

# HAF2007(L), HAF2007(S)

Silicon N Channel MOS FET Series  
Power Switching

# HITACHI

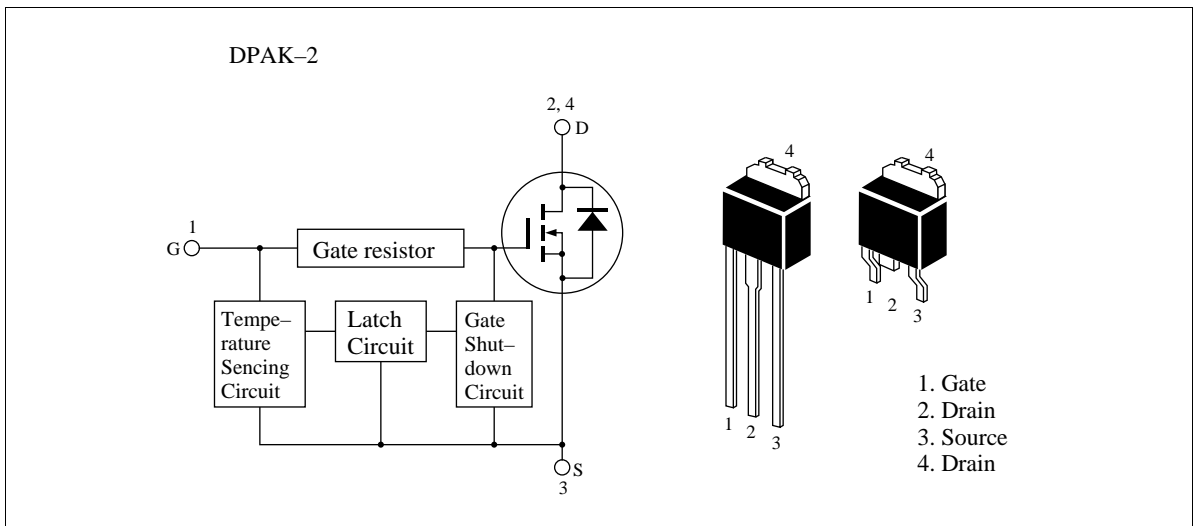
Target specification  
ADE-208-706 (Z)  
1st. Edition  
Dec. 1998

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

Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DSS}$	60	V
Gate to source voltage	$V_{GSS}$	(16)	V
Gate to source voltage	$V_{GSS}$	(-2.5)	V
Drain current	$I_D$	5	A
Drain peak current	$I_{D(pulse)}$ <sup>Note1</sup>	10	A
Body-drain diode reverse drain current	$I_{DR}$	5	A
Channel dissipation	$P_{ch}$ <sup>Note2</sup>	20	W
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

Note: 1.  $PW \leq 10\mu\text{s}$ , duty cycle  $\leq 1\%$   
 2. Value at  $T_a = 25^\circ\text{C}$

**Typical Operation Characteristics**

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input voltage	$V_{IH}$	3.5	—	—	V	
	$V_{IL}$	—	—	1.2	V	
Input current (Gate non shut down)	$I_{IH1}$	—	—	100	$\mu\text{A}$	$V_i = 8\text{V}, V_{DS} = 0$
	$I_{IH2}$	—	—	50	$\mu\text{A}$	$V_i = 3.5\text{V}, V_{DS} = 0$
	$I_{IL}$	—	—	1	$\mu\text{A}$	$V_i = 1.2\text{V}, V_{DS} = 0$
Input current (Gate non shut down)	$I_{IH(sd)1}$	—	0.8	—	$\text{mA}$	$V_i = 8\text{V}, V_{DS} = 0$
	$I_{IH(sd)2}$	—	0.35	—	$\text{mA}$	$V_i = 3.5\text{V}, V_{DS} = 0$
Shut down temperature	$T_{sd}$	—	175	—	$^\circ\text{C}$	Channel temperature
Gate operation voltage	$V_{op}$	3.5	—	12	V	

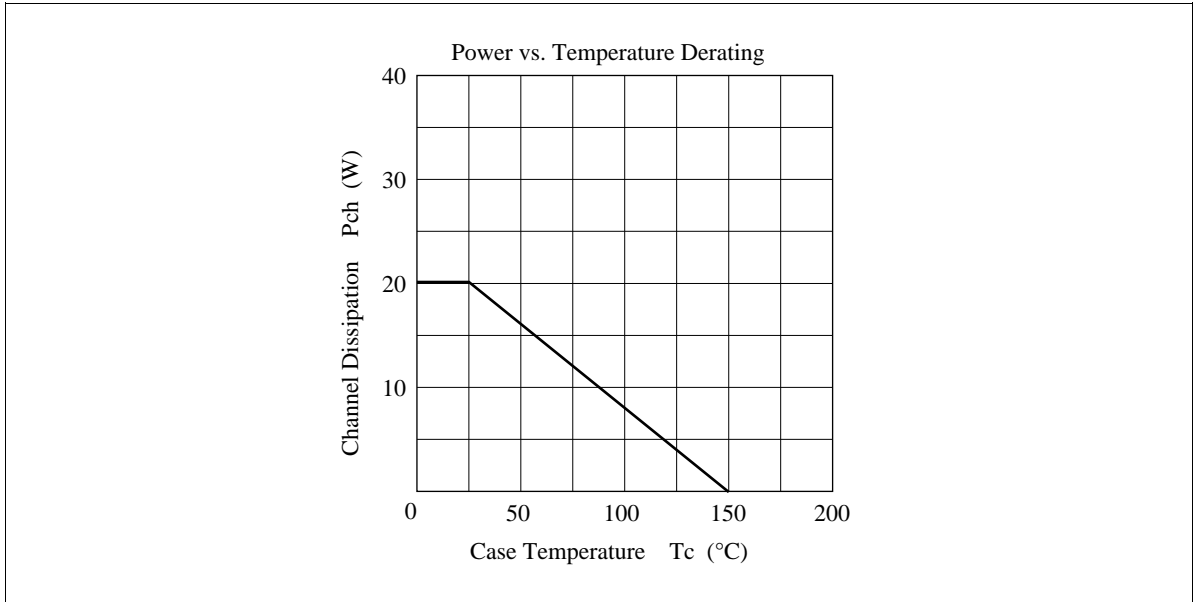
**Electrical Characteristics (Ta = 25°C)**

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	$I_{D1}$	(5)	—	—	A	$V_{GS} = 3.5V, V_{DS} = 2V$
Drain current	$I_{D2}$	—	—	10	mA	$V_{GS} = 1.2V, V_{DS} = 2V$
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	$I_D = 10mA, V_{GS} = 0$
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	$I_{GSS1}$	—	—	100	$\mu A$	$V_{GS} = 8V, V_{DS} = 0$
	$I_{GSS2}$	—	—	50	$\mu A$	$V_{GS} = 3.5V, V_{DS} = 0$
	$I_{GSS3}$	—	—	1	$\mu A$	$V_{GS} = 1.2V, V_{DS} = 0$
	$I_{GSS4}$	—	—	-100	$\mu A$	$V_{GS} = -2.4V, V_{DS} = 0$
Input current (shut down)	$I_{GS(op)1}$	—	0.8	—	mA	$V_{GS} = 8V, V_{DS} = 0$
	$I_{GS(op)2}$	—	0.35	—	mA	$V_{GS} = 3.5V, V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	10	$\mu A$	$V_{DS} = 60V, V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.25	V	$I_D = 1mA, V_{DS} = 10V$
Static drain to source on state resistance	$R_{DS(on)}$	—	100	160	m $\Omega$	$I_D = 2.5A, V_{GS} = 4V$ <sup>Note3</sup>
Static drain to source on state resistance	$R_{DS(on)}$	—	70	100	m $\Omega$	$I_D = 2.5A, V_{GS} = 10V$ <sup>Note3</sup>
Forward transfer admittance	$ y_{fs} $	(5)	(18)	—	S	$I_D = 2.5A, V_{DS} = 10V$ <sup>Note3</sup>
Output capacitance	$C_{oss}$	—	(260)	—	pF	$V_{DS} = 10V, V_{GS} = 0$ $f = 1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	( )	—	$\mu s$	$I_D = 2.5A, V_{GS} = 5V$
Rise time	$t_r$	—	( )	—	$\mu s$	$R_L = 12\Omega$
Turn-off delay time	$t_{d(off)}$	—	( )	—	$\mu s$	
Fall time	$t_f$	—	( )	—	$\mu s$	
Body-drain diode forward voltage	$V_{DF}$	—	(1.0)	—	V	$I_F = 2.5A, V_{GS} = 0$
Body-drain diode reverse recovery time	$t_{rr}$	—	( )	—	ns	$I_F = 5A, V_{GS} = 0$ $diF/dt = 50A/\mu s$
Over load shut down operation time <sup>Note4</sup>	$t_{os1}$	—	( )	—	ms	$V_{GS} = 5V, V_{DD} = 12V$
	$t_{os2}$	—	( )	—	ms	$V_{GS} = 5V, V_{DD} = 24V$

Note: 3. Pulse test

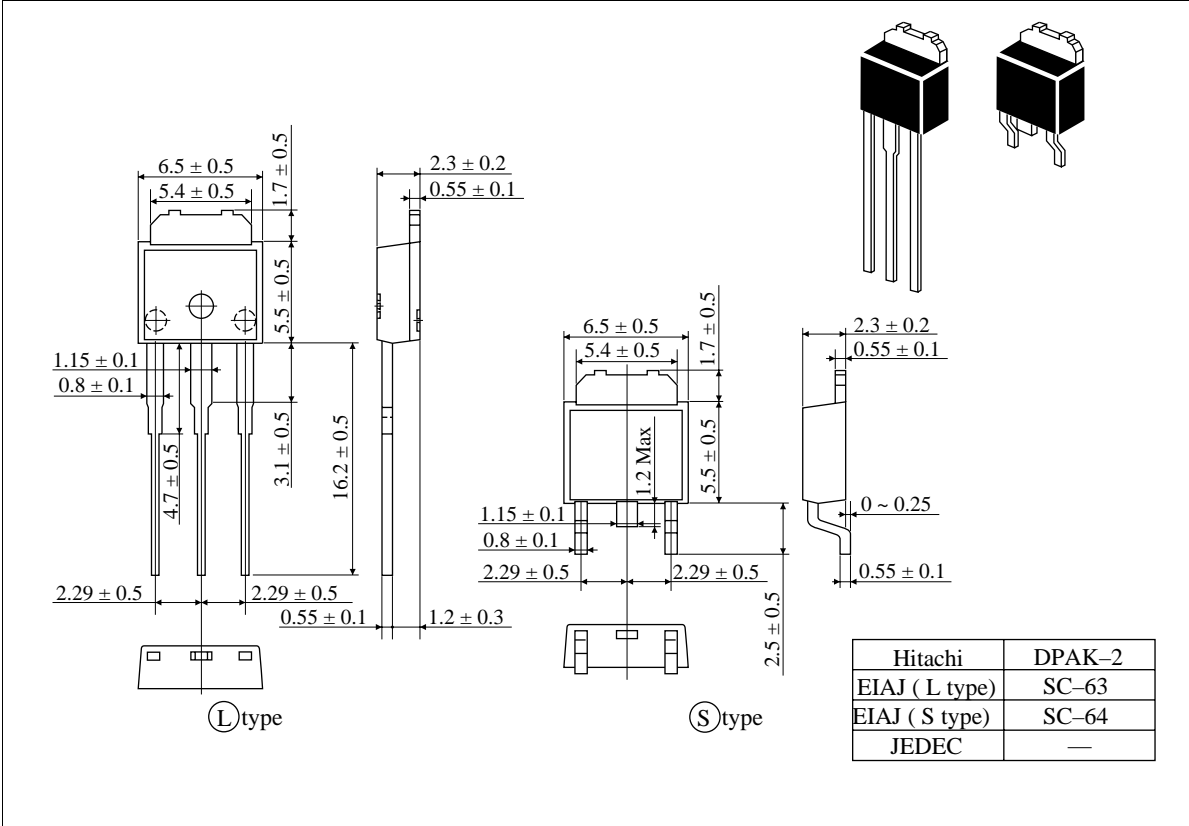
4. Include the time shift based on increasing of channel temperature when operate under over load condition.

**Main Characteristics**



Package Dimensions

Unit: mm



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