HAT2139H

Silicon N Channel Power MOS FET
Power Switching

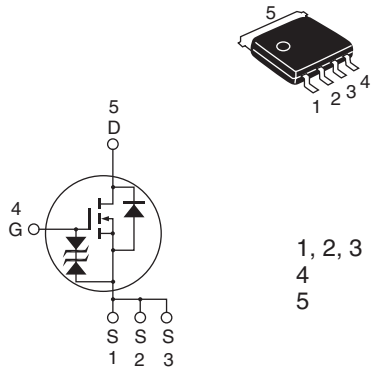
REJ03G0055-0400Z
(Previous ADE-208-1580A(Z))
Rev.4.00
Jul.15.2003

Features

- Capable of 7 V gate drive
- Low drive current
- High density mounting
- Low on-resistance
  $R_{DS(on)}$ = 9 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}	40	V
Gate to source voltage	V_{GSS}	±20	V
Drain current	I_D	20	A
Drain peak current	$I_{D(pulse)}$ Note1	80	A
Body-drain diode reverse drain current	I_{DR}	20	A
Avalanche current	I_{AP} Note 3	10	A
Avalanche energy	E_{AR} Note 3	8	mJ
Channel dissipation	Pch Note2	15	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

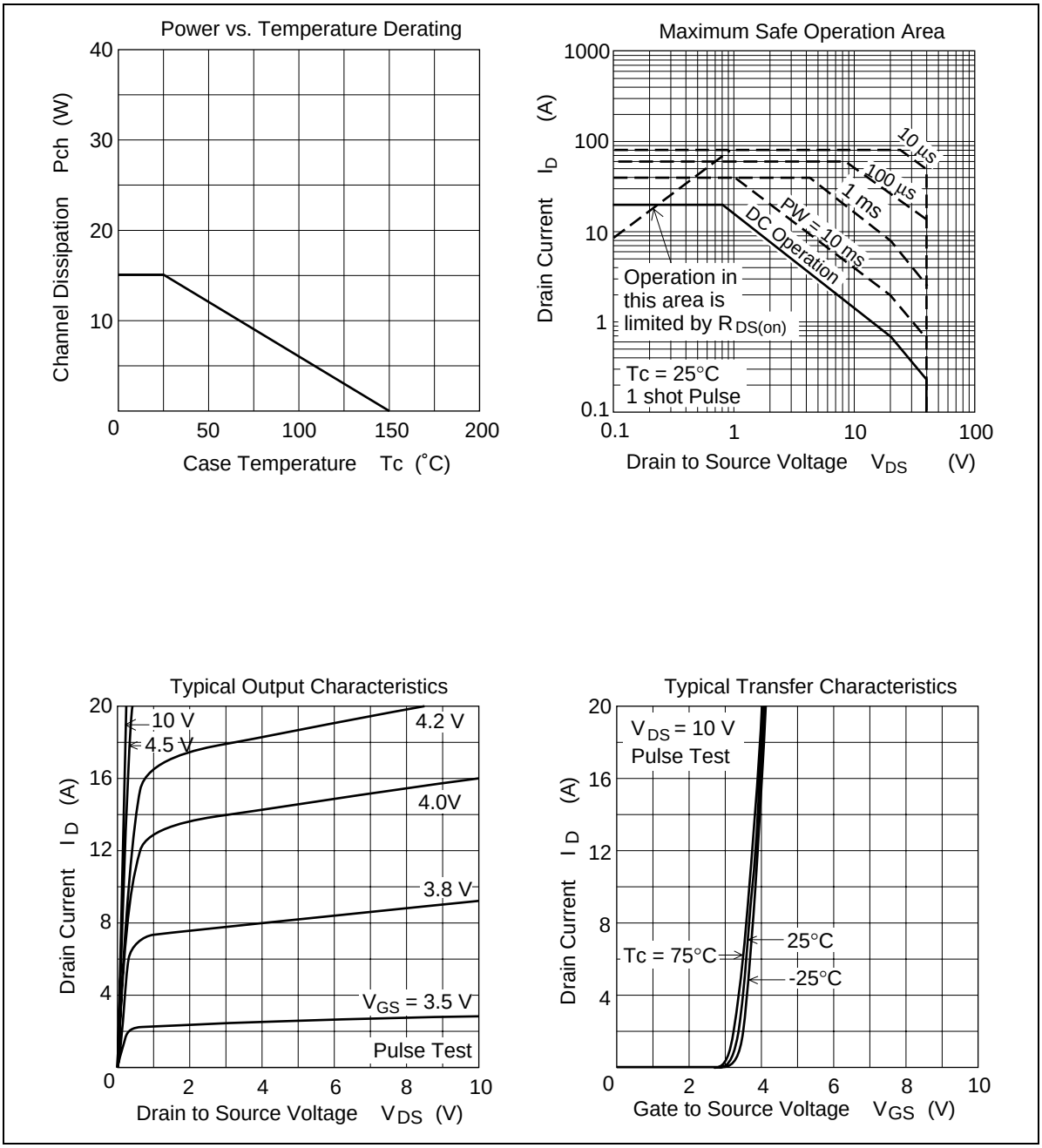
Electrical Characteristics

(Ta = 25°C)

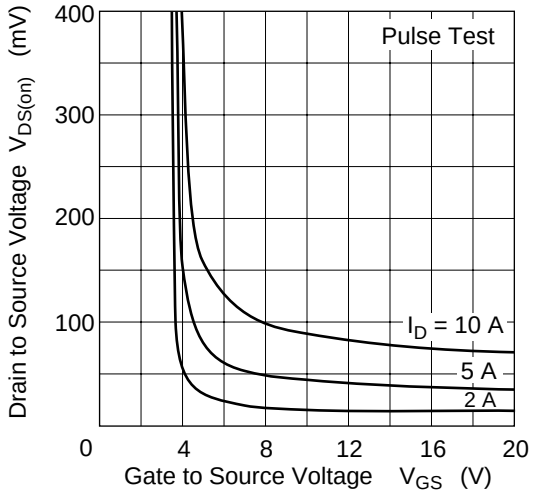
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	40	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	V	I_G = ±100 µA, V_{DS} = 0
Gate to source leak current	I_{GSS}	—	—	± 10	µA	V_{GS} = ±16 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	1	µA	V_{DS} = 40 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	$R_{DS(on)}$	—	9.0	11.5	mΩ	I_D = 10 A, V_{GS} = 10 V Note4
	$R_{DS(on)}$	—	11.0	15.0	mΩ	I_D = 10 A, V_{GS} = 7 V Note4
Forward transfer admittance	$\|y_{fs}\|$	15	25	—	S	I_D = 10 A, V_{DS} = 10 V Note4
Input capacitance	Ciss	—	2000	—	pF	V_{DS} = 10 V
Output capacitance	Coss	—	290	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	175	—	pF	f = 1 MHz
Total gate charge	Qg	—	30	—	nc	V_{DD} = 10 V
Gate to source charge	Qgs	—	8	—	nc	V_{GS} = 10 V
Gate to drain charge	Qgd	—	5	—	nc	I_D = 20 A
Turn-on delay time	$t_{d(on)}$	—	17	—	ns	V_{GS} = 10 V, I_D = 10 A
Rise time	t_r	—	23	—	ns	V_{DD} ≅ 10 V
Turn-off delay time	$t_{d(off)}$	—	58	—	ns	R_L = 1.0 Ω
Fall time	t_f	—	10	—	ns	Rg = 4.7 Ω
Body–drain diode forward voltage	V_{DF}	—	0.83	1.08	V	IF = 20 A, V_{GS} = 0 Note4
Body–drain diode reverse recovery time	t_{rr}	—	50	—	ns	IF = 20 A, V_{GS} = 0 diF/ dt = 50 A/ µs

Notes: 4. Pulse test

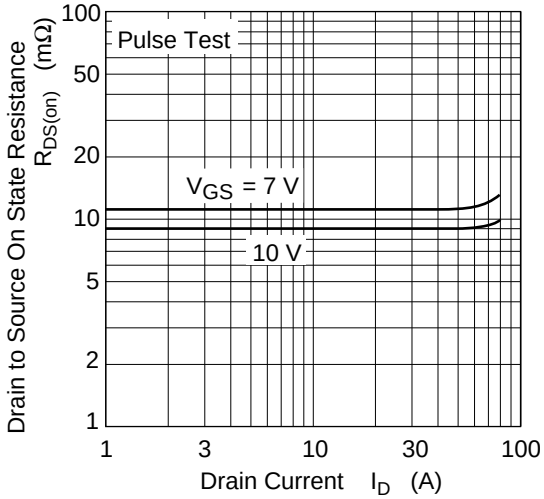
Main Characteristics



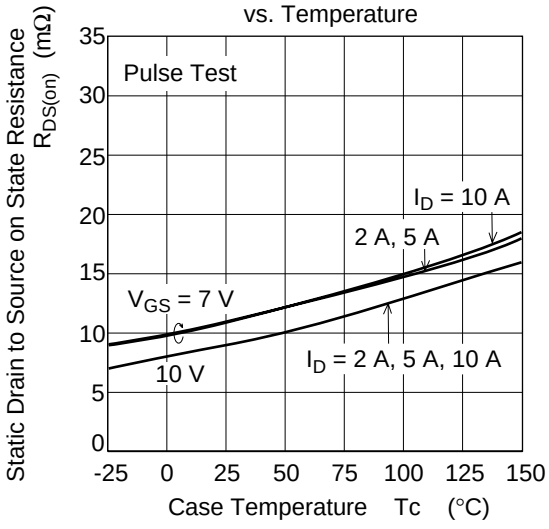
Drain to Source Saturation Voltage vs. Gate to Source Voltage



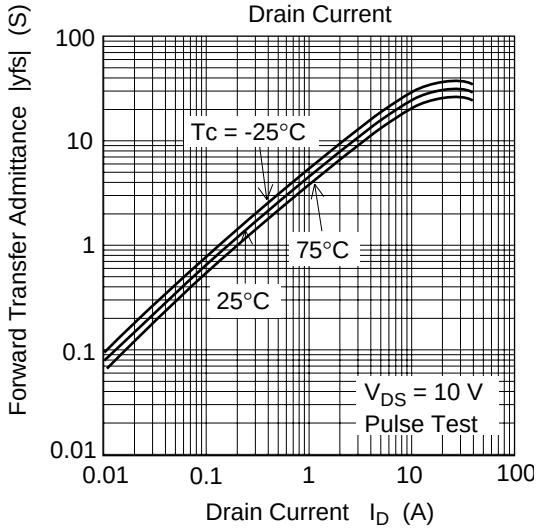
Static Drain to Source on State Resistance vs. Drain Current



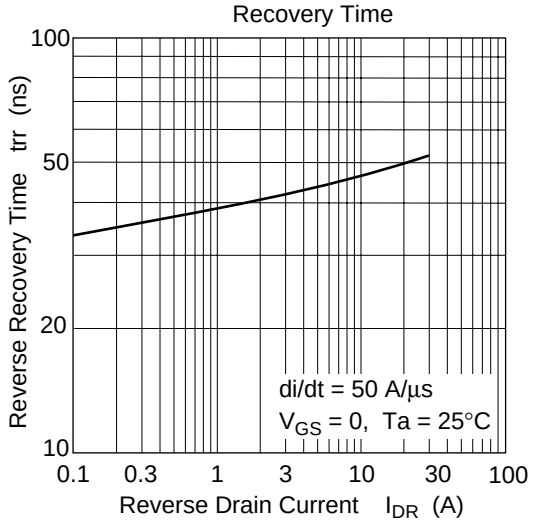
Static Drain to Source on State Resistance vs. Temperature



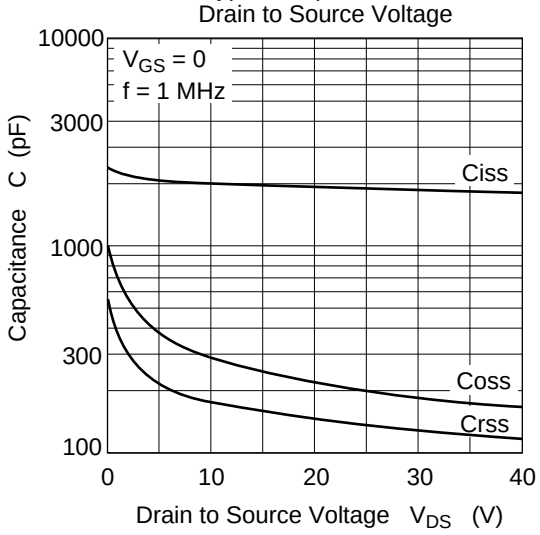
Forward Transfer Admittance vs. Drain Current



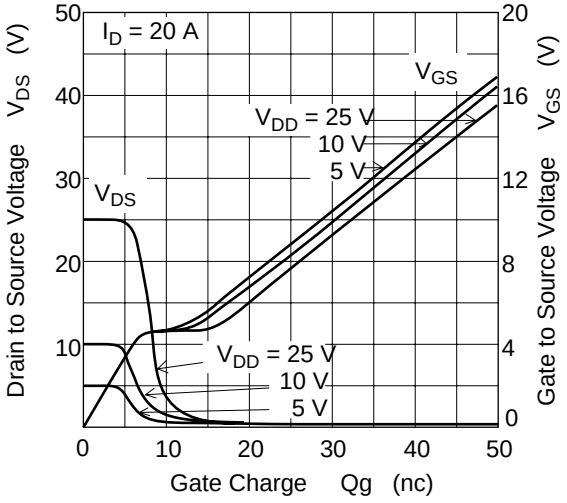
Body-Drain Diode Reverse Recovery Time



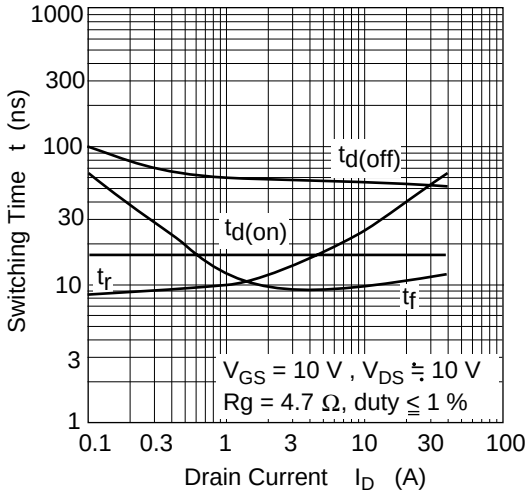
Typical Capacitance vs. Drain to Source Voltage



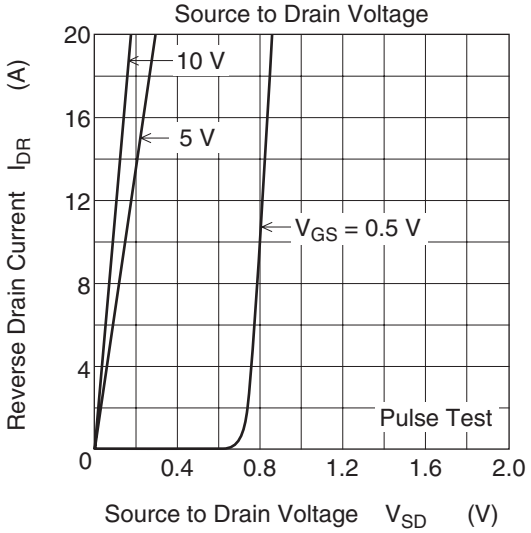
Dynamic Input Characteristics



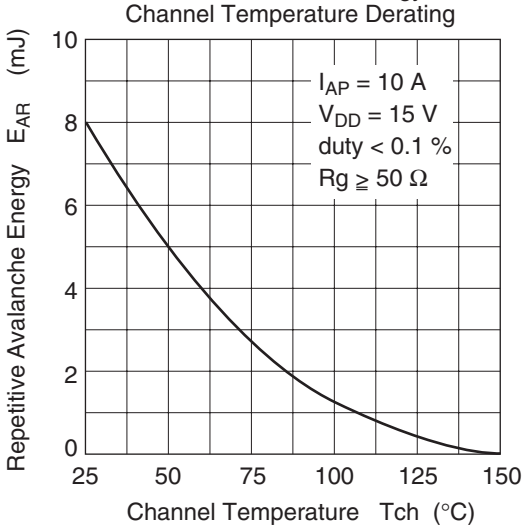
Switching Characteristics



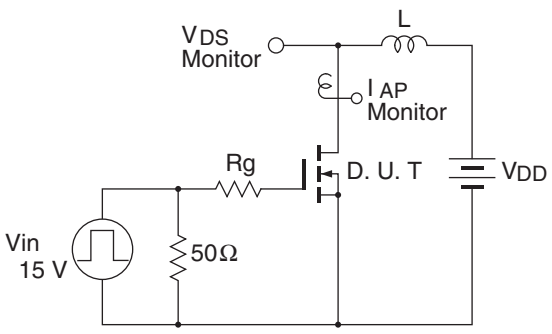
Reverse Drain Current vs. Source to Drain Voltage



Maximum Avalanche Energy vs. Channel Temperature Derating

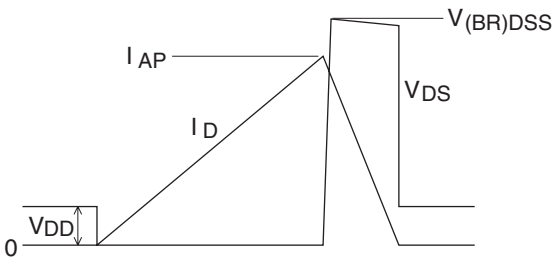


Avalanche Test Circuit

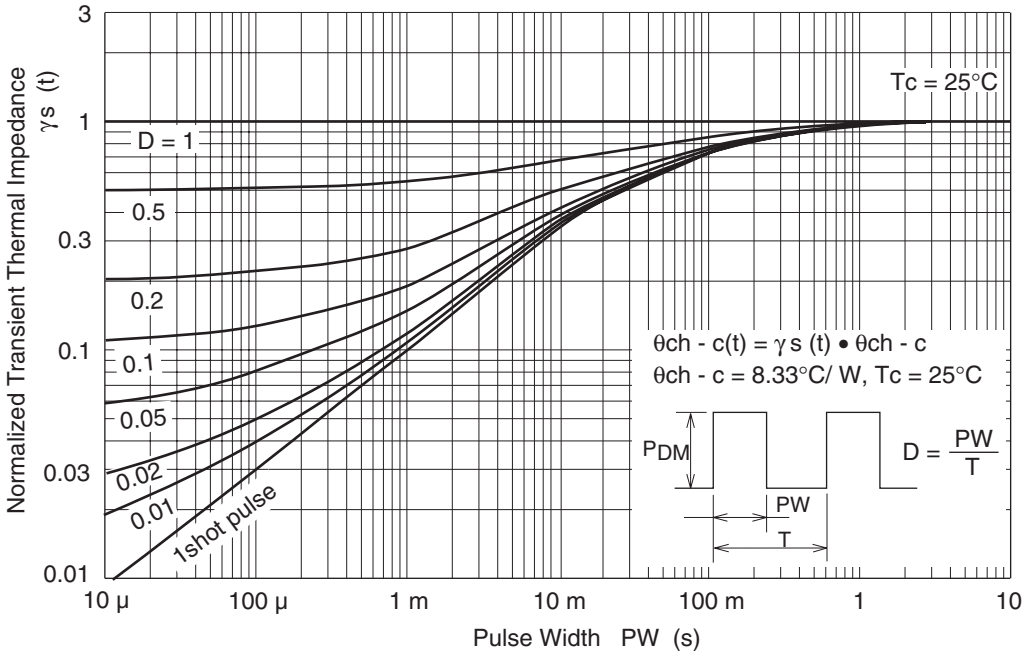


Avalanche Waveform

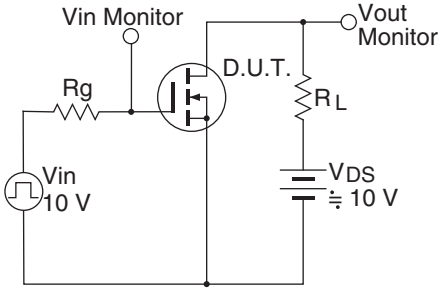
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



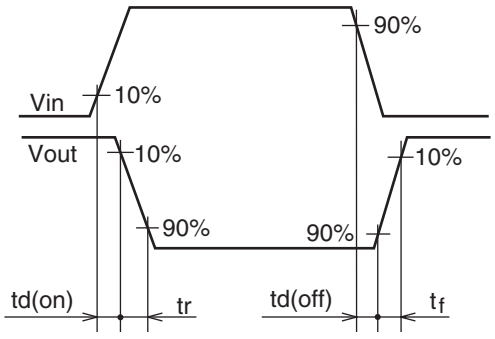
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit



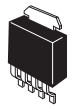
Switching Time Waveform

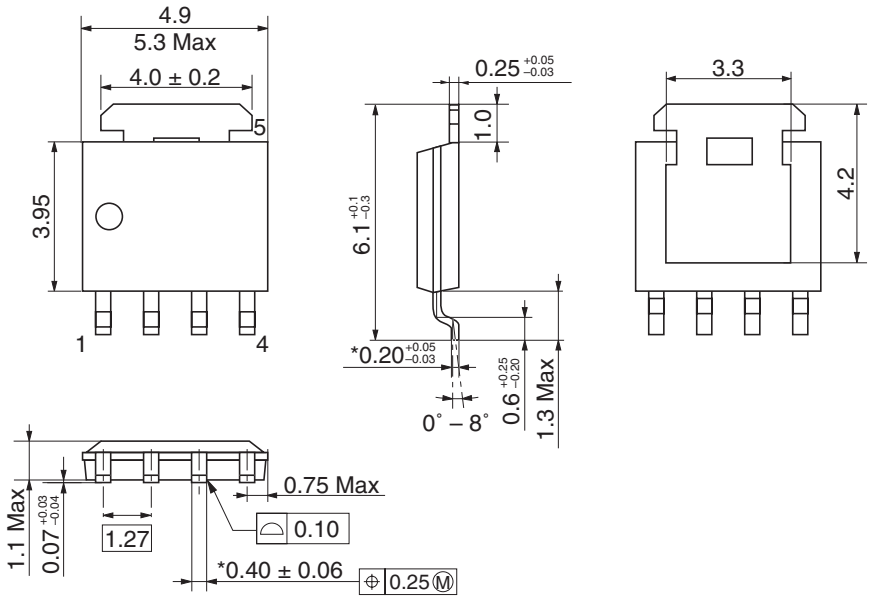


Package Dimensions

As of January, 2003

Unit: mm





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

*Ni/Pd/Au plating

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