



HAF1009(L), HAF1009(S)

Silicon P Channel MOS FET Series Power Switching

REJ03G0029-0100Z
(Previous ADE-208-1525 (Z))
Rev.1.00
May.13.2003

Description

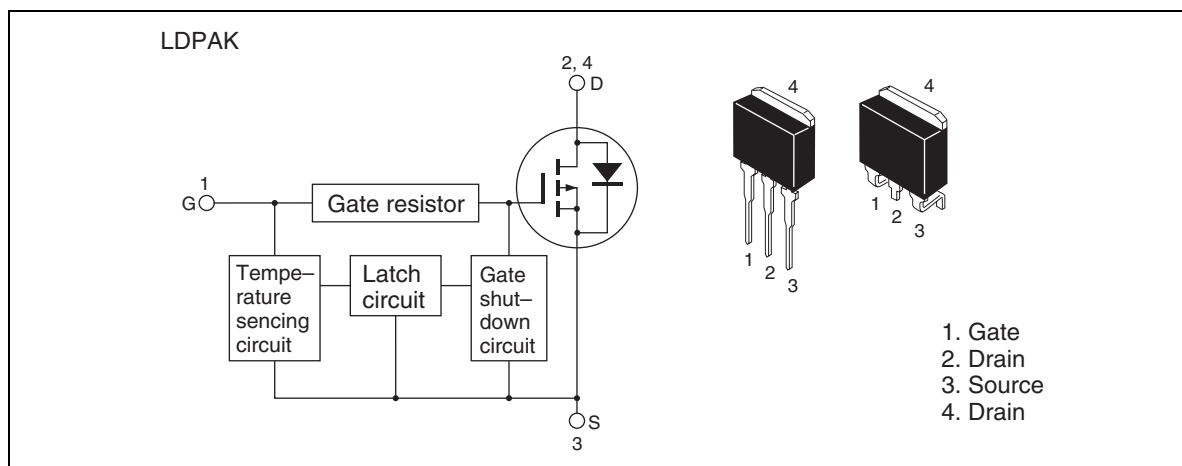
This FET has the over temperature shut-down capability sensing to the junction temperature. This FET has the built-in over temperature shut-down circuit in the gate area. And this circuit operation to shut-down the gate voltage in case of high junction temperature like applying over power consumption,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

Features

- Logic level operation (-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)

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Outline



HAF1009(L), HAF1009(S)**Absolute Maximum Ratings**

(Ta = 25°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	−40	A
Drain peak current	I _D (pulse) ^{Note1}	−80	A
Body-drain diode reverse drain current	I _{DR}	−40	A
Channel dissipation	P _{ch} ^{Note2}	50	W
Channel temperature	T _{ch}	150	°C
Storage temperature	T _{stg}	−55 to +150	°C

Notes: 1. PW ≤ 10μs, duty cycle ≤ 1 %

2. Value at Tc = 25°C

Typical Operation Characteristics

(Ta = 25°C)

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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	μA	V _i = −8 V, V _{DS} = 0
	I _{IH2}	—	—	−50	μA	V _i = −3.5 V, V _{DS} = 0
	I _{IL}	—	—	−1	μA	V _i = −1.2 V, V _{DS} = 0
Input current (Gate shut down)	I _{IH(sd)1}	—	−0.8	—	mA	V _i = −8 V, V _{DS} = 0
	I _{IH(sd)2}	—	−0.35	—	mA	V _i = −3.5 V, V _{DS} = 0
Shut down temperature	T _{sd}	—	175	—	°C	Channel temperature
Gate operation voltage	V _{op}	−3.5	—	−12	V	

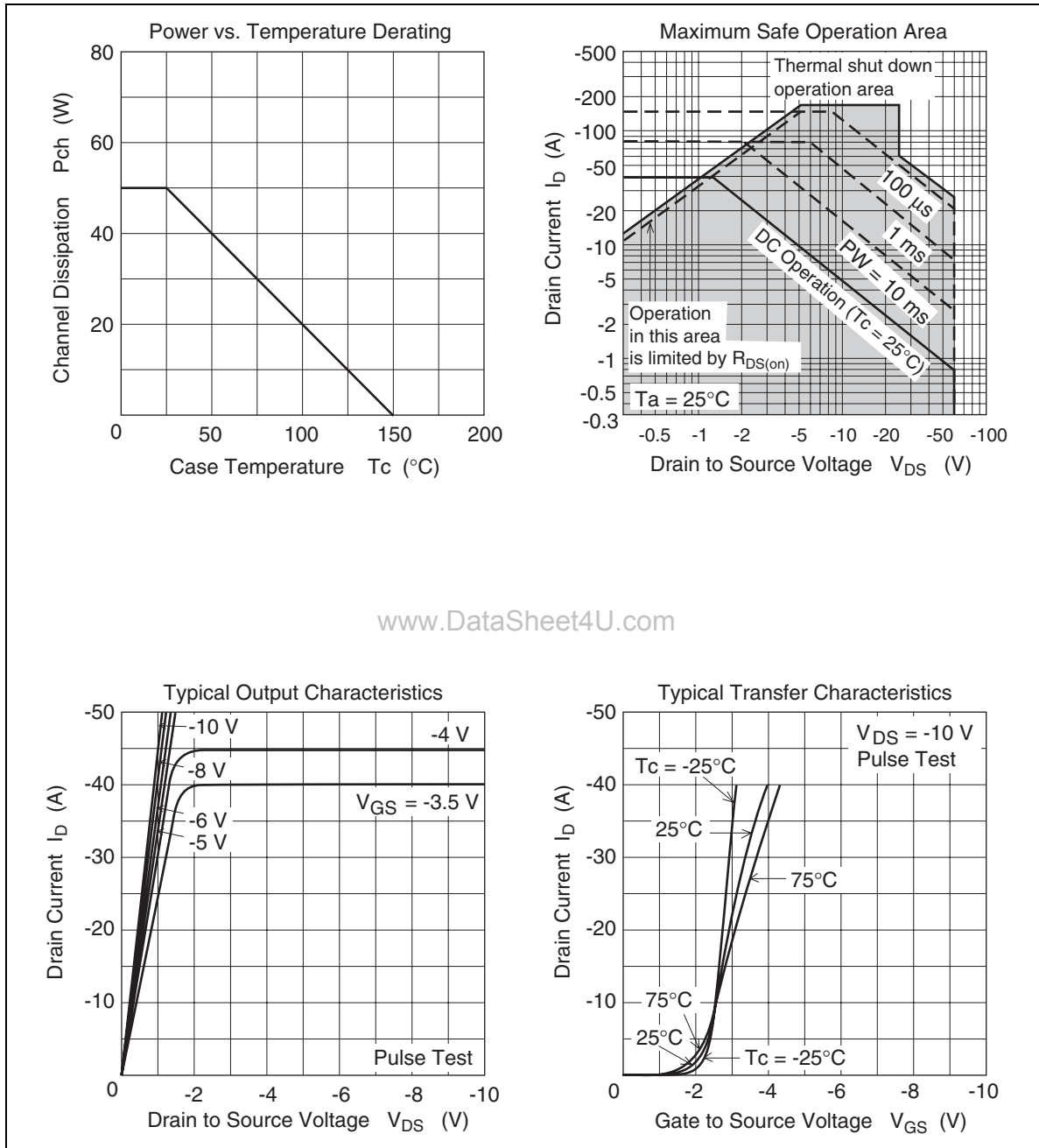
HAF1009(L), HAF1009(S)**Electrical Characteristics**

(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	-10	—	—	A	$V_{GS} = -3.5$, $V_{DS} = -2$ V
Drain current	I_{D2}	—	—	-10	mA	$V_{GS} = -1.2$ V, $V_{DS} = -2$ V
Drain to source breakdown voltage	$V_{(BR)DSS}$	-60	—	—	V	$I_D = -10$ mA, $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	-16	—	—	V	$I_G = -800$ μ A, $V_{DS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	2.5	—	—	V	$I_G = 100$ μ A, $V_{DS} = 0$
Gate to source leak current	I_{GSS1}	—	—	-100	μ A	$V_{GS} = -8$ V, $V_{DS} = 0$
	I_{GSS2}	—	—	-50	μ A	$V_{GS} = -3.5$ V, $V_{DS} = 0$
	I_{GSS3}	—	—	-1	μ A	$V_{GS} = -1.2$ V, $V_{DS} = 0$
	I_{GSS4}	—	—	100	μ A	$V_{GS} = 2.4$ V, $V_{DS} = 0$
Input current (shut down)	$I_{GS(OP)1}$	—	-0.8	—	mA	$V_{GS} = -8$ V, $V_{DS} = 0$
	$I_{GS(OP)2}$	—	-0.35	—	mA	$V_{GS} = -3.5$ V, $V_{DS} = 0$
Zero gate voltage drain current	I_{DSS}	—	—	-10	μ A	$V_{DS} = -60$ V, $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	-1.1	—	-2.15	V	$V_{DS} = -10$ V, $I_D = -1$ mA
Forward transfer admittance	$ y_{fs} $	8.4	14.8	—	S	$I_D = -20$ A, $V_{DS} = -10$ V ^{Note3}
Static drain to source on state resistance	$R_{DS(on)}$	—	33	50	m Ω	$I_D = -20$ A, $V_{GS} = -4$ V ^{Note3}
	$R_{DS(on)}$	—	20	27	m Ω	$I_D = -20$ A, $V_{GS} = -10$ V ^{Note3}
Output capacitance	C_{oss}	—	1500	—	pF	$V_{DS} = -10$ V, $V_{GS} = 0$, $f = 1$ MHz
Turn-on delay time	$t_{d(on)}$	—	10.6	—	μ s	$V_{GS} = -10$ V, $I_D = -20$ A, $R_L = 1.5$ Ω
Rise time	t_r	—	45	—	μ s	
Turn-off delay time	$t_{d(off)}$	—	12	—	μ s	
Fall time	t_f	—	13	—	μ s	
Body-drain diode forward voltage	V_{DF}	—	-0.95	—	V	$I_F = -40$ A, $V_{GS} = 0$
Body-drain diode reverse recovery time	t_{rr}	—	100	—	ns	$I_F = -40$ A, $V_{GS} = 0$ $di_F/dt = 50$ A/ μ s
Over load shut down operation time ^{Note4}	t_{os1}	—	4.1	—	ms	$V_{GS} = -5$ V, $V_{DD} = -16$ V
	t_{os2}	—	1.5	—	ms	$V_{GS} = -5$ V, $V_{DD} = -24$ V

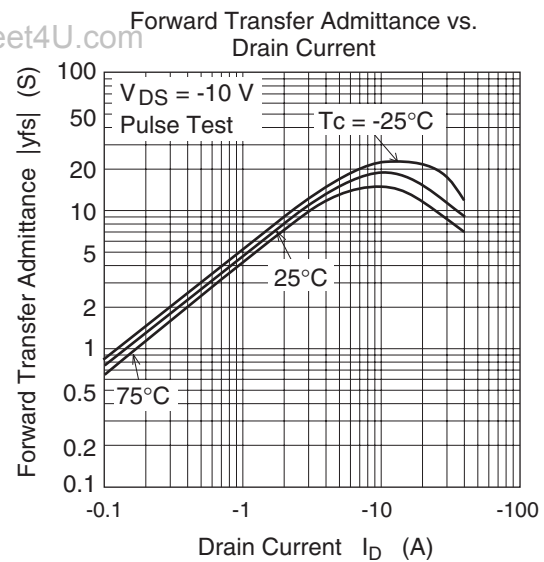
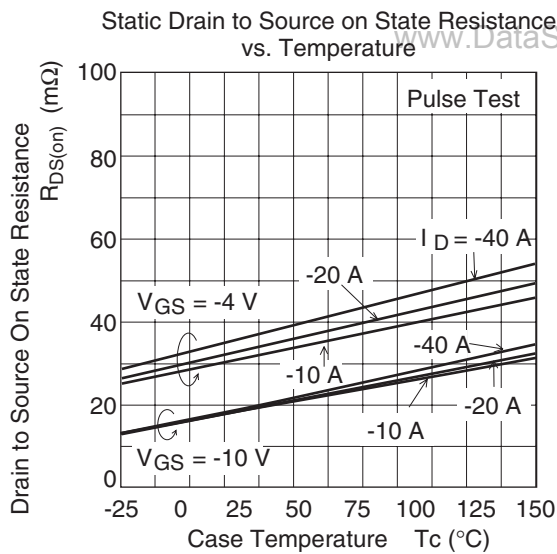
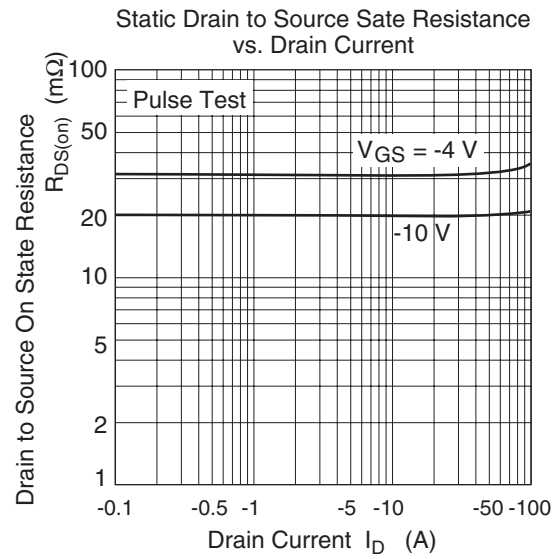
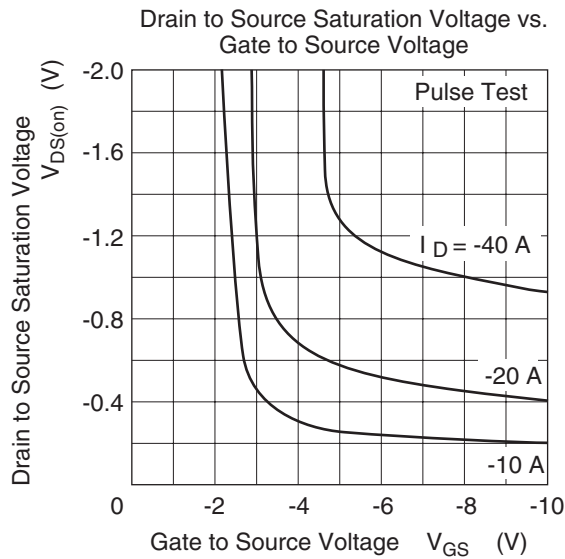
Notes: 3. Pulse test

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

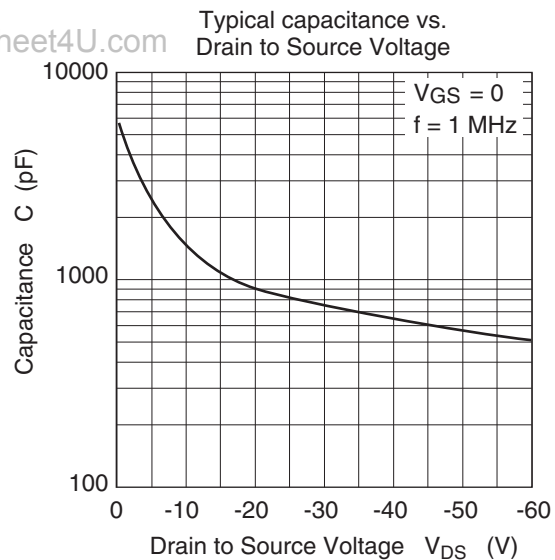
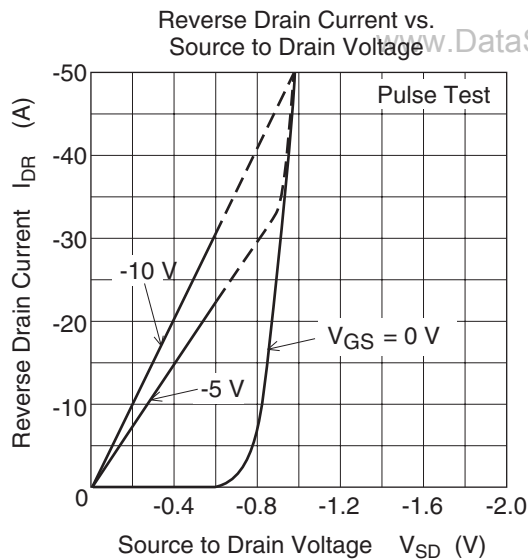
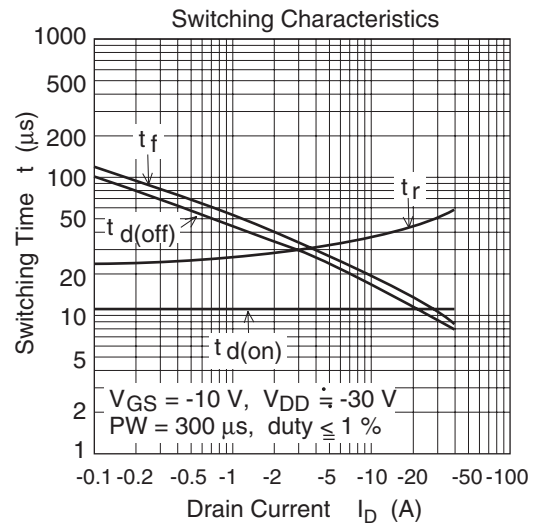
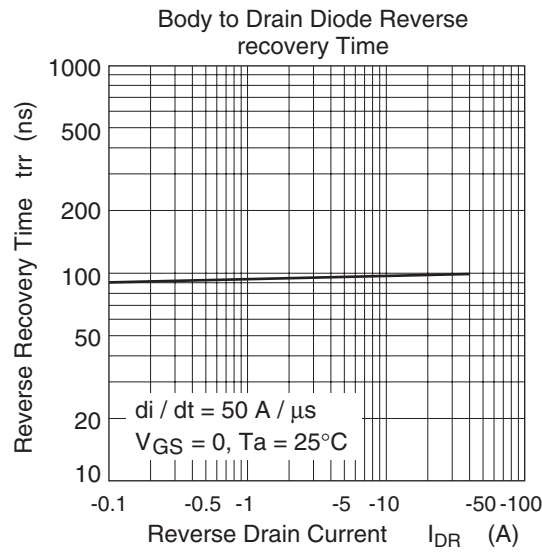
HAF1009(L), HAF1009(S)**Main Characteristics**

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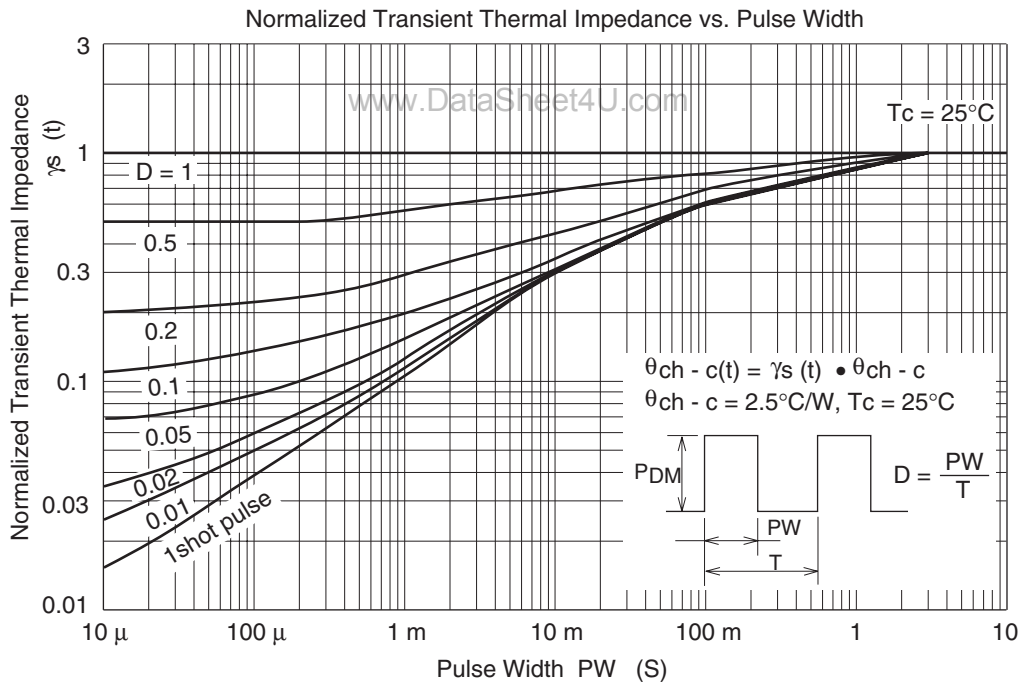
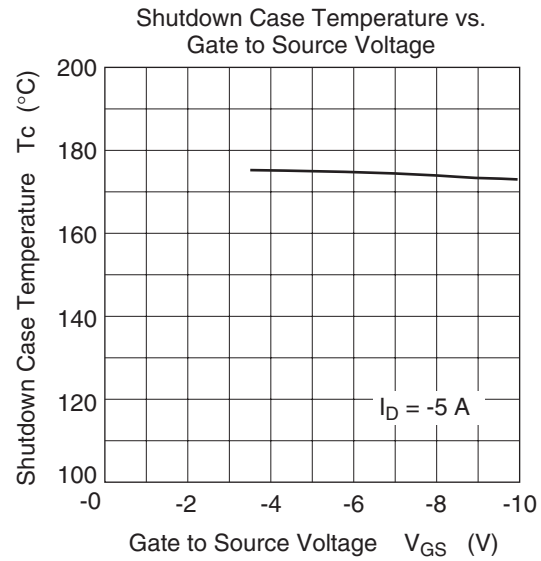
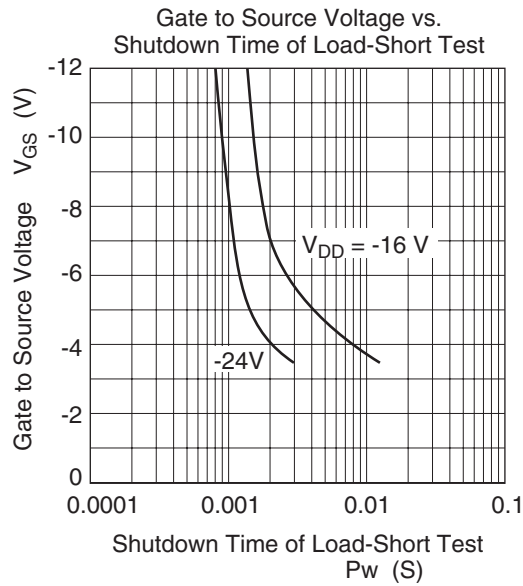
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HAF1009(L), HAF1009(S)

HAF1009(L), HAF1009(S)



HAF1009(L), HAF1009(S)

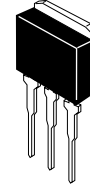
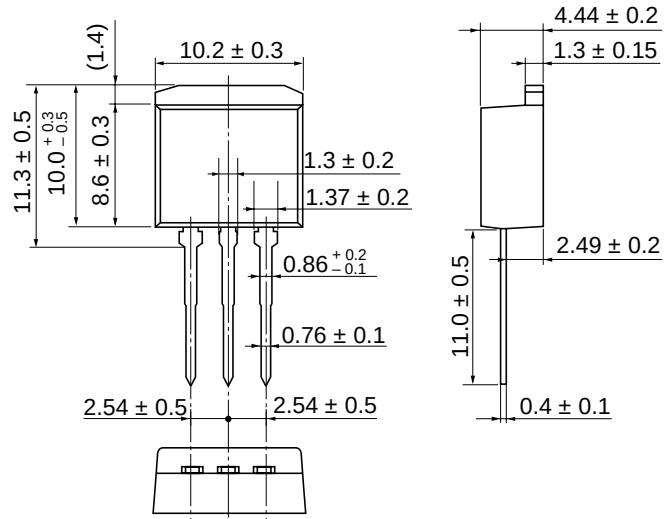


HAF1009(L), HAF1009(S)

Package Dimensions

As of January, 2003

Unit: mm

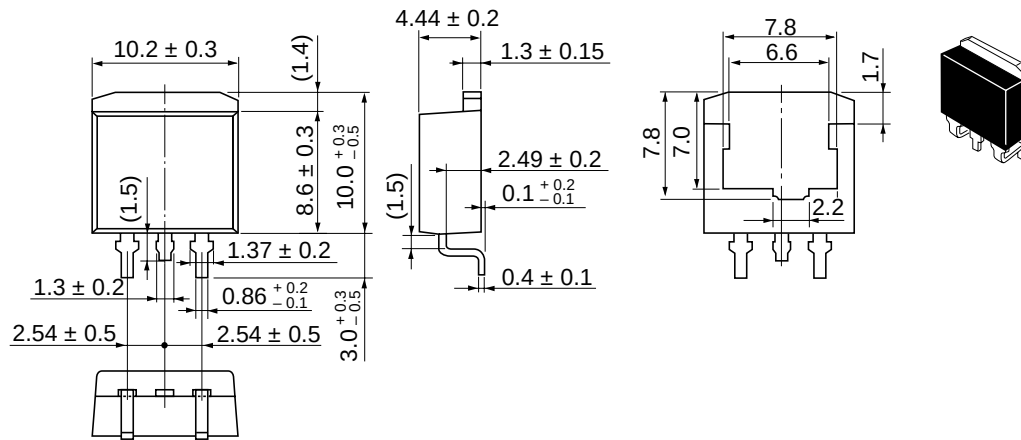


Package Code	LDPAK (L)
JEDEC	—
JEITA	—
Mass (reference value)	1.40 g

HAF1009(L), HAF1009(S)

As of January, 2003

Unit: mm



Package Code	LDPAK (S)-(1)
JEDEC	—
JEITA	—
Mass (reference value)	1.30 g

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HAF1009(L), HAF1009(S)

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