

## **HAF2021(L), HAF2021(S)**

# Silicon N Channel MOS FET Series Power Switching

REJ03G0179-0200Z (Previous ADE-208-1459A(Z)) Rev.2.00 Mar.05.2004

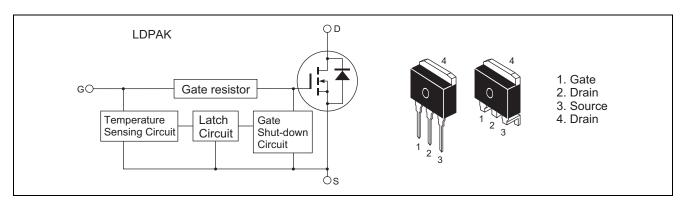
#### **Description**

This FET has the over temperature shut—down capability sensing to the junction temperature. This FET has the built—in over temperature shut—down circuit in the gate area. And this circuit operation to shut—down the gate voltage in case of high junction temperature like applying over power consumption, over current etc.

#### **Features**

- Logic level operation (6 V Gate drive)
- High endurance capability against to the short circuit
- Built-in the over temperature shut-down circuit
- Latch type shut–down operation (Need 0 voltage recovery)

#### **Outline**



#### **Absolute Maximum Ratings**

 $(Ta = 25^{\circ}C)$ 

Item	Symbol	Ratings	Unit	
Drain to source voltage	$V_{DSS}$	60	V	
Gate to source voltage	V <sub>GSS</sub>	16	V	
Gate to source voltage	V <sub>GSS</sub>	-2.5	V	
Drain current	I <sub>D</sub>	50	А	
Drain peak current	I <sub>D(pulse)</sub> Note1	100	А	
Body-drain diode reverse drain current	$I_{DR}$	50	А	
Channel dissipation	Pch Note2	100	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 Ta = 25°C

### **Typical Operation Characteristics**

Item	Symbol	Min	Тур	Max	Unit	Test Conditions
Input voltage	$V_{IH}$	3.5	_	_	V	
	V <sub>IL</sub>	_	_	1.2	V	
Input current	I <sub>IH1</sub>	_	_	100	μΑ	Vi = 6 V, V <sub>DS</sub> = 0
(Gate non shut down)	I <sub>IH2</sub>	_	_	50	μΑ	$Vi = 3.5 V, V_{DS} = 0$
	I <sub>IL</sub>	_	_	1	μΑ	$Vi = 1.2 V, V_{DS} = 0$
Input current	I <sub>IH(sd)1</sub>	_	0.6	_	mA	$Vi = 6 V, V_{DS} = 0$
(Gate shut down)	I <sub>IH(sd)2</sub>	_	0.35	_	mA	$Vi = 3.5 V, V_{DS} = 0$
Shut down temperature	T <sub>sd</sub>	_	175	_	°C	Channel temperature
Gate operation voltage	$V_{OP}$	3.5	_	12	V	



#### **Electrical Characteristics**

 $(Ta = 25^{\circ}C)$ 

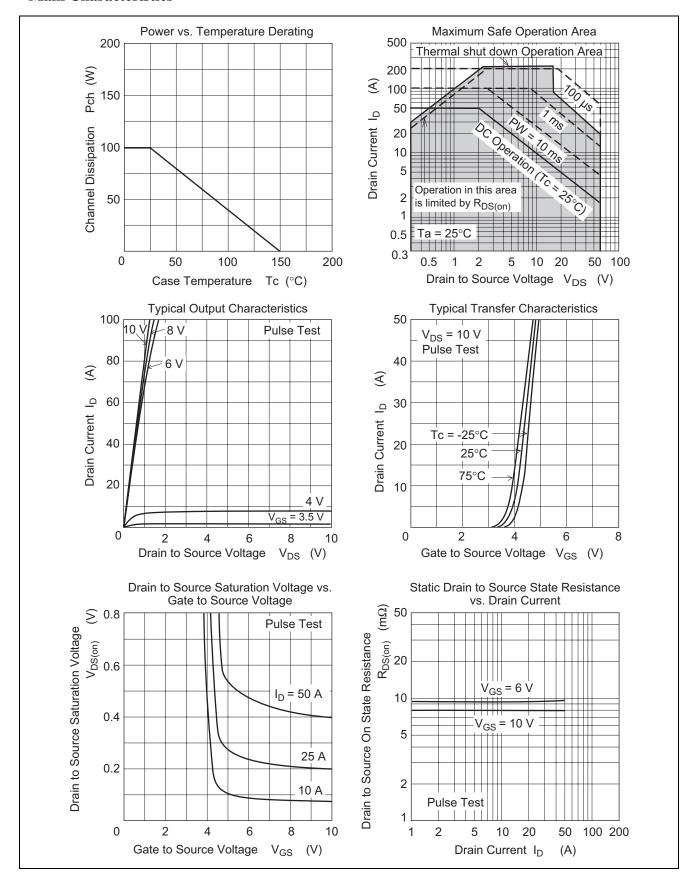
Item	Symbol	Min	Тур	Max	Unit	Test Conditions
Drain current	$I_{D1}$	90	_	_	Α	$V_{GS} = 6 \text{ V}, V_{DS} = 10 \text{ V}$
Drain current	$I_{D2}$		_	10	mΑ	$V_{GS} = 1.2 \text{ V}, V_{DS} = 10 \text{ V}$
Drain to source breakdown voltage	$V_{(BR)DSS} \\$	60	_	_	V	$I_D = 10 \text{ mA}, V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	16	_	_	V	$I_G = 300 \ \mu A, \ V_{DS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	-2.5	_	_	V	$I_G = -100 \ \mu A, \ V_{DS} = 0$
Gate to source leak current	I <sub>GSS1</sub>	_	_	100	μΑ	$V_{GS} = 6 \text{ V}, V_{DS} = 0$
	I <sub>GSS2</sub>	_	_	50	μΑ	$V_{GS} = 3.5 \text{ V}, V_{DS} = 0$
	I <sub>GSS3</sub>	_	_	1	μΑ	$V_{GS} = 1.2 \text{ V}, V_{DS} = 0$
	I <sub>GSS4</sub>	_	_	-100	μΑ	$V_{GS} = -2.4 \text{ V}, V_{DS} = 0$
Input current (shut down)	I <sub>GS(op)1</sub>	_	0.6	_	mA	$V_{GS} = 6 \text{ V}, V_{DS} = 0$
	I <sub>GS(op)2</sub>	_	0.35	_	mA	$V_{GS} = 3.5 \text{ V}, V_{DS} = 0$
Zero gate voltage drain current	I <sub>DSS</sub>	_	_	10	μΑ	$V_{DS} = 60 \text{ V}, V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	2.2	_	3.4	V	$I_D = 1 \text{ mA}, V_{DS} = 10 \text{ V}$
Forward transfer admittance	y <sub>fs</sub>	15	50	_	S	$I_D = 25 \text{ A}, V_{DS} = 10 \text{ V}^{\text{Note3}}$
Static drain to source on state	R <sub>DS(on)</sub>	_	8	12	mΩ	$I_D = 25 \text{ A}, V_{GS} = 10 \text{ V}^{\text{Note3}}$
resistance						
Static drain to source on state	$R_{DS(on)}$	_	9.5	15	$m\Omega$	$I_D = 25 \text{ A}, V_{GS} = 6 \text{ V}^{\text{Note3}}$
resistance						
Output capacitance	Coss	_	1450	_	pF	$V_{DS} = 10 \text{ V}$ , $V_{GS} = 0$ , $f = 1 \text{ MHz}$
Turn-on delay time	$t_{\text{d(on)}}$	_	20	_	μs	$I_D = 25 \text{ A}, V_{GS} = 10 \text{ V}$
Rise time	t <sub>r</sub>	_	75	_	μs	$R_L = 1.2 \Omega$
Turn-off delay time	$t_{d(off)}$	_	3	_	μs	<u></u>
Fall time	t <sub>f</sub>	_	2.6	_	μs	
Body-drain diode forward voltage	$V_{DF}$	_	0.9	_	V	$I_F = 50 \text{ A}, V_{GS} = 0$
Body-drain diode reverse	t <sub>rr</sub>		110	_	ns	$I_F = 50 \text{ A}, V_{GS} = 0$
recovery time						diF/ dt =50 A/μs
Over load shut down operation time Note4	t <sub>os</sub>	_	8.0	_	ms	$V_{GS} = 6 \text{ V}, V_{DD} = 16 \text{ V}$
operation time						

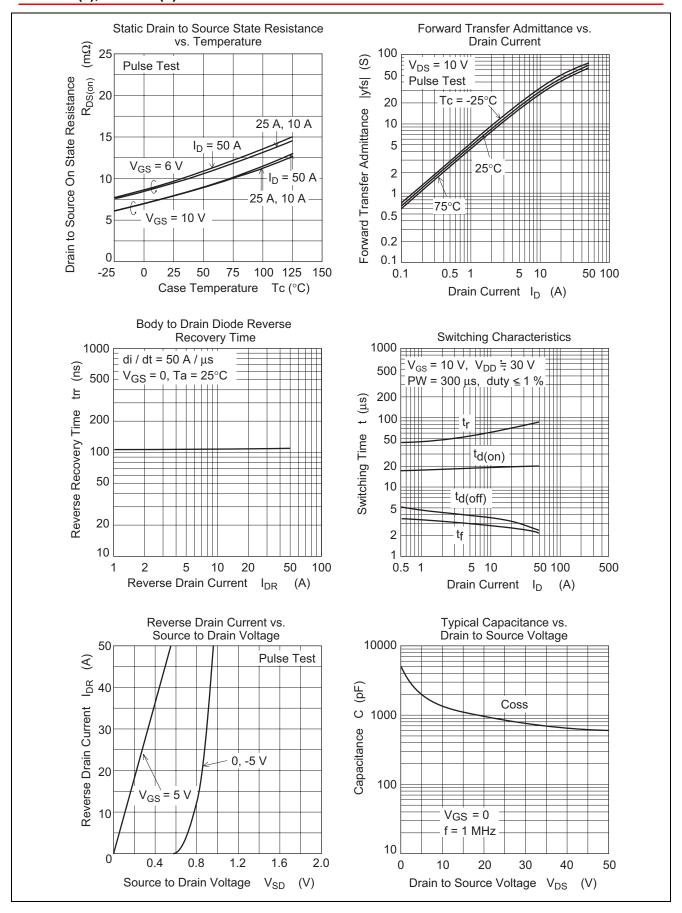
Notes: 3. Pulse test

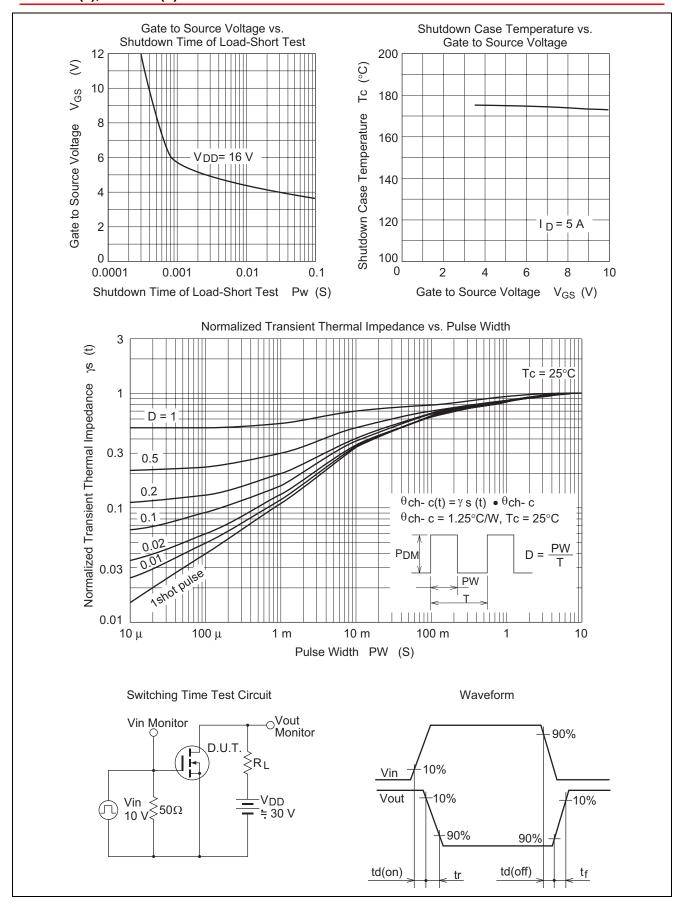
4. Including the junction temperature rise of the over loaded condition.



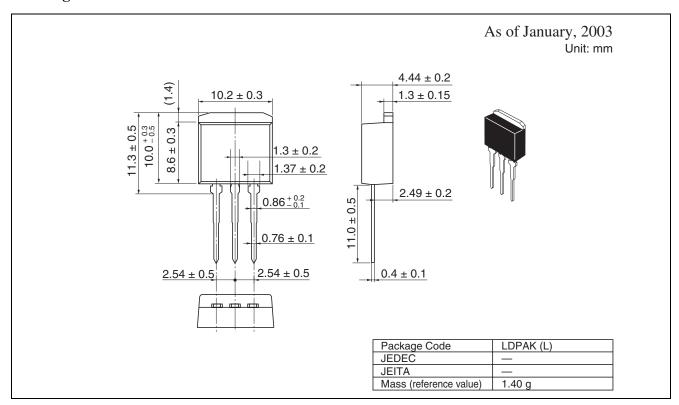
#### **Main Characteristics**

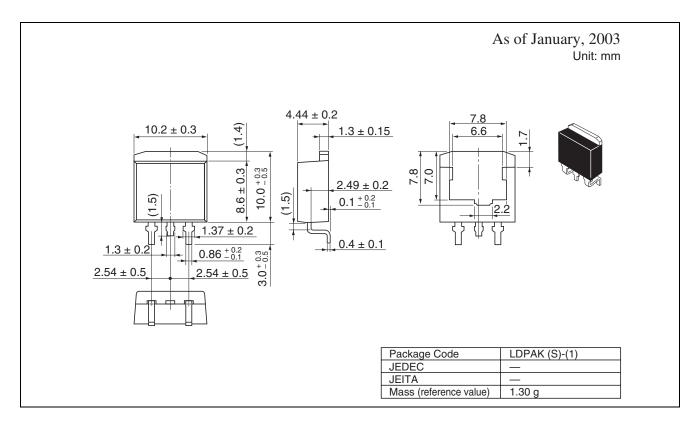






#### **Package Dimensions**





#### HAF2021(L), HAF2021(S)

#### **Ordering Information**

Part Name	Quantity	Shipping Container
HAF2021-90L	Max:50pcs/sack	sack
HAF2021-90S	Max:50pcs/sack	sack
HAF2021-90STL	1000pcs/Reel	Embossed tape
HAF2021-90STR	1000pcs/Reel	Embossed tape

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