

# HAF2025(L), HAF2025(S)

## Silicon N Channel Power MOS FET Power Switching

REJ03G0145-0300Z

Rev.3.00

Apr.22.2004

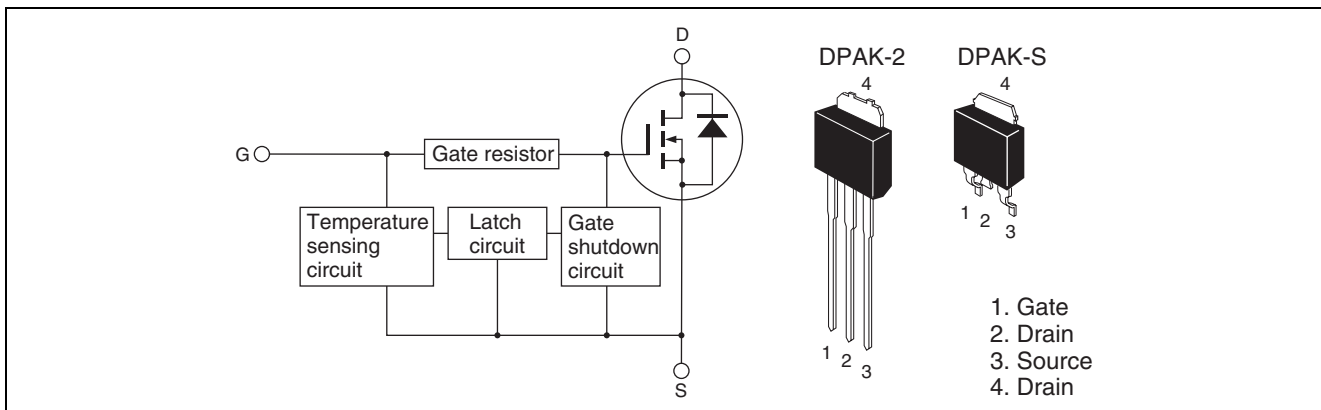
### Descriptions

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

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	V <sub>DSS</sub>	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>	15	A
Drain peak current	I <sub>D(pulse)</sub> <sup>Note1</sup>	30	A
Body-drain diode reverse drain current	I <sub>DR</sub>	15	A
Channel dissipation	P <sub>ch</sub> <sup>Note2</sup>	40	W
Channel temperature	T <sub>ch</sub>	150	°C
Storage temperature	T <sub>stg</sub>	-55 to +150	°C

Notes: 1. PW ≤ 10μs, duty cycle ≤ 1 %

2. Value at T<sub>c</sub> = 25°C

## Typical Operation Characteristics

(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input voltage	V <sub>IH</sub>	3.5	—	—	V	
	V <sub>IL</sub>	—	—	1.2	V	
Input current (Gate non shut down)	I <sub>IH1</sub>	—	—	100	μA	V <sub>i</sub> = 8V, V <sub>DS</sub> = 0
	I <sub>IH2</sub>	—	—	50	μA	V <sub>i</sub> = 3.5V, V <sub>DS</sub> = 0
	I <sub>IL</sub>	—	—	1	μA	V <sub>i</sub> = 1.2V, V <sub>DS</sub> = 0
Input current (Gate shut down)	I <sub>IH(sd)1</sub>	—	0.8	—	mA	V <sub>i</sub> = 8V, V <sub>DS</sub> = 0
	I <sub>IH(sd)2</sub>	—	0.35	—	mA	V <sub>i</sub> = 3.5V, V <sub>DS</sub> = 0
Shut down temperature	T <sub>sd</sub>	—	175	—	°C	Channel temperature
Gate operation voltage	V <sub>op</sub>	3.5	—	12	V	

## Electrical Characteristics

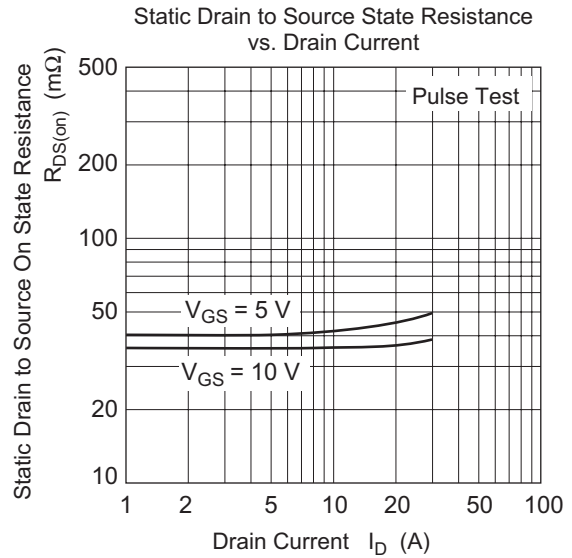
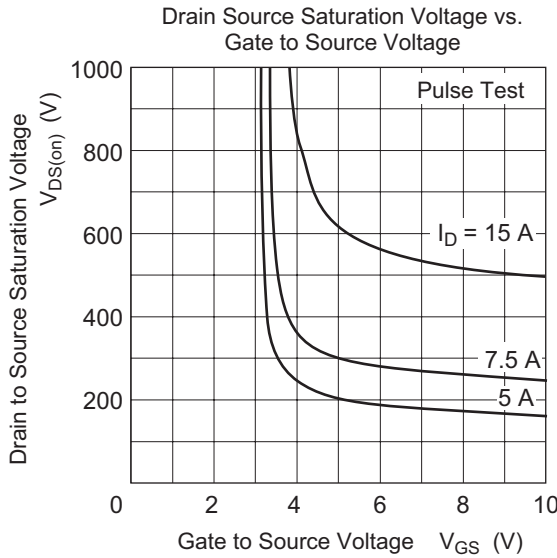
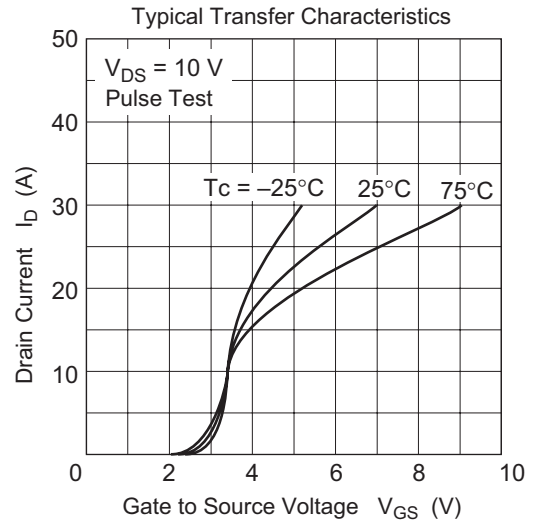
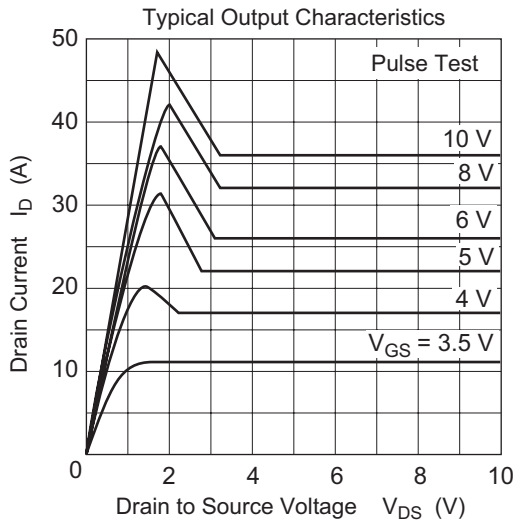
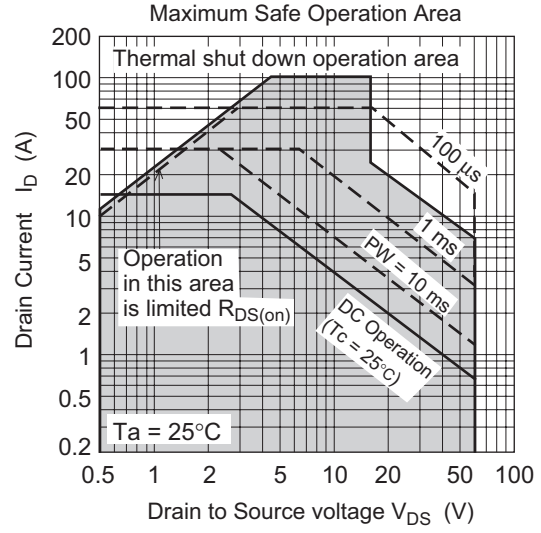
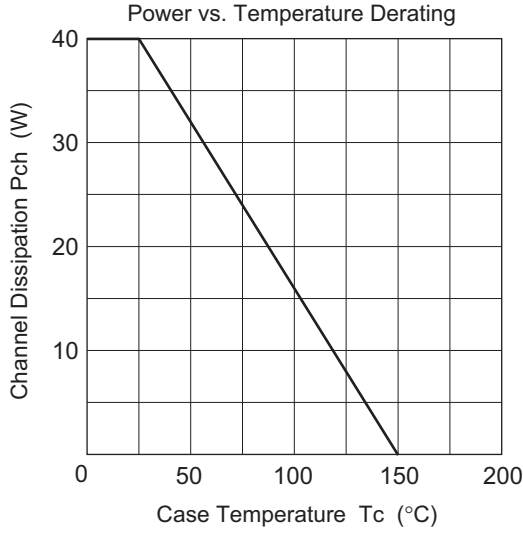
(Ta = 25°C)

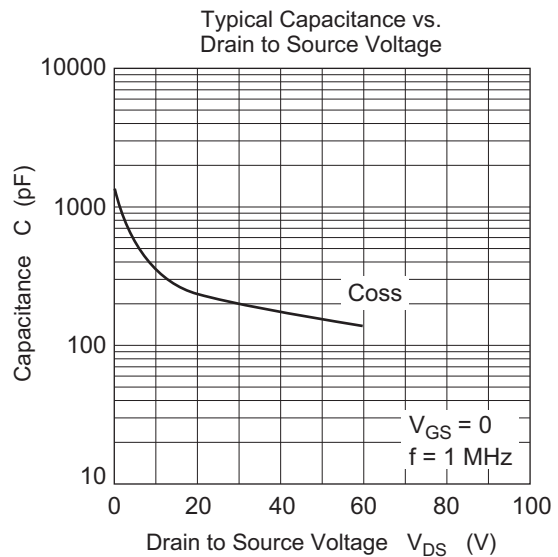
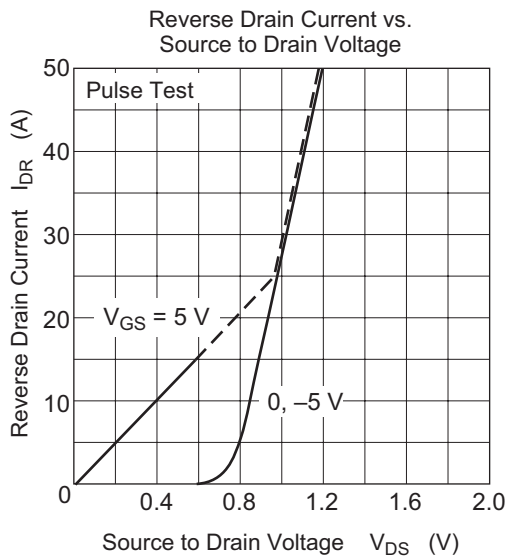
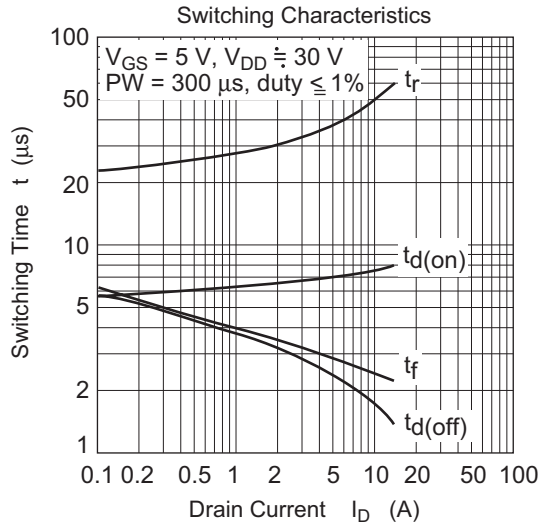
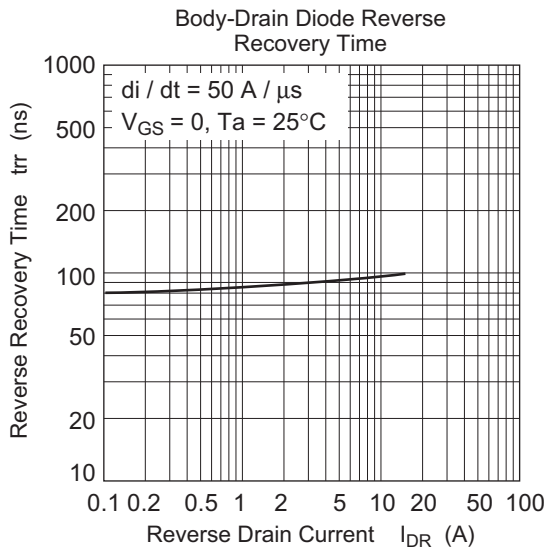
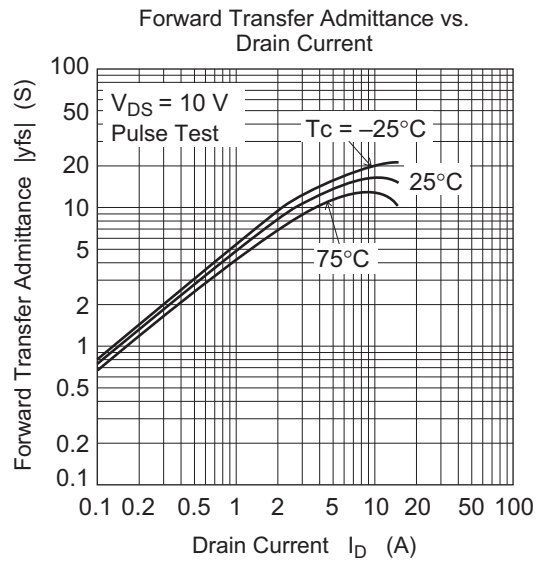
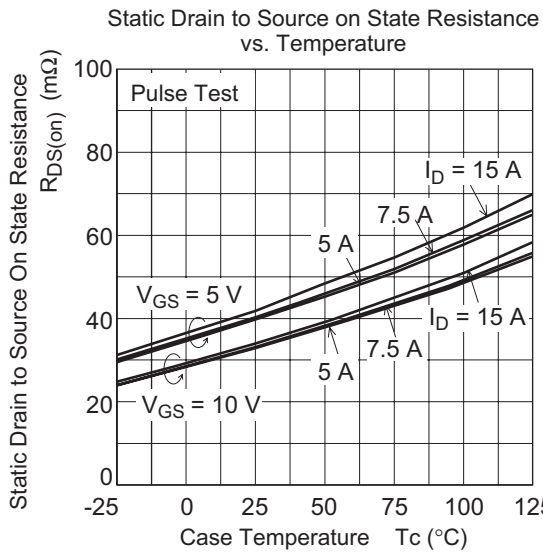
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	$I_{D1}$	1	—	—	A	$V_{GS} = 3.5 \text{ V}, V_{DS} = 2 \text{ V}$
	$I_{D2}$	—	—	10	mA	$V_{GS} = 1.2 \text{ V}, V_{DS} = 2 \text{ V}$
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	$I_D = 10 \text{ mA}, V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	16	—	—	V	$I_G = 800 \mu\text{A}, V_{DS} = 0$
	$V_{(BR)GSS}$	-2.5	—	—	V	$I_G = -100 \mu\text{A}, V_{DS} = 0$
Gate to source leak current	$I_{GSS1}$	—	—	100	$\mu\text{A}$	$V_{GS} = 8 \text{ V}, V_{DS} = 0$
	$I_{GSS2}$	—	—	50	$\mu\text{A}$	$V_{GS} = 3.5 \text{ V}, V_{DS} = 0$
	$I_{GSS3}$	—	—	1	$\mu\text{A}$	$V_{GS} = 1.2 \text{ V}, V_{DS} = 0$
	$I_{GSS4}$	—	—	-100	$\mu\text{A}$	$V_{GS} = -2.4 \text{ V}, V_{DS} = 0$
Input current (shut down)	$I_{GS(op)1}$	—	0.8	—	mA	$V_{GS} = 8 \text{ V}, V_{DS} = 0$
	$I_{GS(op)2}$	—	0.35	—	mA	$V_{GS} = 3.5 \text{ V}, V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	10	$\mu\text{A}$	$V_{DS} = 60 \text{ V}, V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.4	—	2.6	V	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$
Forward transfer admittance	$ y_{fs} $	1.5	16	—	S	$I_D = 7.5 \text{ A}, V_{DS} = 10 \text{ V}$ <sup>Note3</sup>
Static drain to source on state resistance	$R_{DS(on)}$	—	41	60	$\text{m}\Omega$	$I_D = 7.5 \text{ A}, V_{GS} = 5 \text{ V}$ <sup>Note3</sup>
	$R_{DS(on)}$	—	34	45	$\text{m}\Omega$	$I_D = 7.5 \text{ A}, V_{GS} = 10 \text{ V}$ <sup>Note3</sup>
Output capacitance	$C_{oss}$	—	365	—	pF	$V_{DS} = 10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	7.4	—	$\mu\text{s}$	$V_{GS} = 5 \text{ V}, I_D = 7.5 \text{ A},$
Rise time	$t_r$	—	43	—	$\mu\text{s}$	$R_L = 4 \Omega$
Turn-off delay time	$t_{d(off)}$	—	2	—	$\mu\text{s}$	
Fall time	$t_f$	—	2.5	—	$\mu\text{s}$	
Body-drain diode forward voltage	$V_{DF}$	—	0.9	—	V	$I_F = 15 \text{ A}, V_{GS} = 0$
Body-drain diode reverse recovery time	$t_{rr}$	—	100	—	ns	$I_F = 15 \text{ A}, V_{GS} = 0$ $di_F/dt = 50 \text{ A}/\mu\text{s}$
Over load shut down operation time <sup>Note4</sup>	$t_{os1}$	—	0.93	—	ms	$V_{GS} = 5 \text{ V}, V_{DD} = 16 \text{ V}$

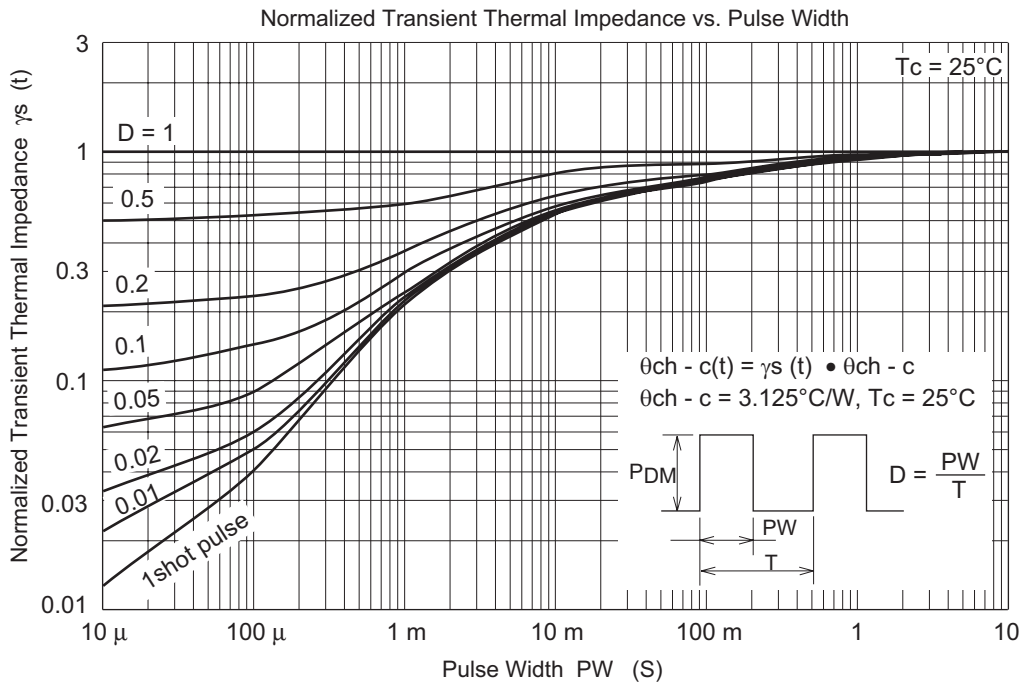
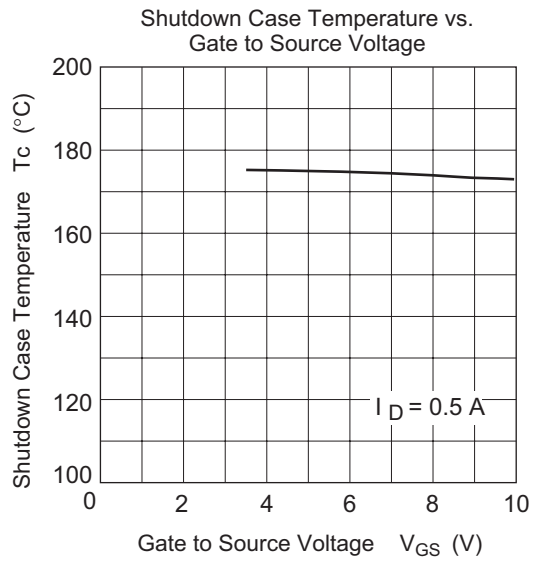
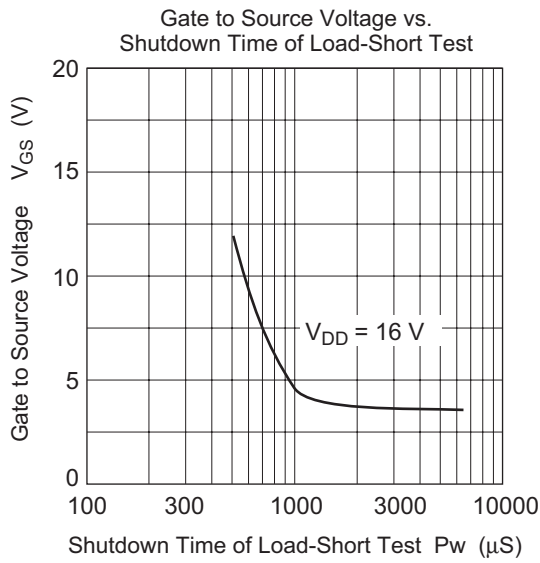
Notes: 3. Pulse test

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

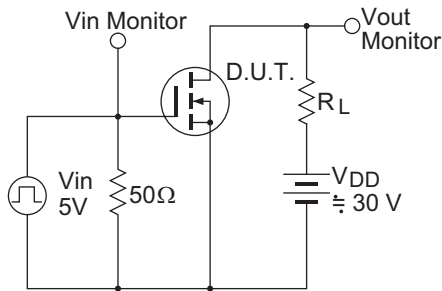
Main Characteristics



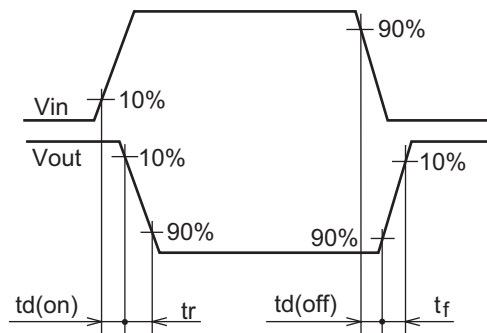




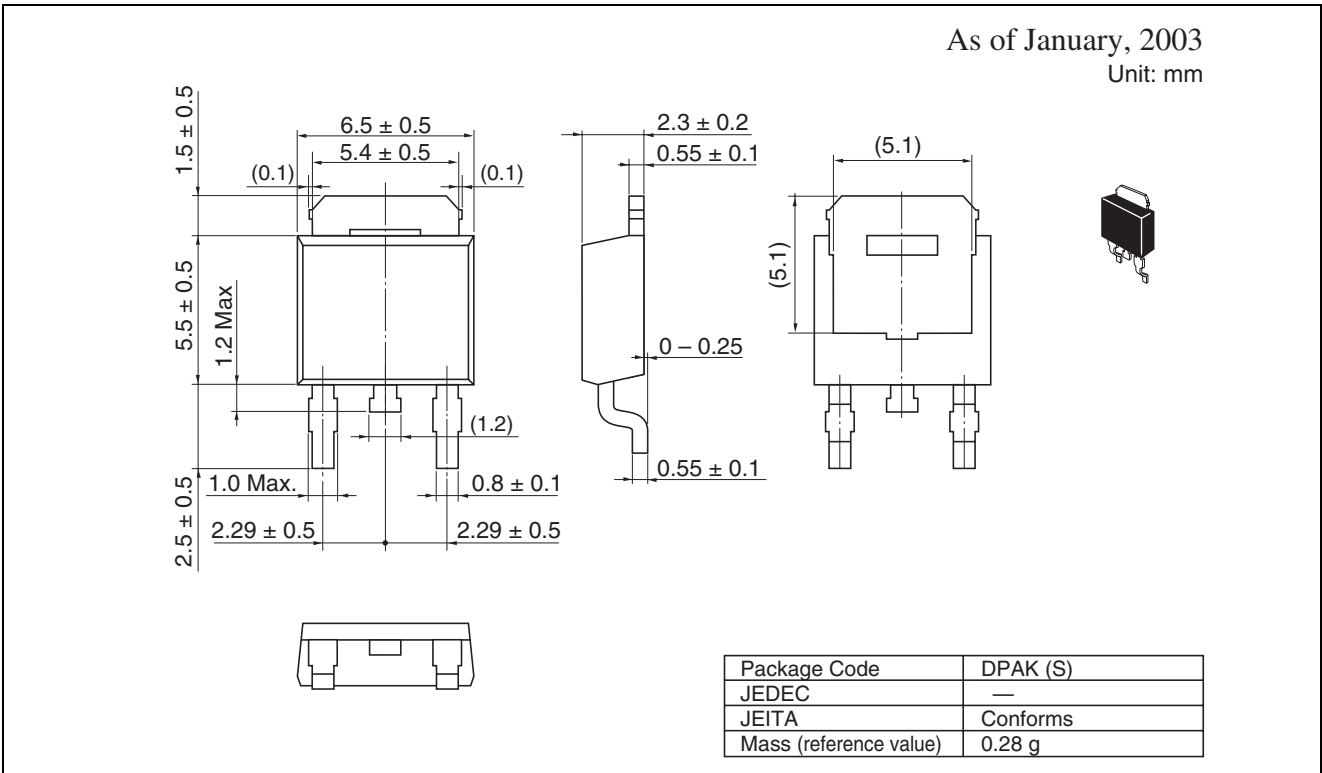
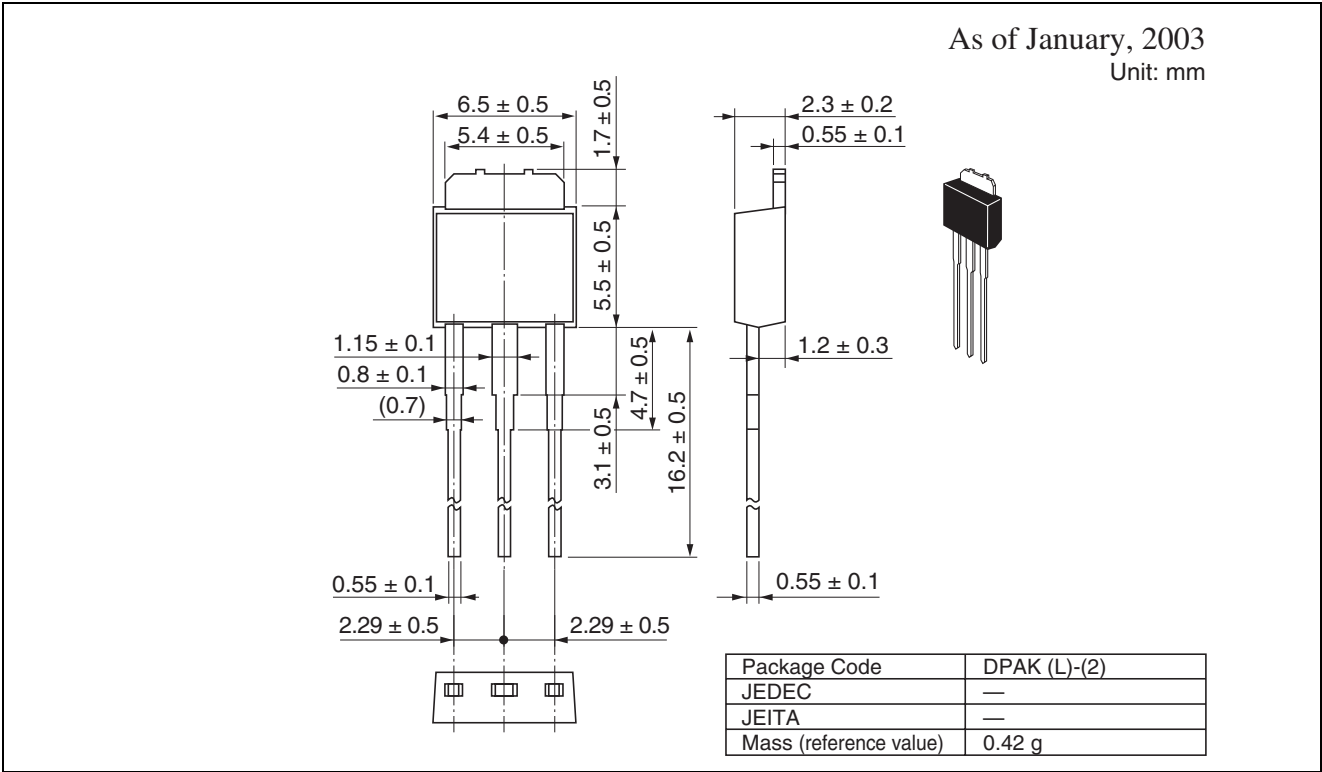
Switching Time Test Circuit



Waveform



Package Dimensions



**Ordering Information**

<b>Part Name</b>	<b>Quantity</b>	<b>Shipping Container</b>
HAF2025-90L	Max: 100 pcs/ sack	Sack
HAF2025-90S	Max: 100 pcs/ sack	Sack
HAF2025-90STL	3000 pcs/ Reel	Embossed tape
HAF2025-90STR	3000 pcs/ Reel	Embossed tape

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