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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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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

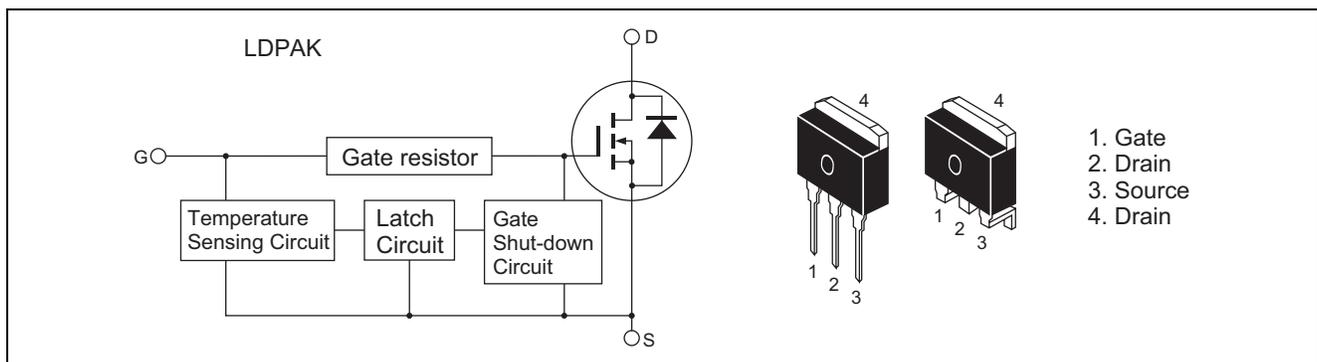
Description

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°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	50	A
Drain peak current	I _{D(pulse)} ^{Note1}	100	A
Body-drain diode reverse drain current	I _{DR}	50	A
Channel dissipation	P _{ch} ^{Note2}	100	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 Ta = 25°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	μA	V _i = 6 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}	—	0.6	—	mA	V _i = 6 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	

Electrical Characteristics

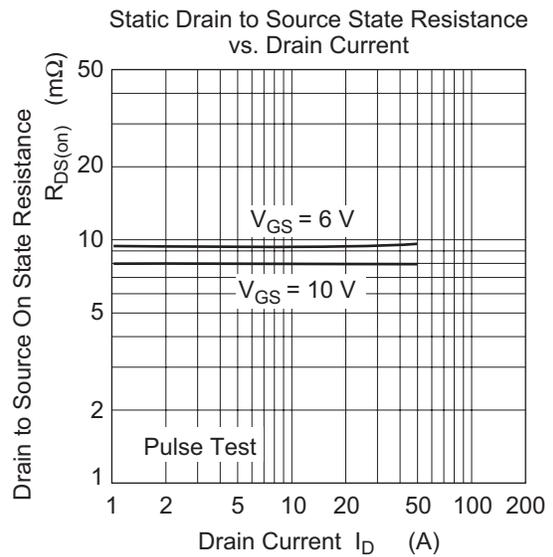
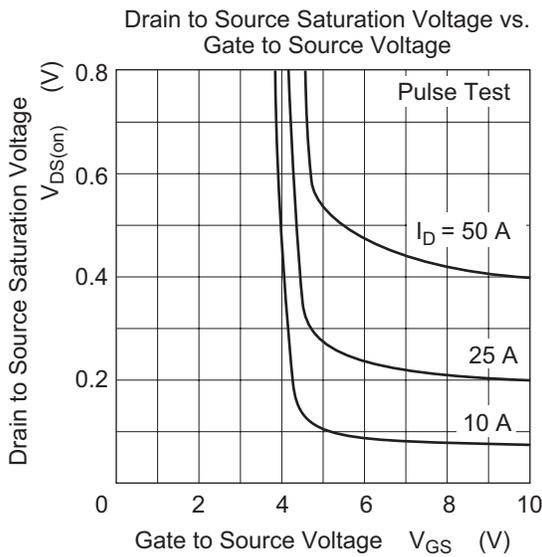
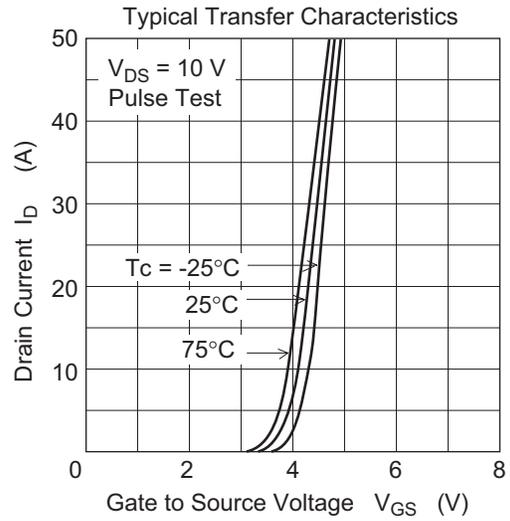
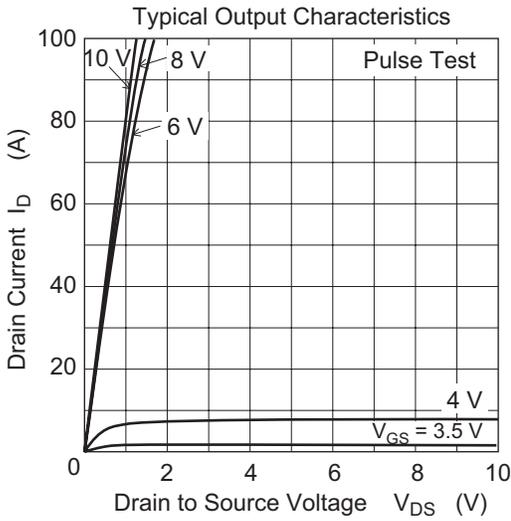
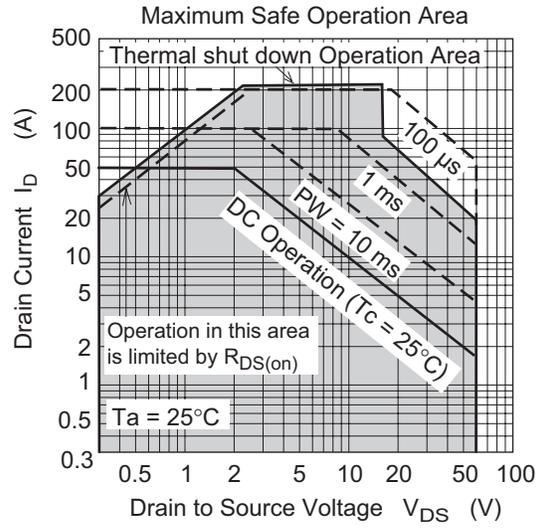
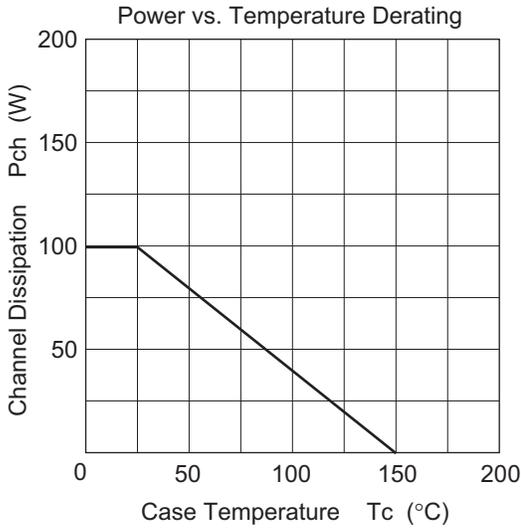
(Ta = 25°C)

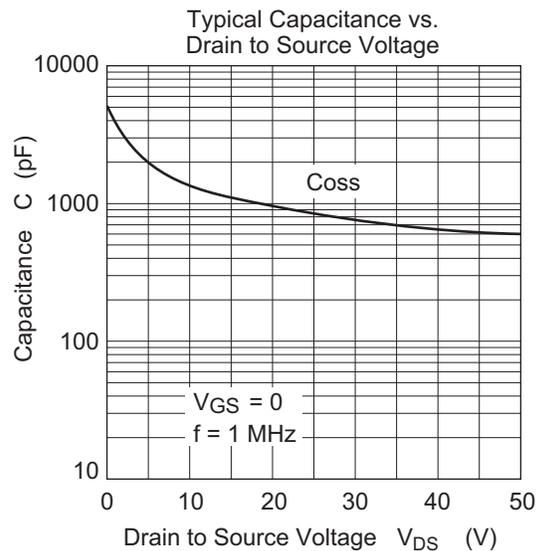
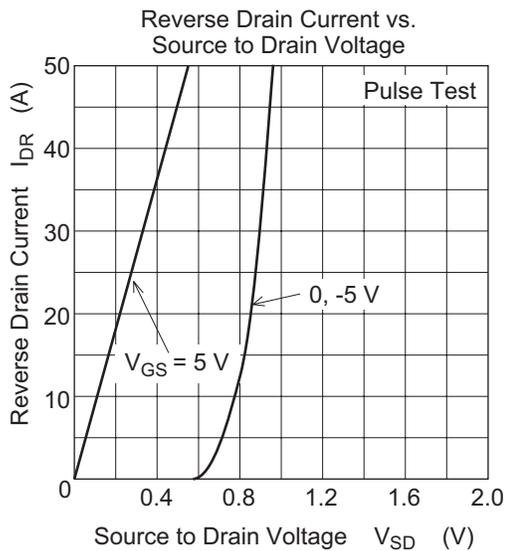
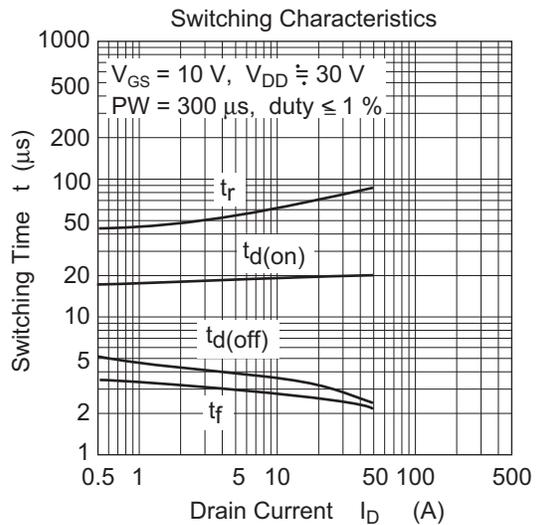
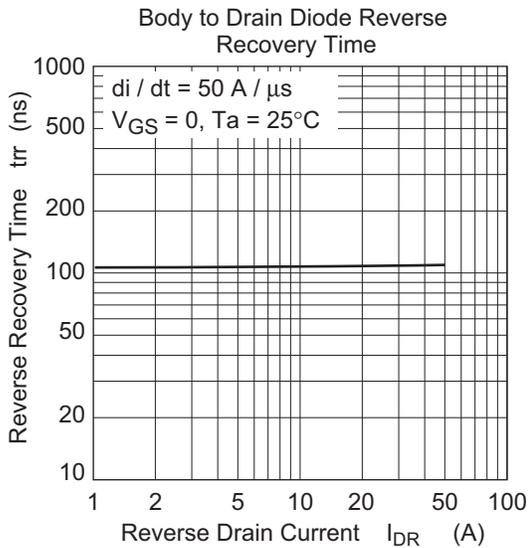
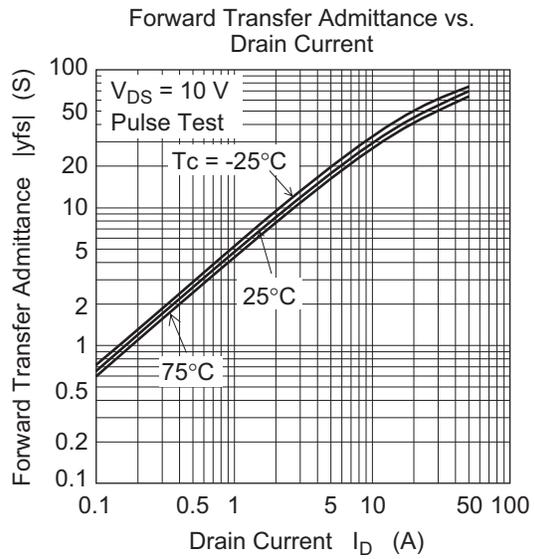
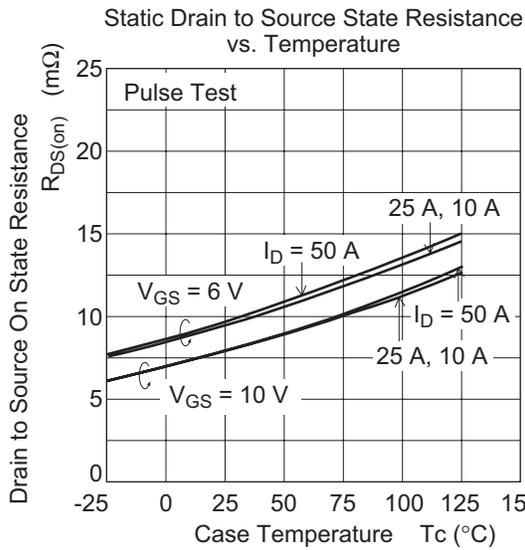
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	90	—	—	A	$V_{GS} = 6\text{ V}, V_{DS} = 10\text{ V}$
Drain current	I_{D2}	—	—	10	mA	$V_{GS} = 1.2\text{ V}, V_{DS} = 10\text{ V}$
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	$I_D = 10\text{ mA}, V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	16	—	—	V	$I_G = 300\text{ }\mu\text{A}, V_{DS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	-2.5	—	—	V	$I_G = -100\text{ }\mu\text{A}, V_{DS} = 0$
Gate to source leak current	I_{GSS1}	—	—	100	μA	$V_{GS} = 6\text{ V}, V_{DS} = 0$
	I_{GSS2}	—	—	50	μA	$V_{GS} = 3.5\text{ V}, V_{DS} = 0$
	I_{GSS3}	—	—	1	μA	$V_{GS} = 1.2\text{ V}, V_{DS} = 0$
	I_{GSS4}	—	—	-100	μA	$V_{GS} = -2.4\text{ V}, V_{DS} = 0$
Input current (shut down)	$I_{GS(op)1}$	—	0.6	—	mA	$V_{GS} = 6\text{ V}, V_{DS} = 0$
	$I_{GS(op)2}$	—	0.35	—	mA	$V_{GS} = 3.5\text{ V}, V_{DS} = 0$
Zero gate voltage drain current	I_{DSS}	—	—	10	μA	$V_{DS} = 60\text{ V}, V_{GS} = 0$
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_{fs} $	15	50	—	S	$I_D = 25\text{ A}, V_{DS} = 10\text{ V}$ ^{Note3}
Static drain to source on state resistance	$R_{DS(on)}$	—	8	12	m Ω	$I_D = 25\text{ A}, V_{GS} = 10\text{ V}$ ^{Note3}
Static drain to source on state resistance	$R_{DS(on)}$	—	9.5	15	m Ω	$I_D = 25\text{ A}, V_{GS} = 6\text{ V}$ ^{Note3}
Output capacitance	C_{oss}	—	1450	—	pF	$V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	20	—	μs	$I_D = 25\text{ A}, V_{GS} = 10\text{ V}$
Rise time	t_r	—	75	—	μs	$R_L = 1.2\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	—	3	—	μs	
Fall time	t_f	—	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 recovery time	t_{rr}	—	110	—	ns	$I_F = 50\text{ A}, V_{GS} = 0$ $di_F/dt = 50\text{ A}/\mu\text{s}$
Over load shut down operation time ^{Note4}	t_{os}	—	0.8	—	ms	$V_{GS} = 6\text{ V}, V_{DD} = 16\text{ V}$

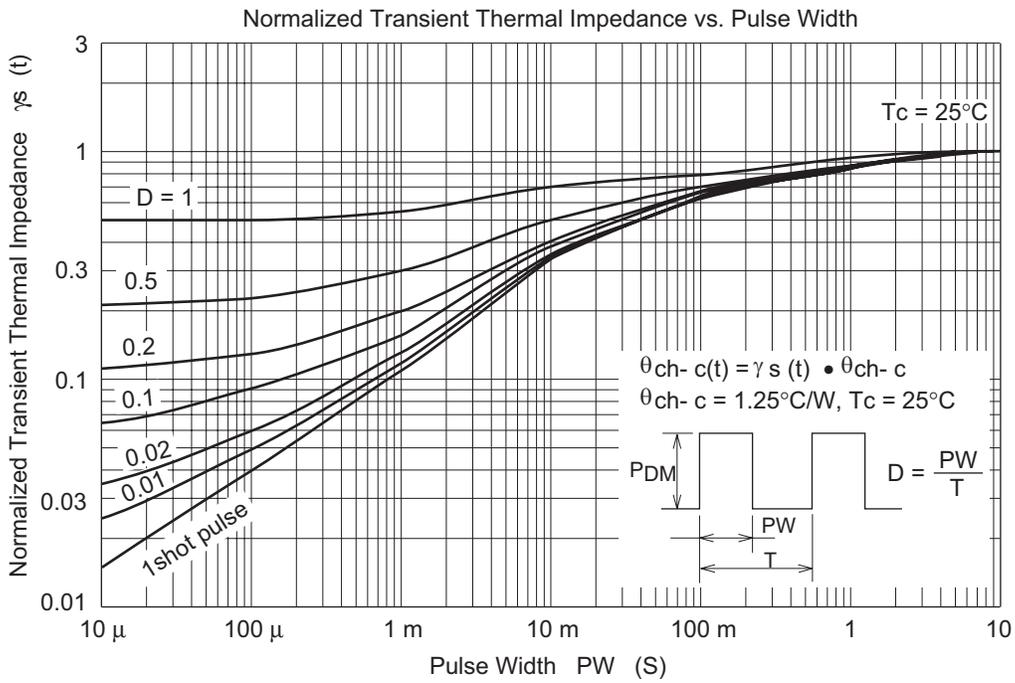
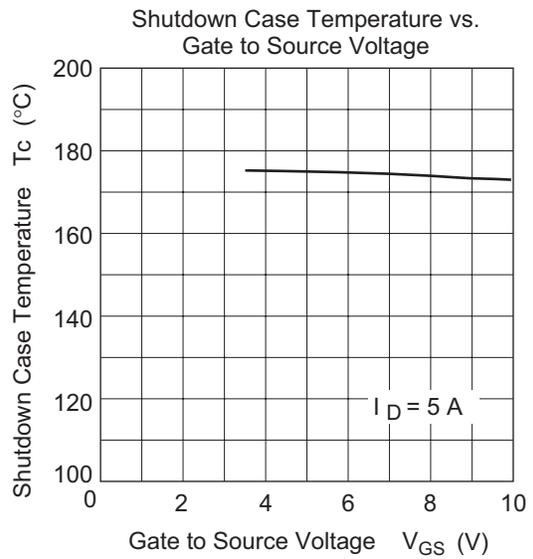
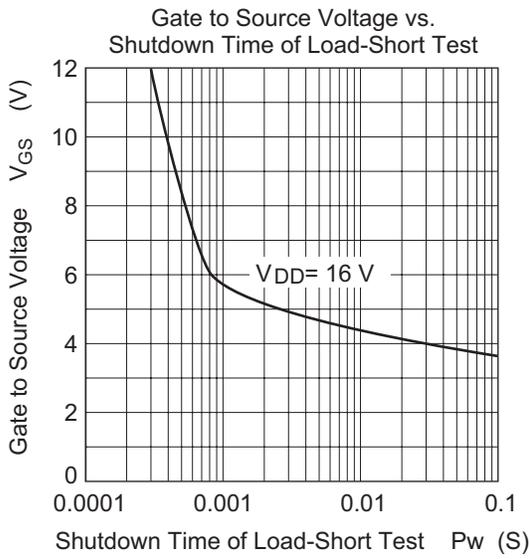
Notes: 3. Pulse test

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

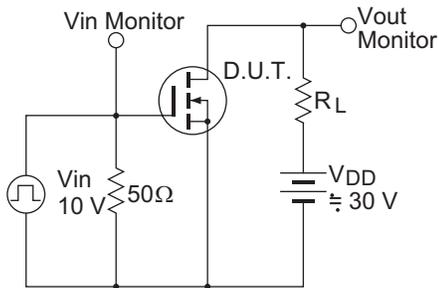
Main Characteristics



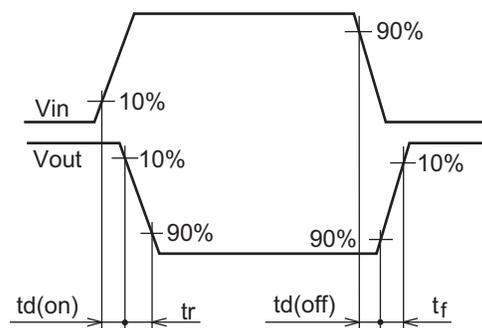




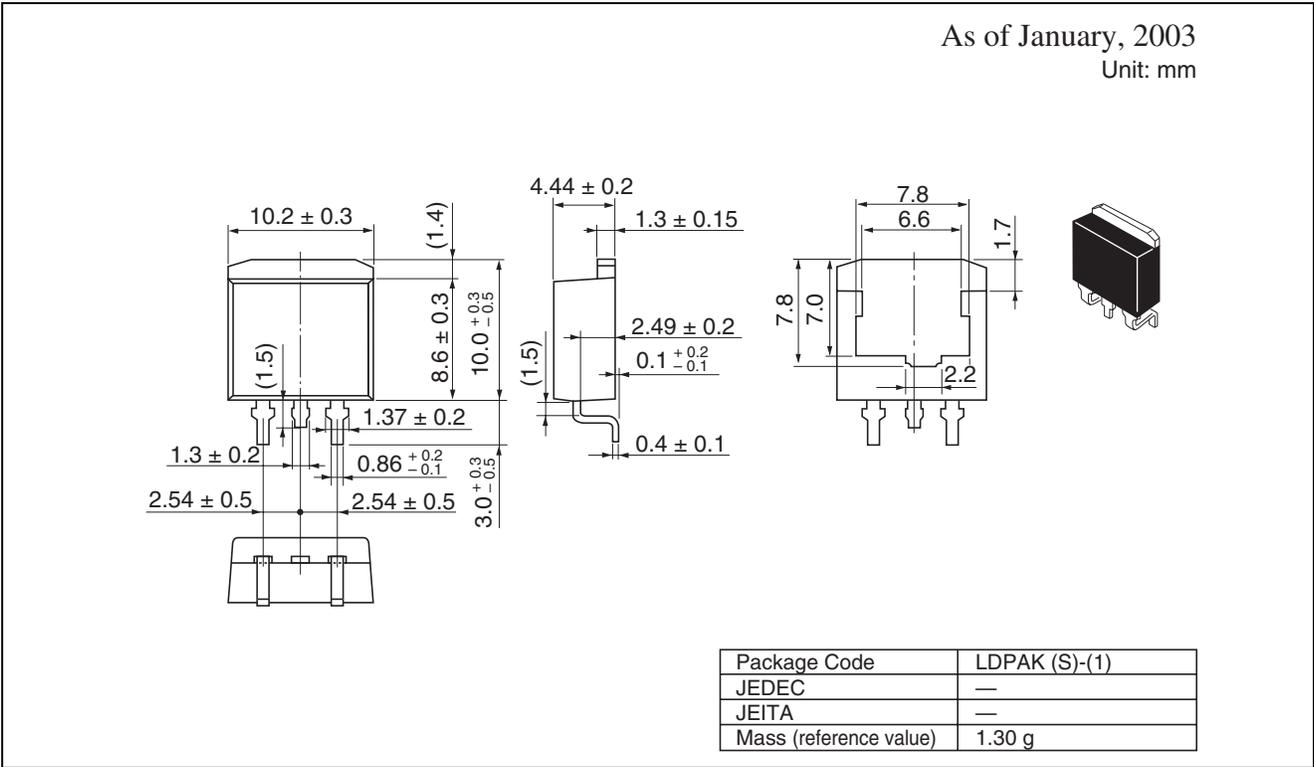
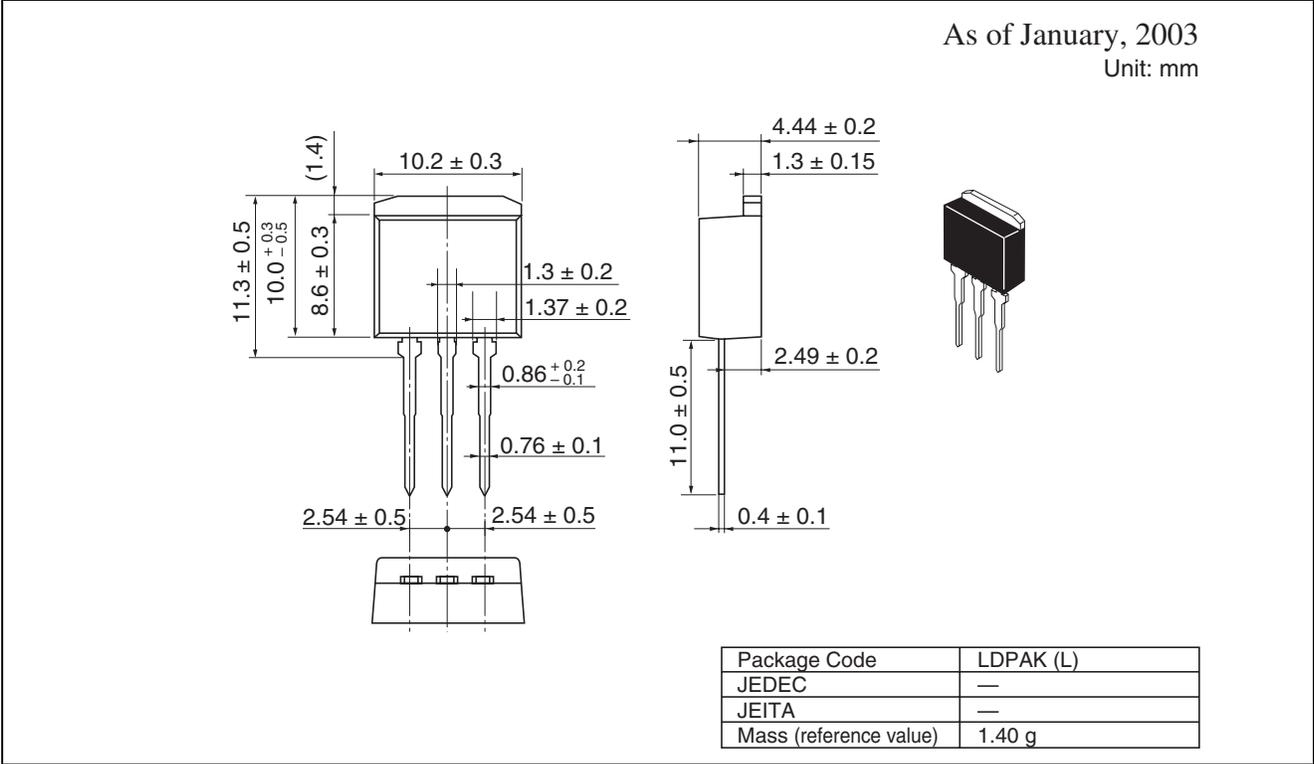
Switching Time Test Circuit



Waveform



Package Dimensions



Ordering Information

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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