

# HAT2166H

## Silicon N Channel Power MOS FET Power Switching

REJ03G0005-0600

Rev.6.00

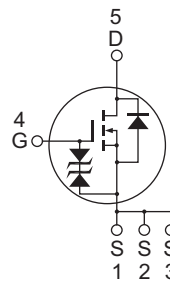
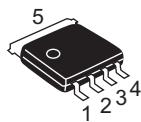
Sep 20, 2005

### Features

- High speed switching
- Capable of 4.5 V gate drive
- Low drive current
- High density mounting
- Low on-resistance  
 $R_{DS(on)} = 2.9 \text{ m}\Omega$  typ. (at  $V_{GS} = 10 \text{ V}$ )

### Outline

RENESAS Package code: PTZZ0005DA-A)  
(Package name: LFPAK )



1, 2, 3 Source  
4 Gate  
5 Drain

### Absolute Maximum Ratings

( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DSS}$	30	V
Gate to source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	$I_D$	45	A
Drain peak current	$I_{D(pulse)}$ <sup>Note 1</sup>	180	A
Body-drain diode reverse drain current	$I_{DR}$	45	A
Avalanche current	$I_{AP}$ <sup>Note 2</sup>	25	A
Avalanche energy	$E_{AR}$ <sup>Note 2</sup>	62.5	mJ
Channel dissipation	$P_{ch}$ <sup>Note 3</sup>	25	W
Channel to Case Thermal Resistance	$\theta_{ch-C}$	5.0	$^\circ\text{C}/\text{W}$
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

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

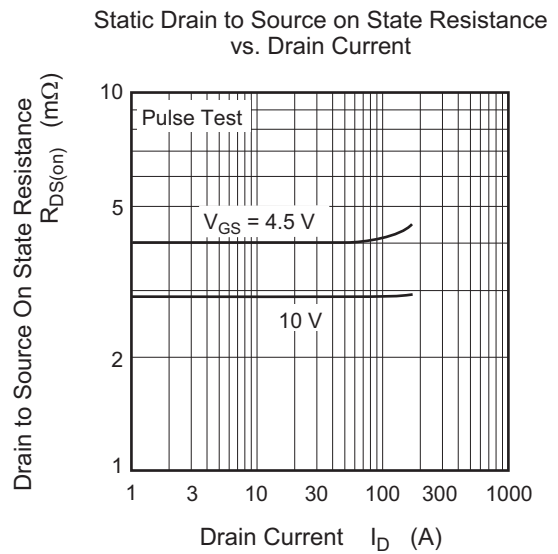
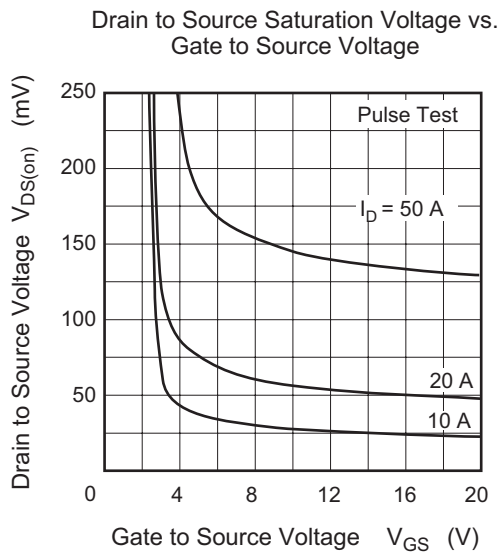
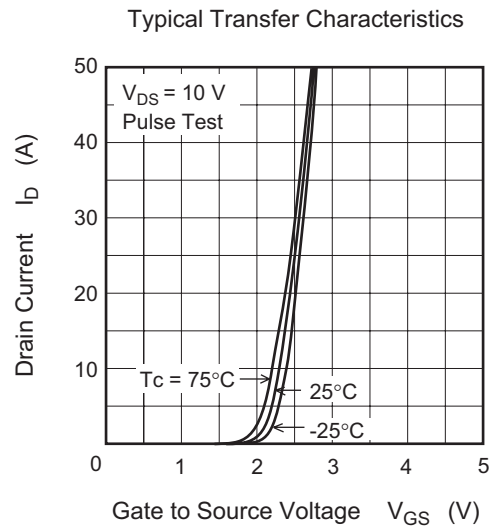
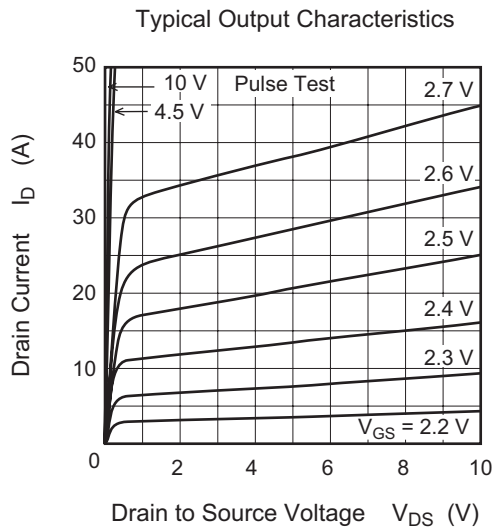
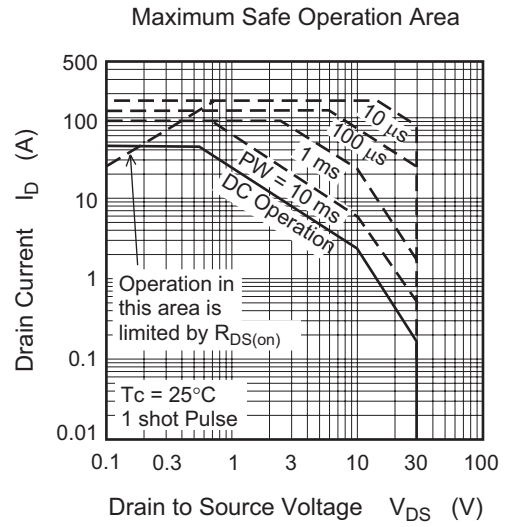
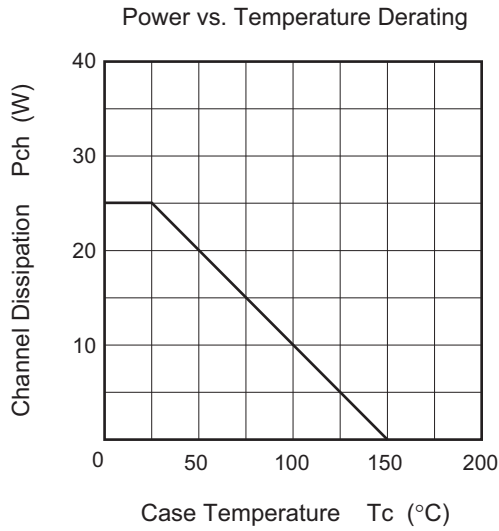
## Electrical Characteristics

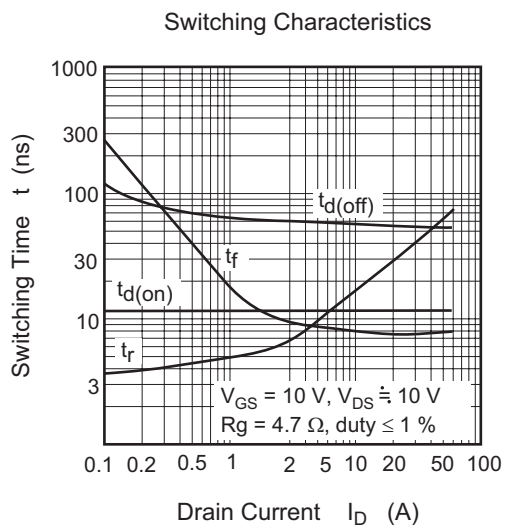
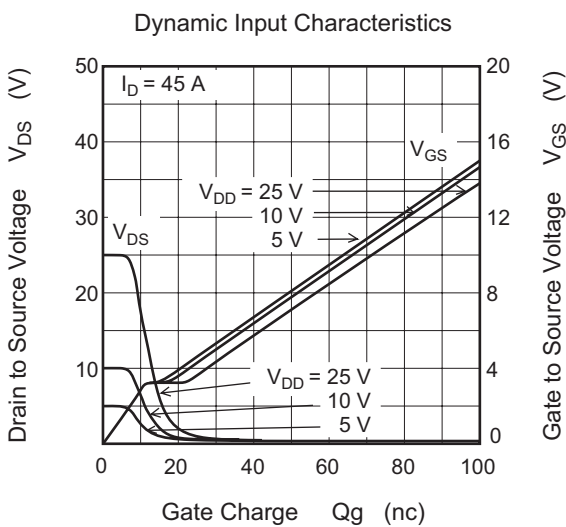
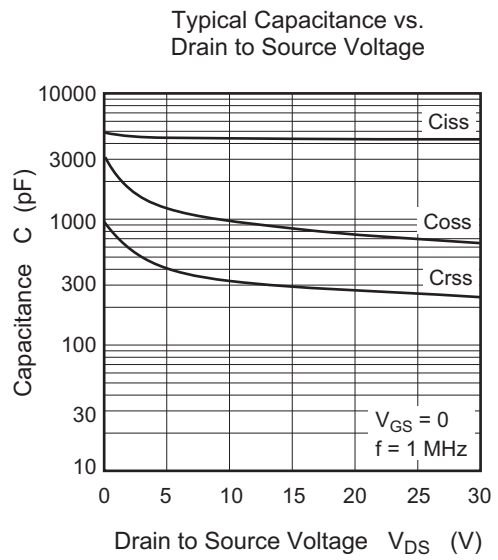
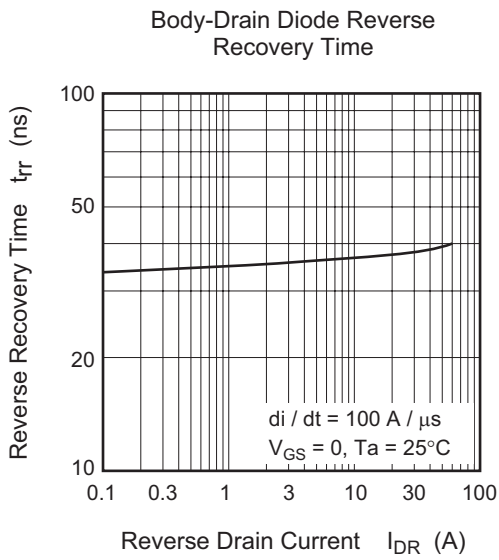
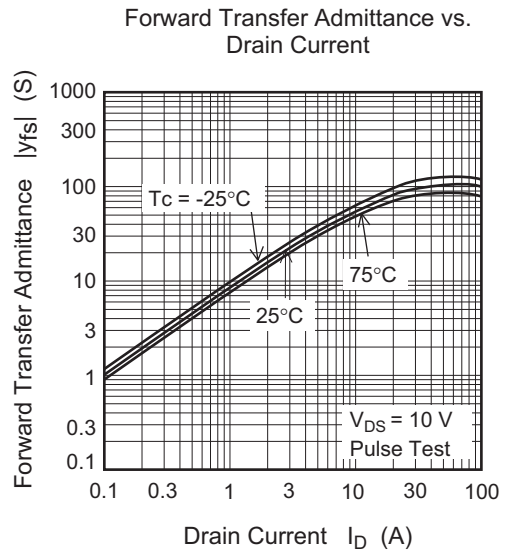
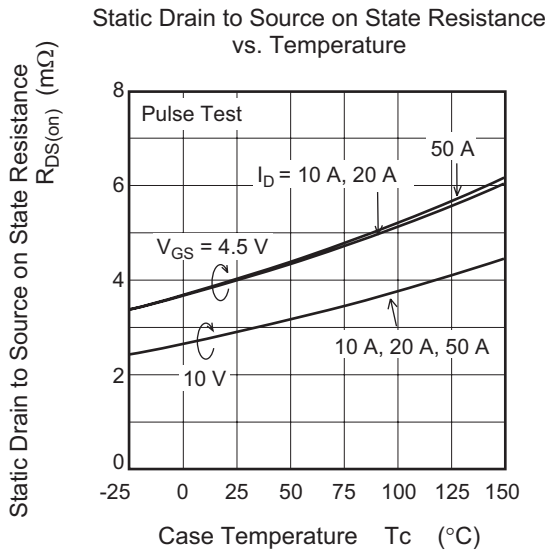
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	30	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \text{ }\mu\text{A}$ , $V_{DS} = 0$
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	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 30 \text{ V}$ , $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.5	V	$V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	2.9	3.8	$\text{m}\Omega$	$I_D = 22.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note4</sup>
	$R_{DS(on)}$	—	4.0	6.1	$\text{m}\Omega$	$I_D = 22.5 \text{ A}$ , $V_{GS} = 4.5 \text{ V}$ <sup>Note4</sup>
Forward transfer admittance	$ y_{fs} $	52	87	—	S	$I_D = 22.5 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note4</sup>
Input capacitance	$C_{iss}$	—	4400	—	pF	$V_{DS} = 10 \text{ V}$ , $V_{GS} = 0$ , $f = 1 \text{ MHz}$
Output capacitance	$C_{oss}$	—	1000	—	pF	
Reverse transfer capacitance	$C_{rss}$	—	330	—	pF	
Gate Resistance	$R_g$	—	0.5	—	$\Omega$	
Total gate charge	$Q_g$	—	27	—	nC	$V_{DD} = 10 \text{ V}$ , $V_{GS} = 4.5 \text{ V}$ , $I_D = 45 \text{ A}$
Gate to source charge	$Q_{gs}$	—	12	—	nC	
Gate to drain charge	$Q_{gd}$	—	5.9	—	nC	
Turn-on delay time	$t_{d(on)}$	—	12	—	ns	$V_{GS} = 10 \text{ V}$ , $I_D = 22.5 \text{ A}$ , $V_{DD} \cong 10 \text{ V}$ , $R_L = 0.44 \text{ }\Omega$ , $R_g = 4.7 \text{ }\Omega$
Rise time	$t_r$	—	35	—	ns	
Turn-off delay time	$t_{d(off)}$	—	55	—	ns	
Fall time	$t_f$	—	7.5	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	0.83	1.08	V	$I_F = 45 \text{ A}$ , $V_{GS} = 0$ <sup>Note4</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	37	—	ns	$I_F = 45 \text{ A}$ , $V_{GS} = 0$ $di_F/dt = 100 \text{ A}/\mu\text{s}$

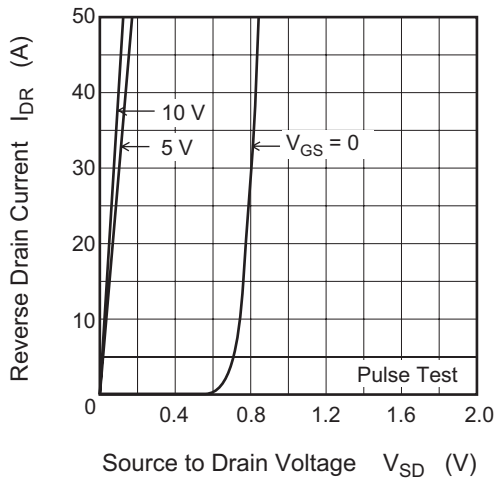
Notes: 4. Pulse test

### Main Characteristics

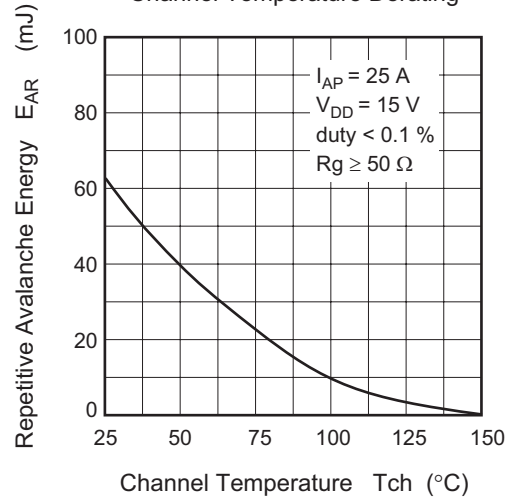




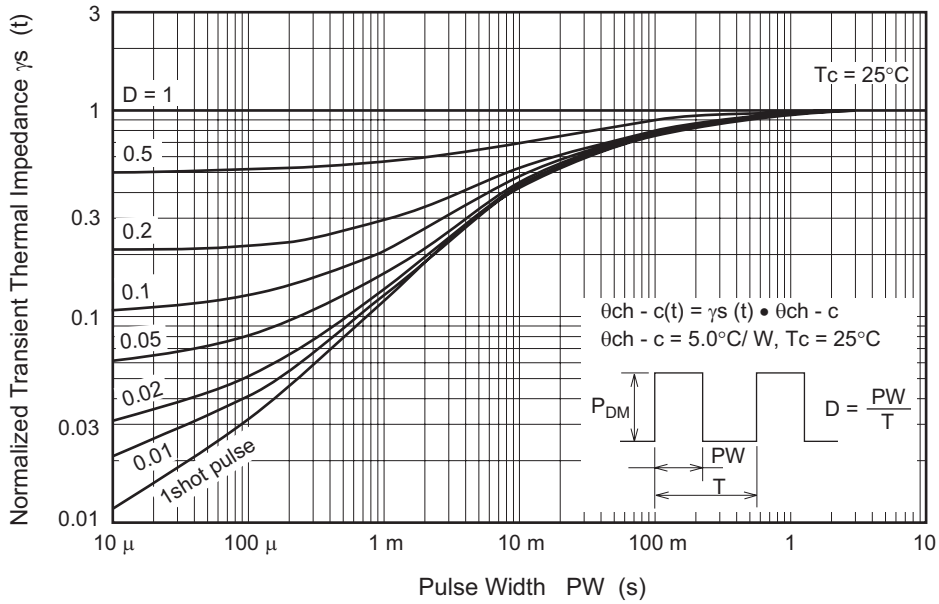
Reverse Drain Current vs. Source to Drain Voltage



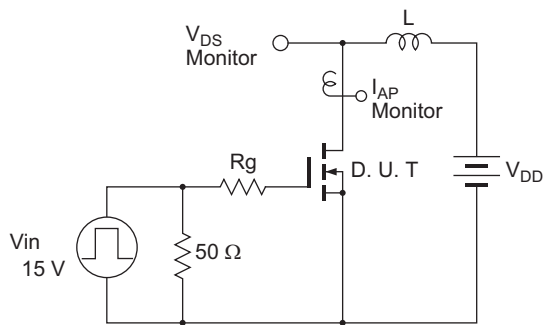
Maximum Avalanche Energy vs. Channel Temperature Derating



Normalized Transient Thermal Impedance vs. Pulse Width

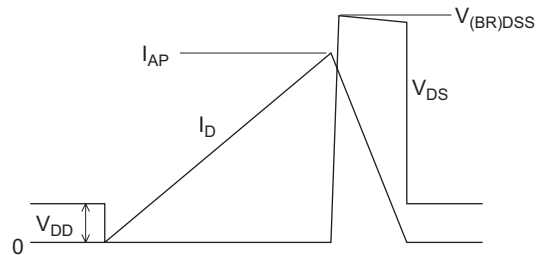


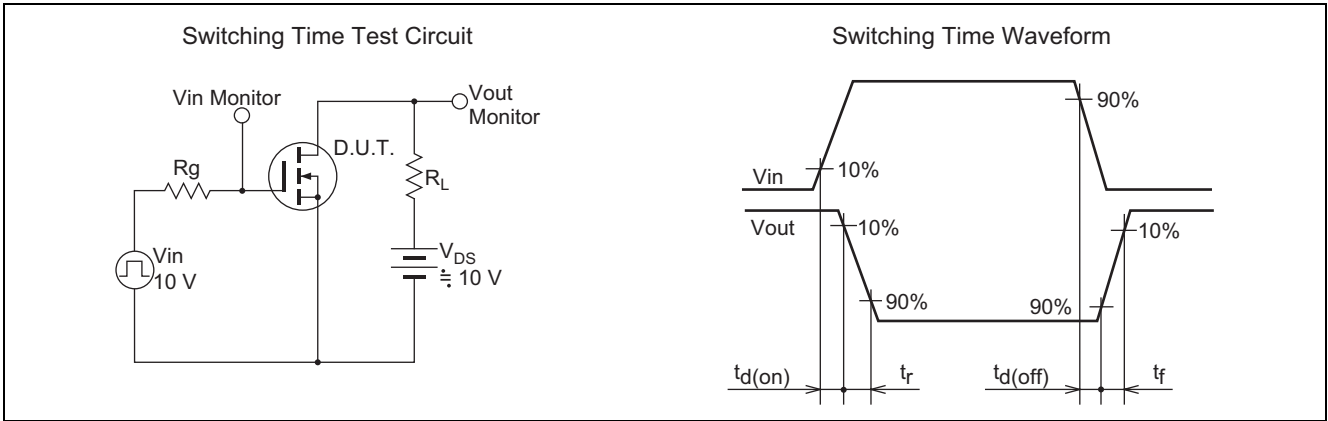
Avalanche Test Circuit



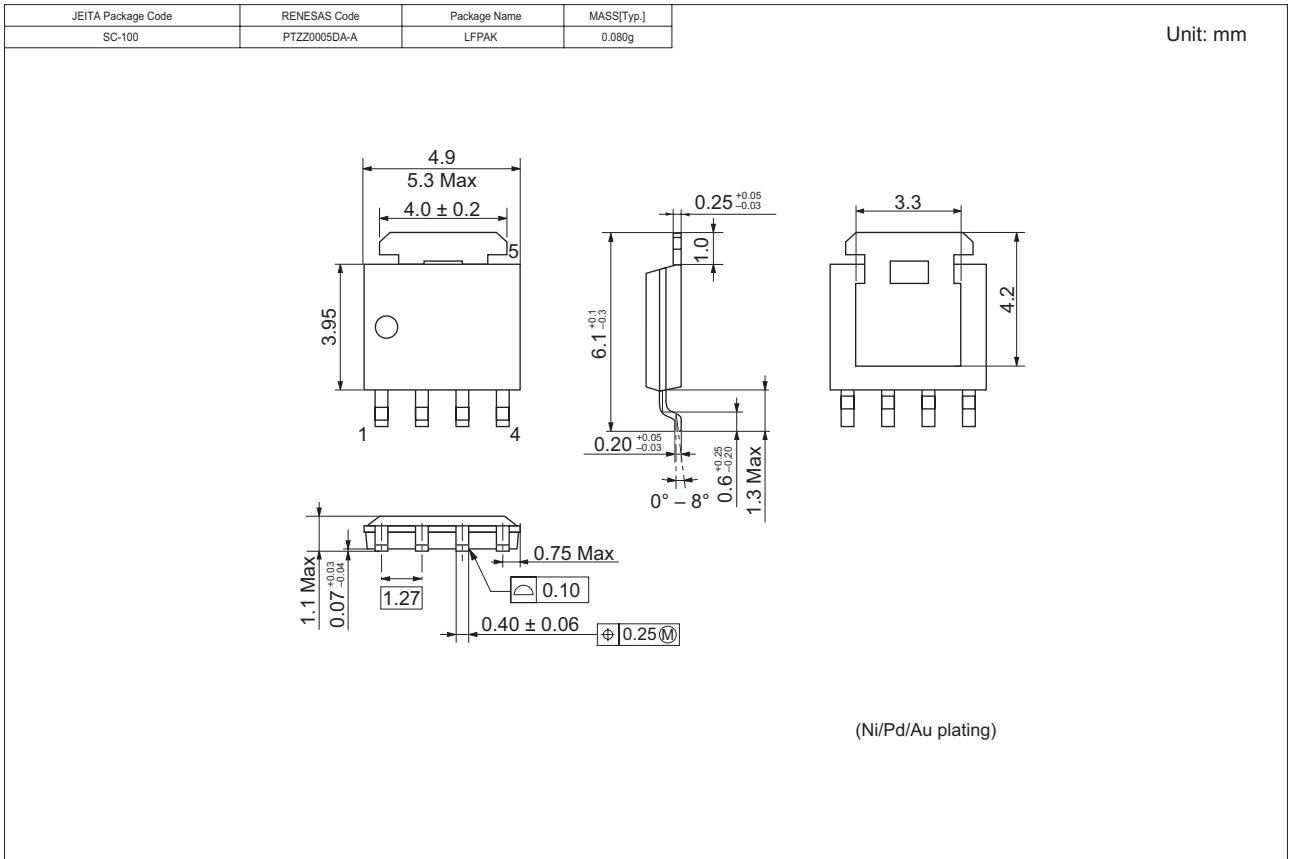
Avalanche Waveform

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





Package Dimensions



Ordering Information

Part Name	Quantity	Shipping Container
HAT2166H-EL-E	2500 pcs	Taping

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

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