4AM14

Silicon N-Channel/P-Channel Complementary Power MOS FET Array

HITACHI

ADE-208-1212 (Z)
1st. Edition
Mar. 2001

Application

High speed power switching

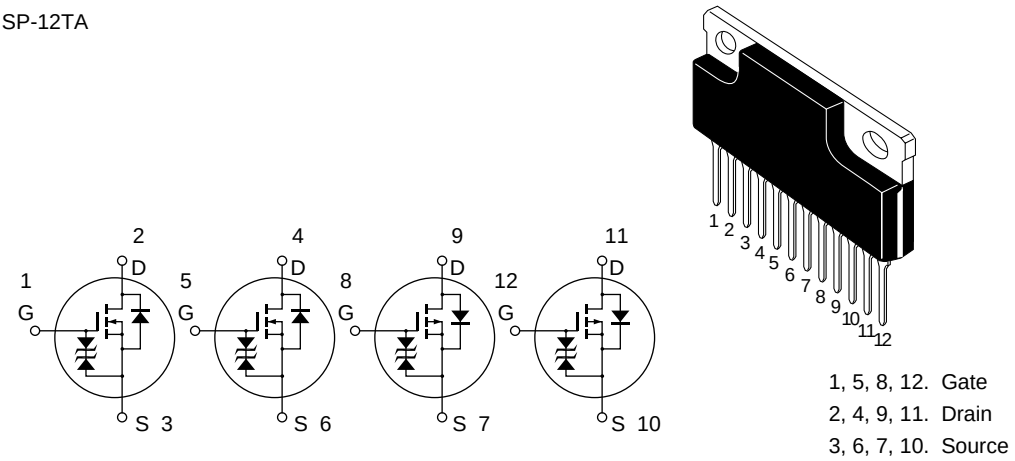
Features

- Low on-resistance
  N-channel: $R_{DS(on)} \leq 0.17$, V_{GS} = 10 V, I_D = 4 A
  P-channel: $R_{DS(on)} \leq 0.2$, V_{GS} = –10 V, I_D = –4 A
- Capable of 4 V gate drive
- Low drive current
- High speed switching
- High density mounting
- Suitable for H-bridged motor driver

Hitachi semiconductor

Outline

SP-12TA



1, 5, 8, 12. Gate
2, 4, 9, 11. Drain
3, 6, 7, 10. Source

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings Nch	Ratings Pch	Unit
Drain to source voltage	V_{DSS}	60	–60	V
Gate to source voltage	V_{GSS}	±20	±20	V
Drain current	I_D	8	–8	A
Drain peak current	$I_{D(pulse)}$*[1]	32	–32	A
Body to drain diode reverse drain current	I_{DR}	8	–8	A
Channel dissipation	Pch (Tc = 25°C)*[2]	32		W
Channel dissipation	Pch*[2]	4		W
Channel temperature	Tch	150		°C
Storage temperature	Tstg	–55 to +150		°C

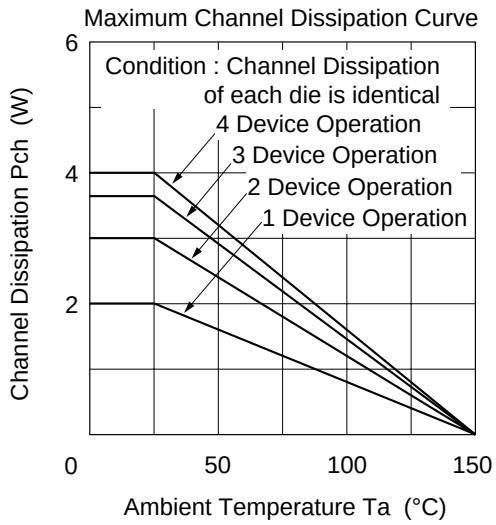
Notes: 1. PW ≤ 10 µs, duty cycle ≤ 1%
2. 4 devices operation

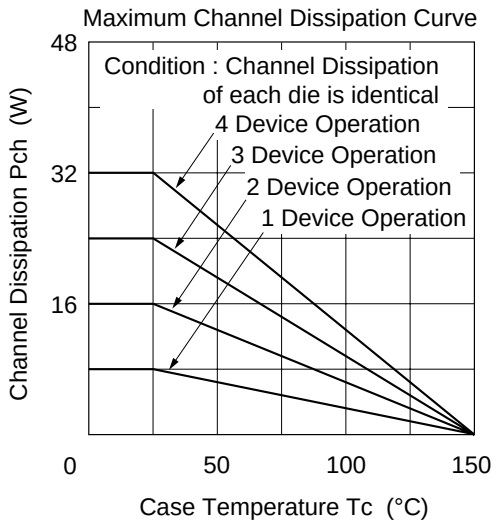
Electrical Characteristics (Ta = 25°C) (1 Unit)

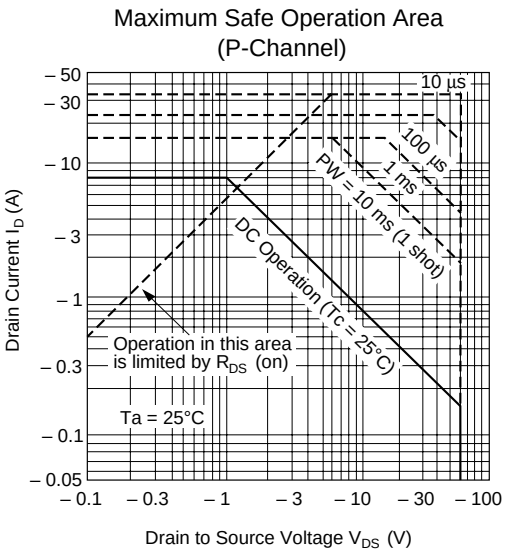
		N channel			P channel				
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Test conditions**
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	–60	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	±20	—	—	V	I_G = ±100 µA, V_{DS} = 0
Gate to source leak current	I_{GSS}	—	—	±10	—	—	±10	µA	V_{GS} = ±16 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	250	—	—	–250	µA	V_{DS} = 50 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.0	–1.0	—	–2.0	V	I_D = 1 mA, V_{DS} = 10 V
Static drain to source	$R_{DS(on)}$	—	0.13	0.17	—	0.15	0.2	Ω	I_D = 4 A, V_{GS} = 10 V*[1]
on state resistance		—	0.18	0.24	—	0.20	0.27	Ω	I_D = 4 A, V_{GS} = 4 V*[1]
Forward transfer admittance	$\|y_{fs}\|$	3.5	5.5	—	3.5	6.0	—	S	I_D = 4 A, V_{DS} = 10 V*[1]
Input capacitance	Ciss	—	400	—	—	900	—	pF	V_{DS} = 10 V, V_{GS} = 0, f = 1 MHz
Output capacitance	Coss	—	220	—	—	460	—	pF	
Reverse transfer capacitance	Crss	—	60	—	—	130	—	pF	
Turn-on delay time	$t_{d(on)}$	—	5	—	—	8	—	ns	I_D = 4 A, V_{GS} = 10 V, R_L = 7.5 Ω
Rise time	t_r	—	45	—	—	50	—	ns	
Turn-off delay time	$t_{d(off)}$	—	150	—	—	180	—	ns	
Fall time	t_f	—	85	—	—	95	—	ns	
Body to drain diode forward voltage	V_{DF}	—	1.2	—	—	–1.2	—	V	I_F = 8 A, V_{GS} = 0
Body to drain diode reverse recovery time	t_{rr}	—	120	—	—	185	—	ns	I_F = 8 A, V_{GS} = 0, dIF/dt = 50 A/µs

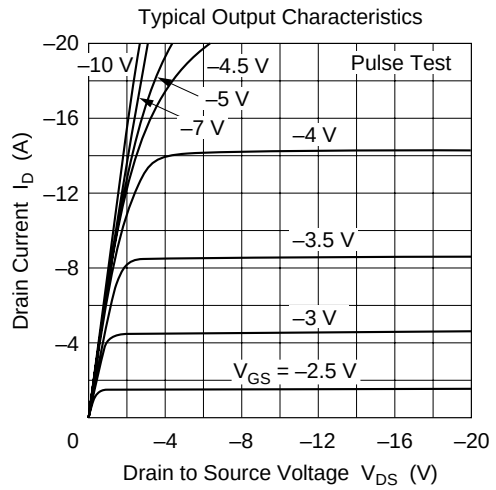
Note: 1. Pulse Test

Polarity of test conditions for P channel device is reversed.

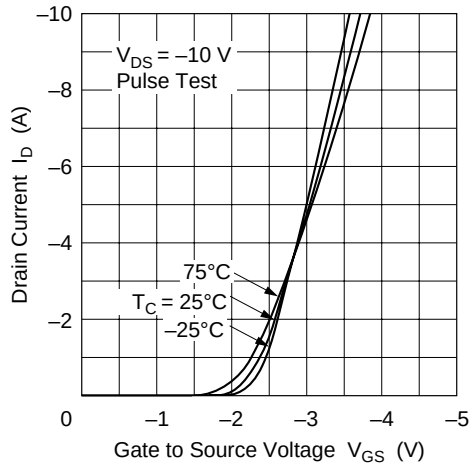

Maximum Channel Dissipation Curve
Condition : Channel Dissipation of each die is identical
4 Device Operation
3 Device Operation
2 Device Operation
1 Device Operation
Channel Dissipation Pch (W)
6
4
2
0
50
100
150
Ambient Temperature Ta (°C)


Maximum Channel Dissipation Curve
Condition : Channel Dissipation of each die is identical
4 Device Operation
3 Device Operation
2 Device Operation
1 Device Operation
Channel Dissipation Pch (W)
48
32
16
0
50
100
150
Case Temperature Tc (°C)

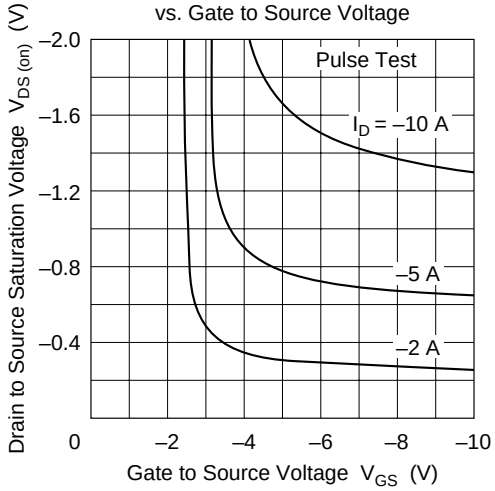

Maximum Safe Operation Area
(P-Channel)
10 µs
100 µs
1 ms
PW = 10 ms (1 shot)
DC Operation (Tc = 25°C)
Operation in this area is limited by RDS (on)
Ta = 25°C
Drain Current ID (A)
– 50
– 30
– 10
– 3
– 1
– 0.3
– 0.1
– 0.05
– 0.1
– 0.3
– 1
– 3
– 10
– 30
– 100
Drain to Source Voltage VDS (V)


Typical Output Characteristics
Pulse Test
–10 V
–4.5 V
–5 V
–7 V
–4 V
–3.5 V
–3 V
VGS = –2.5 V
Drain Current ID (A)
–20
–16
–12
–8
–4
0
–4
–8
–12
–16
–20
Drain to Source Voltage VDS (V)

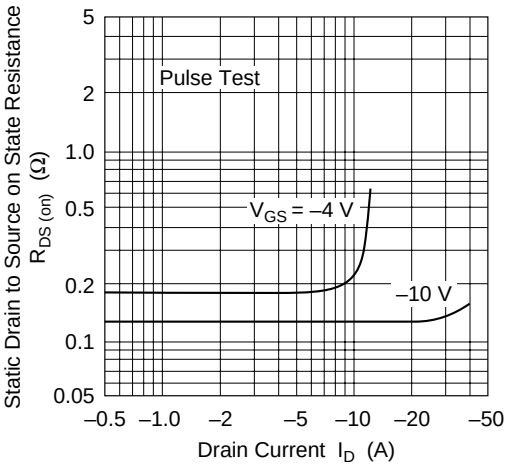
Typical Transfer Characteristics



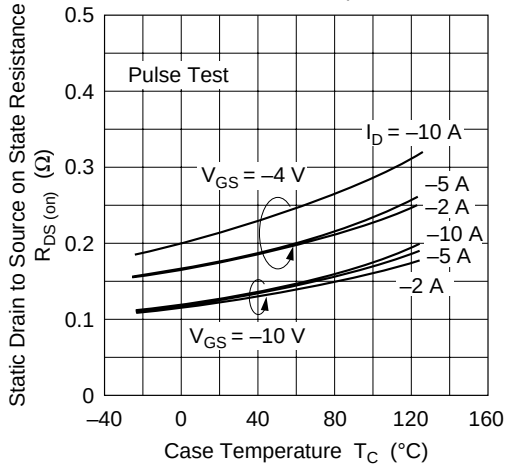
Drain to Source Saturation Voltage vs. Gate to Source Voltage



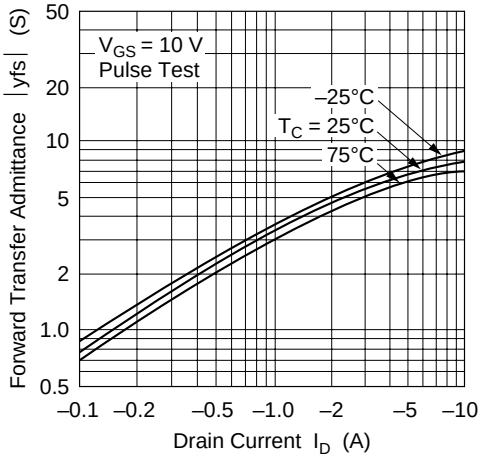
Static Drain to Source on State Resistance vs. Drain Current



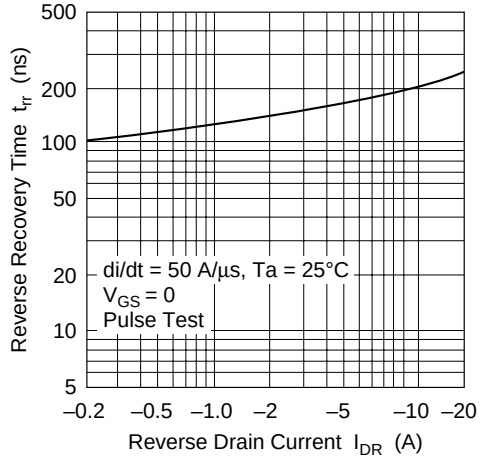
Static Drain to Source on State Resistance vs. Temperature



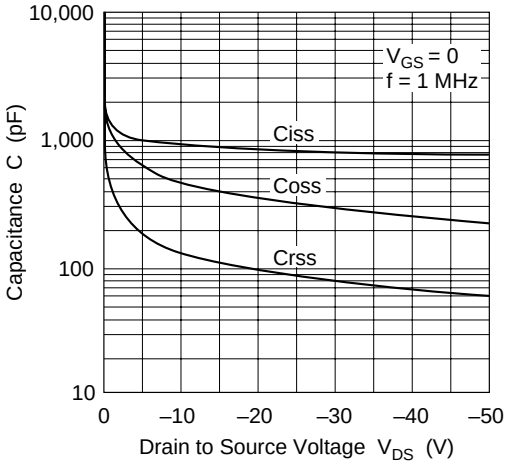
Forward Transfer Admittance vs. Drain Current



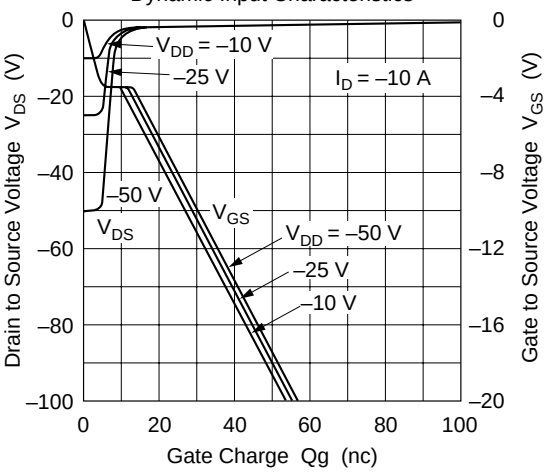
Body to Drain Diode Reverse Recovery Time



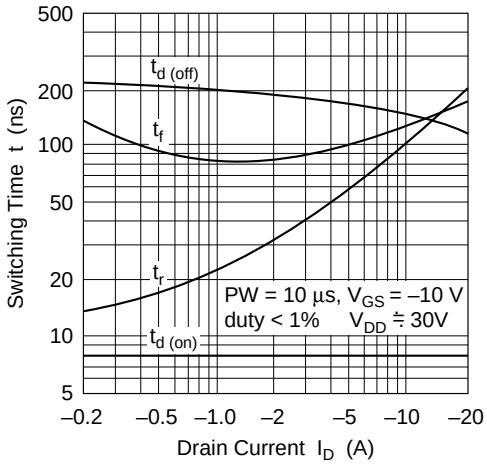
Typical Capacitance vs. Drain to Source Voltage



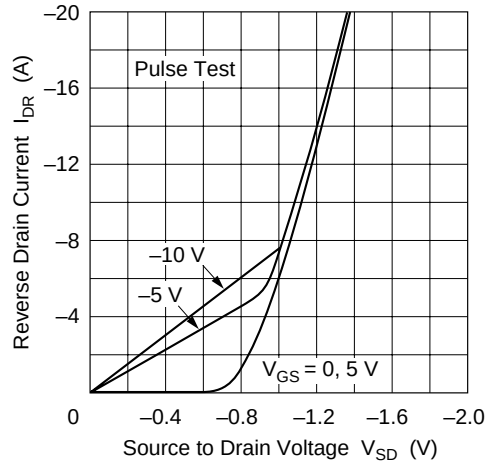
Dynamic Input Characteristics



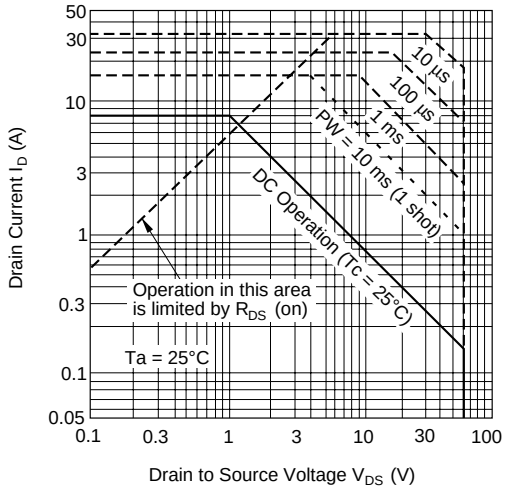
Switching Characteristics



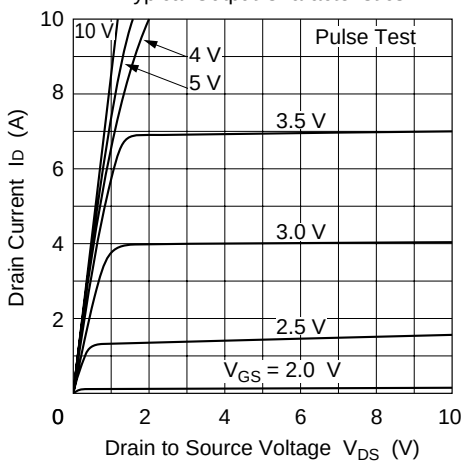
Reverse Drain Current vs.
Source to Drain Voltage



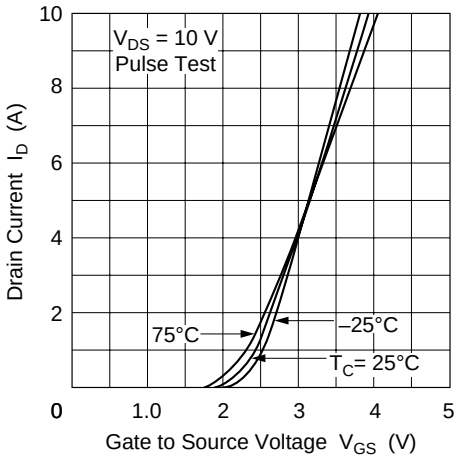
Maximum Safe Operation Area
(N-Channel)



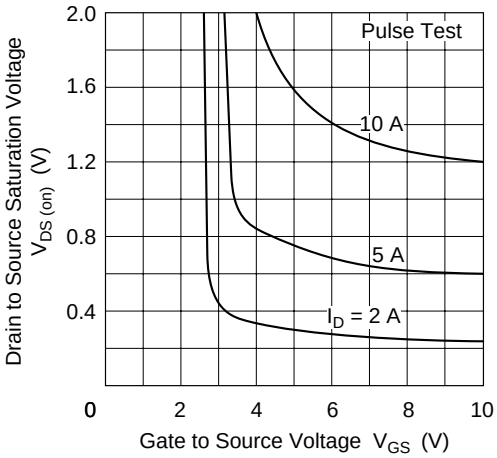
Typical Output Characteristics



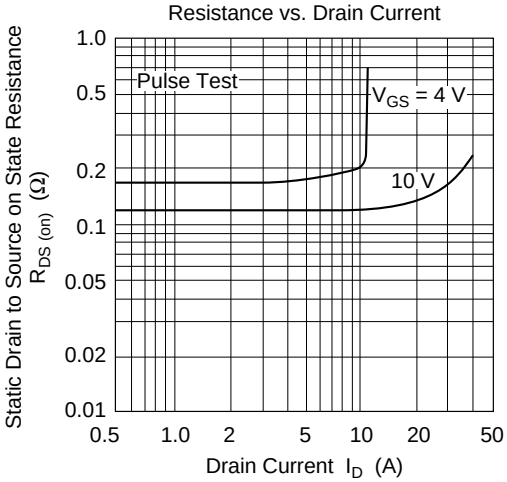
Typical Transfer Characteristics



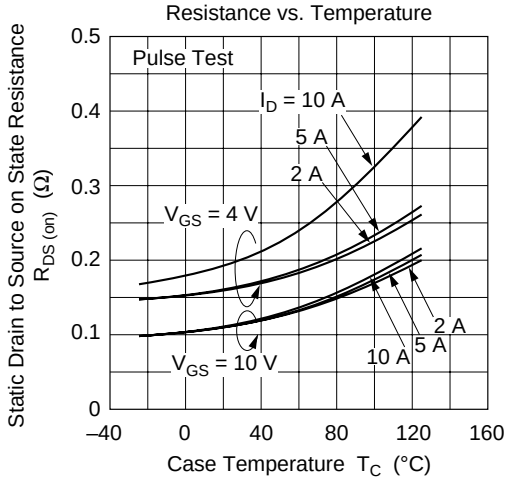
Drain to Source Saturation Voltage
vs. Gate to Source Voltage



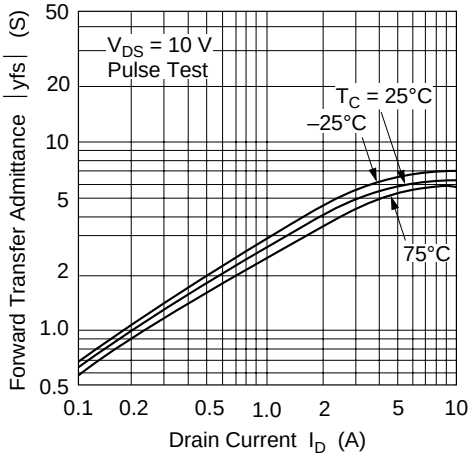
Static Drain to Source on State Resistance vs. Drain Current



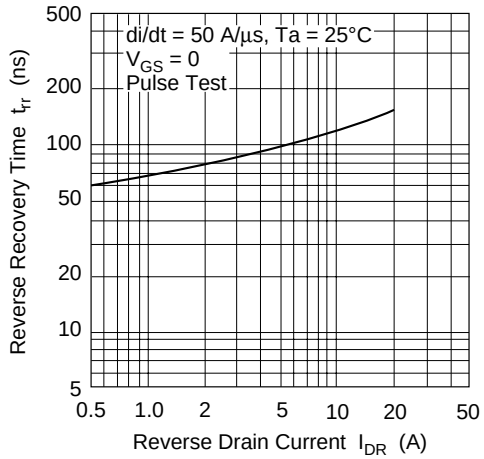
Static Drain to Source on State Resistance vs. Temperature



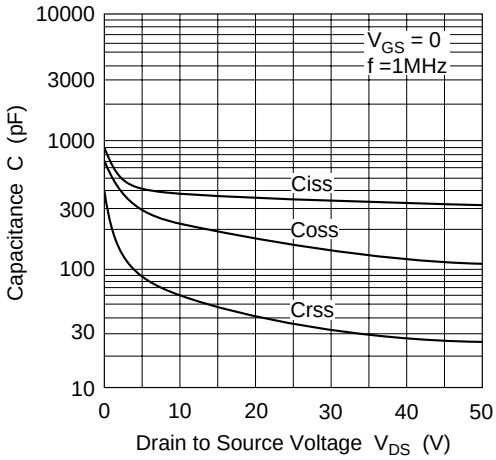
Forward Transfer Admittance vs. Drain Current



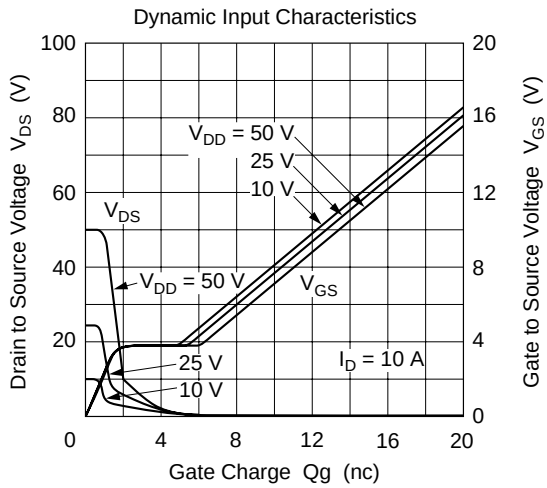
Body to Drain Diode Reverse Recovery Time



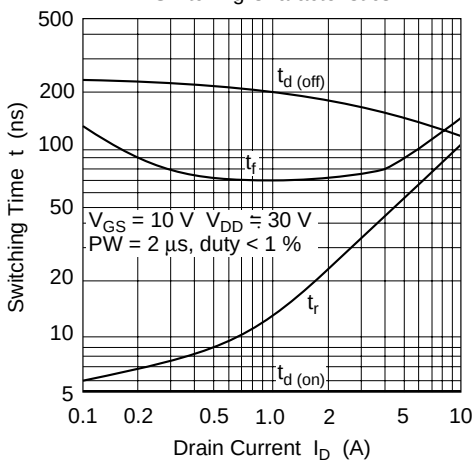
Typical Capacitance vs.
Drain to Source Voltage



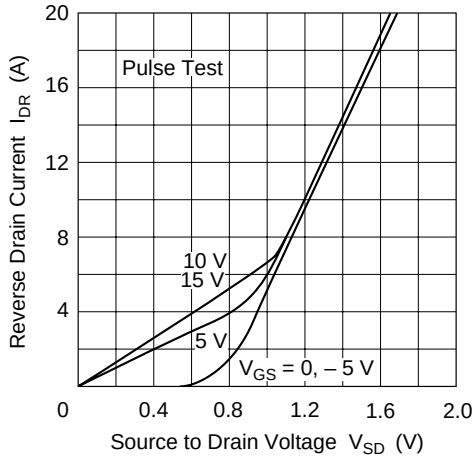
Dynamic Input Characteristics



Switching Characteristics

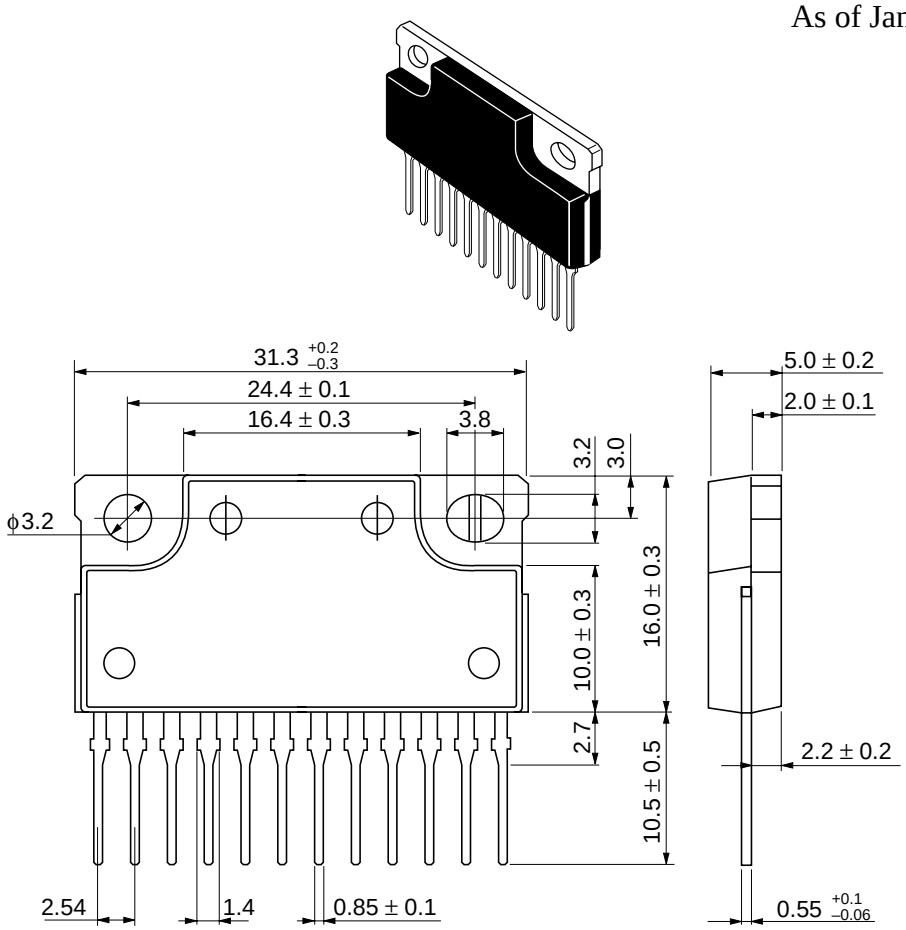


Reverse Drain Current vs.
Source to Drain Voltage



Package Dimensions

As of January, 2001
Unit: mm



Hitachi Code	SP-12TA
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Mass (reference value)	6.1 g

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