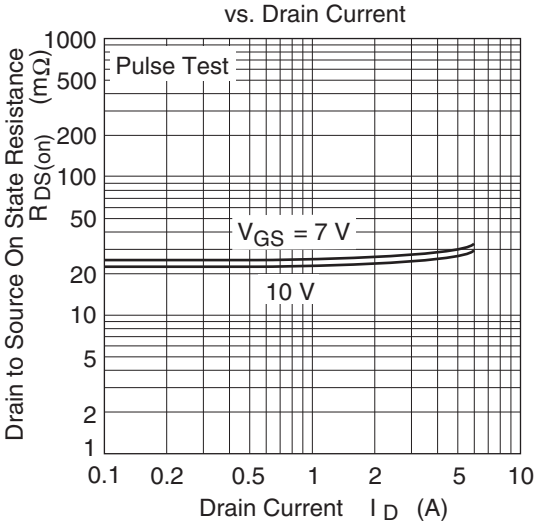
Typical Transfer Characteristics



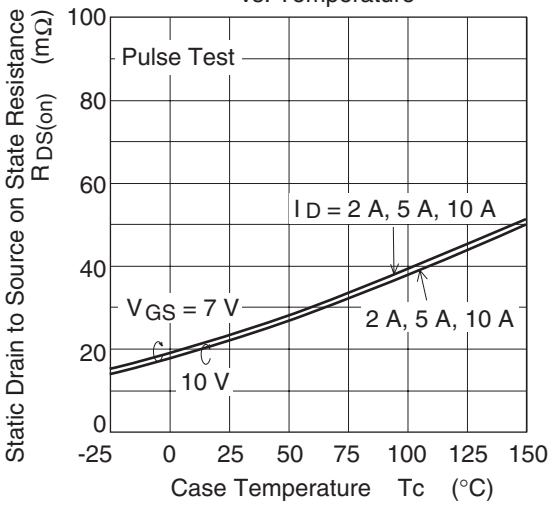
Drain to Source Saturation Voltage vs. Gate to Source Voltage



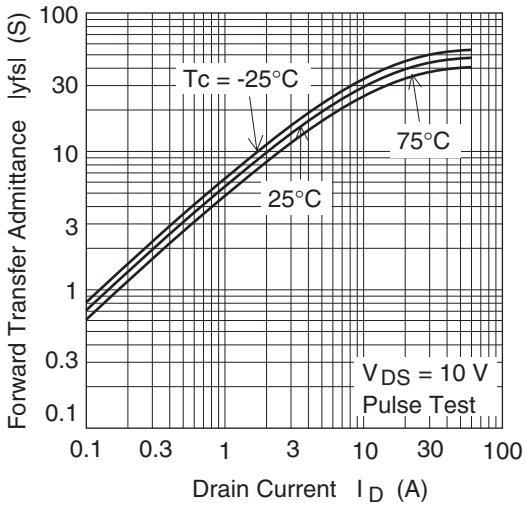
Static Drain to Source on State Resistance vs. Drain Current



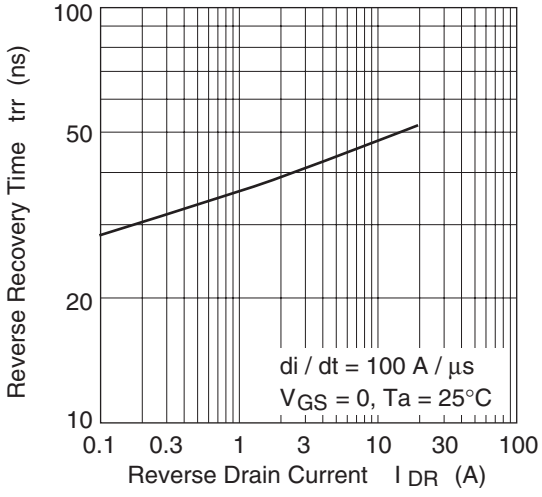
Static Drain to Source on State Resistance vs. Temperature



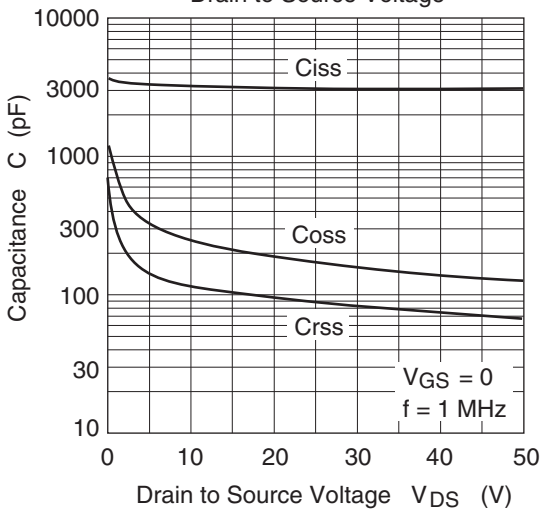
Forward Transfer Admittance vs. Drain Current



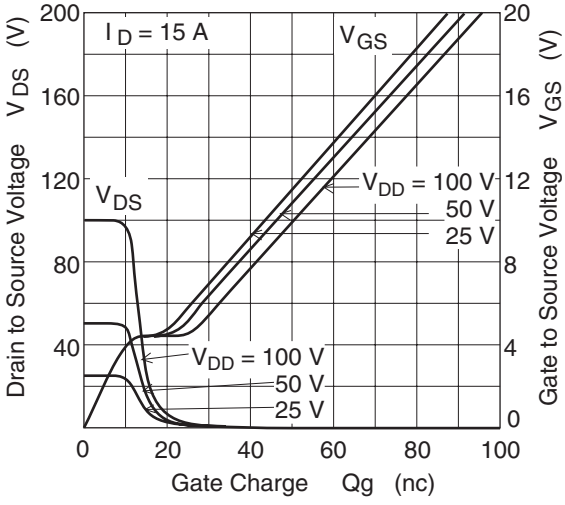
Body-Drain Diode Reverse Recovery Time



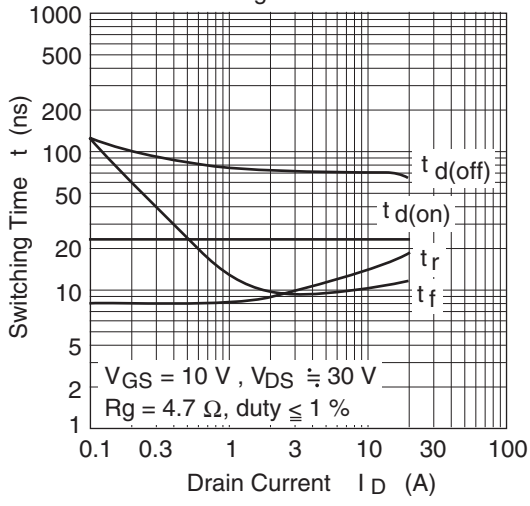
Typical Capacitance vs. Drain to Source Voltage



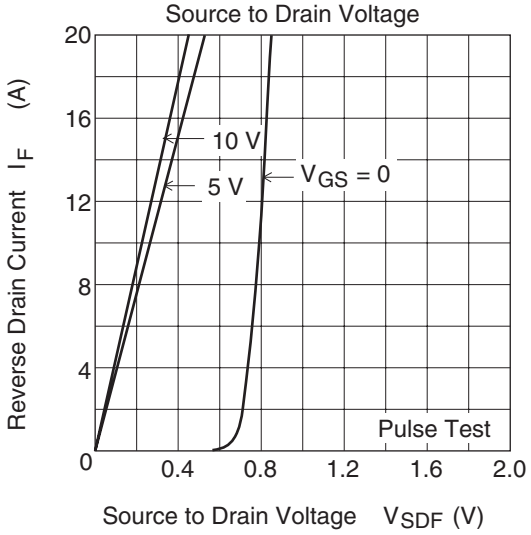
Dynamic Input Characteristics



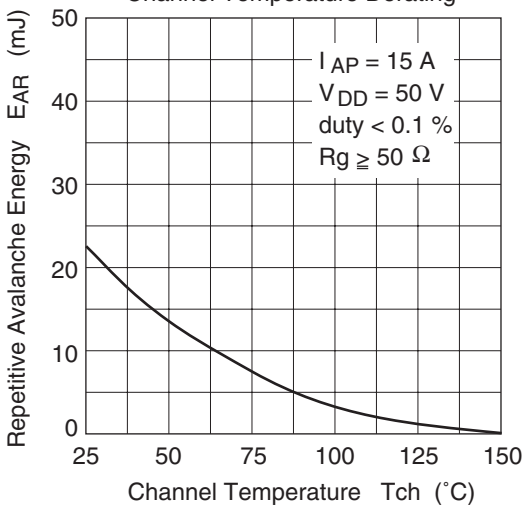
Switching Characteristics



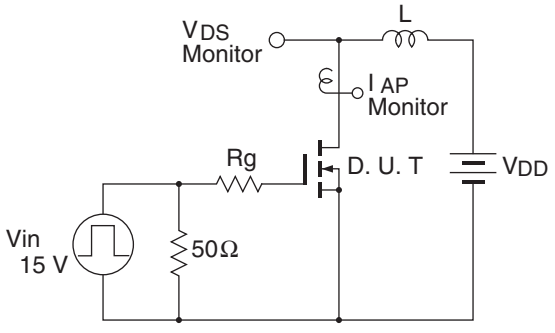
Reverse Drain Current vs. Source to Drain Voltage



Maximum Avalanche Energy vs. Channel Temperature Derating

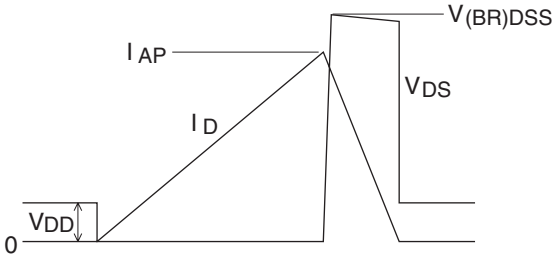


Avalanche Test Circuit

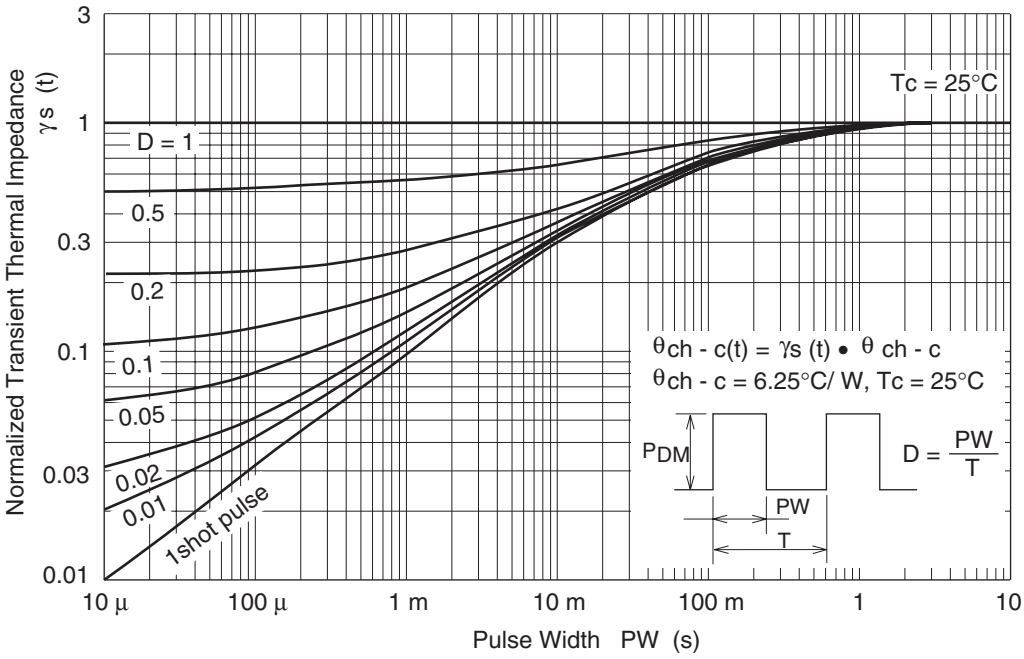


Avalanche Waveform

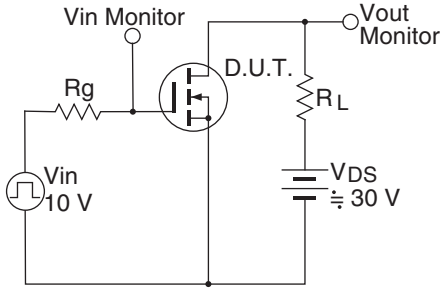
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



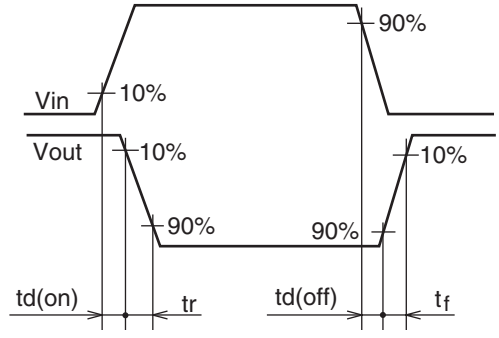
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit



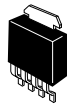
Switching Time Waveform

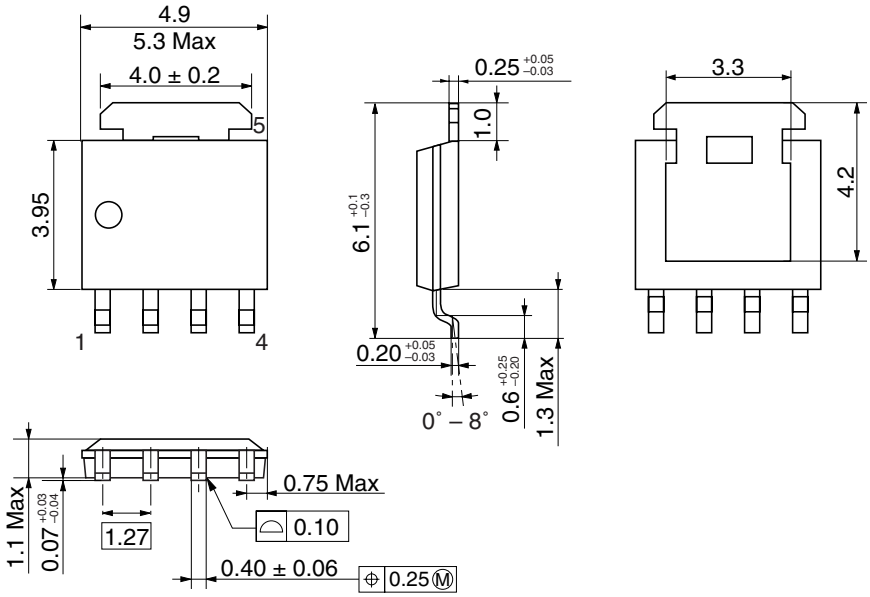


Package Dimensions

As of July, 2002

Unit: mm





Hitachi Code	LFPAK
JEDEC	—
JEITA	—
Mass (reference value)	0.080 g