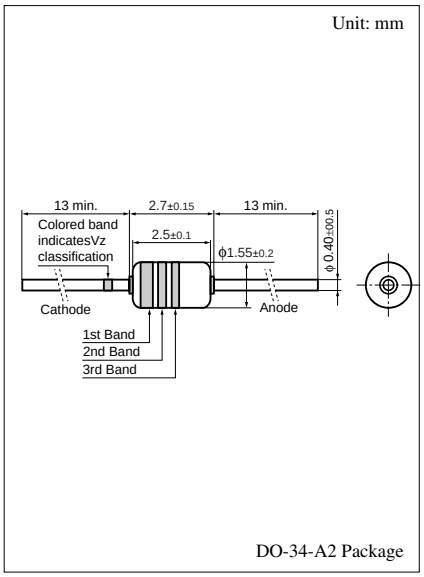
MAZ4000 Series (MA4000 Series)

Silicon planar type

For stabilization of power supply



■ Features

- High reliability, achieved by the DHD structure
- Allowing to insert to a 5 mm pitch hole
- Finely divided zener-voltage rank
- Sharp rising performance
- Wide voltage range: V_Z = 2.0 V to 39 V

■ Absolute Maximum Ratings T_a = 25°C

Parameter	Symbol	Rating	Unit
Average forward current	$I_{F(AV)}$	250	mA
Repetitive peak forward current	I_{FRM}	250	mA
Total power dissipation*1	P_{tot}	370	mW
Non-repetitive reverse surge power dissipation*2	P_{ZSM}	30	W
Junction temperature	T_j	200	°C
Storage temperature	T_{stg}	−65 to +200	°C

Note) ∗1: With a printed circuit board
∗2: t = 100 µs, T_j = 150°C

• Color indication of V_Z rank classification

Rank	L	M	H
Color	Black	Blue	Red

■ Common Electrical Characteristics T_a = 25°C *1

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Forward voltage	V_F	I_F = 10 mA			0.8	0.9	V
Zener voltage *2	V_Z	I_Z	Specified value				V
Zener knee operating resistance	R_{ZK}	I_Z	Specified value				Ω
Zener operating resistance	R_Z	I_Z	Specified value				Ω
Reverse current	I_{R1}	V_R	Specified value				µA
	I_{R2}	V_R	Specified value				µA
Temperature coefficient of zener voltage *3	S_Z	I_Z	Specified value				mV/°C
Terminal capacitance	C_t	V_R	Specified value				pF

Refer to the list of the electrical characteristics within part numbers

Note) 1. Rated input/output frequency: 5 MHz
2. ∗1 : The V_Z value is for the temperature of 25°C. In other cases, carry out the temperature compensation.
∗2 : Guaranteed at 20 ms after power application.
∗3 : T_j = 25°C to 150°C

Note) The part number in the parenthesis shows conventional part number.

■ Electrical characteristics within part numbers $T_a = 25°C$

• $V_Z = 2.0$ V to 6.8 V ($I_Z = 5$ mA)

Part number	Zener voltage			Reverse current				Zener operating resistance				Temperature coefficient of zener voltage			Terminal capacitance		Marking symbol (Color indication Main body: Yellowish green)		
	V_Z (V) I_Z = 5 mA			I_{R1} (μA)		I_{R2} (μA)		R_Z (Ω)		R_{ZK} (Ω)		S_Z (mV/°C) I_Z = 5 mA			C_t (pF) (V_R = 0 V) f = 1 MHz				
	Min	Nom	Max	V_R (V)	Max	V_R (V)	Max	I_Z = 5 mA Typ	Max	I_Z (mA)	Max	Min	Typ	Max	Typ	Max	1st.	2nd.	3rd.
MAZ4020	1.88	—	2.24	0.5	120	—	—	—	100	1	2000	−3.5	−1.5	0	375	450	Red	Black	Black
MAZ40200L	1.88	—	2.12																
MAZ40200H	2.01	—	2.24																
MAZ4022	2.08	—	2.45	0.7	120	—	—	—	100	1	2000	−3.5	−1.5	0	375	450	Red	Red	Red
MAZ40220L	2.08	—	2.33																
MAZ40220H	2.20	—	2.45																
MAZ4024	2.28	2.4	2.7	1	120	—	—	—	100	1	2000	−3.5	−1.6	0	375	450	Red	Yellow	Yellow
MAZ40240L	2.28	—	2.56																
MAZ40240H	2.4	—	2.7																
MAZ4027	2.5	2.7	2.9	1	100	—	—	—	100	1	1000	−3.5	−2	0	350	450	Red	Purple	Purple
MAZ40270L	2.5	—	2.75																
MAZ40270H	2.65	—	2.9																
MAZ4030	2.8	3.0	3.2	1	50	—	—	85	100	1	1000	−3.5	−2.1	0	350	450	Orange	Black	Black
MAZ40300L	2.83	2.9	2.97																
MAZ40300M	2.93	3.0	3.08																
MAZ40300H	3.02	3.1	3.18																
MAZ4033	3.1	3.3	3.5	1	20	—	—	83	100	1	1000	−3.5	−2.4	0	325	450	Orange	Orange	Orange
MAZ40330L	3.12	3.2	3.28																
MAZ40330M	3.22	3.3	3.38																
MAZ40330H	3.32	3.4	3.49																
MAZ4036	3.4	3.6	3.8	1	10	—	—	81	100	1	1000	−3.5	−2.4	0	300	450	Orange	Blue	Blue
MAZ40360L	3.41	3.5	3.59																
MAZ40360M	3.51	3.6	3.69																
MAZ40360H	3.61	3.7	3.79																
MAZ4039	3.7	3.9	4.1	1	10	—	—	79	100	1	1000	−3.5	−2.5	0	300	450	Orange	White	White
MAZ40390L	3.71	3.8	3.9																
MAZ40390M	3.8	3.9	4.0																
MAZ40390H	3.9	4.0	4.1																
MAZ4043	4.0	4.3	4.6	1	10	—	—	75	100	1	1000	−3.5	−2.5	0	275	450	Yellow	Orange	Orange
MAZ40430L	4.03	4.1	4.26																
MAZ40430M	4.17	4.3	4.4																
MAZ40430H	4.31	4.4	4.54																
MAZ4047	4.4	4.7	5.0	1	3	—	—	50	80	1	900	−3.5	−1.4	0.2	130	180	Yellow	Purple	Purple
MAZ40470L	4.45	4.6	4.69																
MAZ40470M	4.59	4.7	4.83																
MAZ40470H	4.74	4.9	4.99																
MAZ4051	4.8	5.1	5.4	2	2	—	—	40	60	1	800	−2.7	0.8	1.2	110	160	Green	Brown	Brown
MAZ40510L	4.87	5.0	5.12																
MAZ40510M	5.0	5.1	5.26																
MAZ40510H	5.14	5.3	5.4																
MAZ4056	5.3	5.6	6.0	2	1	—	—	15	40	1	500	−2	1.2	2.5	95	140	Green	Blue	Blue
MAZ40560L	5.3	5.4	5.58																
MAZ40560M	5.48	5.6	5.76																
MAZ40560H	5.66	5.8	5.95																
MAZ4062	5.8	6.2	6.6	4	3	5.3	60	6	20	0.5	300	0.4	2.3	3.7	90	130	Blue	Red	Red
MAZ40620L	5.85	6.0	6.15			5.3													
MAZ40620M	6.05	6.2	6.36			5.5													
MAZ40620H	6.24	6.4	6.56			5.7													
MAZ4068	6.4	6.8	7.2	4	2	5.9	60	6	15	0.5	140	1.2	3	4.5	85	110	Blue	Gray	Gray
MAZ40680L	6.44	6.6	6.77			5.9													
MAZ40680M	6.64	6.8	6.98			6.1													
MAZ40680H	6.85	7.0	7.2			6.3													

■ Electrical characteristics within part numbers (continued) $T_a = 25°C$

• $V_Z = 7.5$ V to 20 V ($I_Z = 5$ mA)

Part number	Zener voltage			Reverse current				Zener operating resistance				Temperature coefficient of zener voltage			Terminal capacitance		Marking symbol (Color indication Main body: Yellowish green)		
	V_Z (V) I_Z = 5 mA			I_{R1} (μA)		I_{R2} (μA)		R_Z (Ω) I_Z = 5 mA		R_{ZK} (Ω)		S_Z (mV/°C) I_Z = 5 mA			C_t (pF) (V_R = 0 V) f = 1 MHz				
	Min	Nom	Max	V_R (V)	Max	V_R (V)	Max	Typ	Max	I_Z (mA)	Max	Min	Typ	Max	Typ	Max	1st.	2nd.	3rd.
MAZ4075	7.0	7.5	7.9	5	1	6.5	60	6	15	0.5	120	2.5	4	5.3	80	100	Purple	Green	Green
MAZ40750L	7.07	7.3	7.43			6.5													
MAZ40750M	7.29	7.5	7.67			6.7													
MAZ40750H	7.51	7.7	7.89			7.0													
MAZ4082	7.7	8.2	8.7	5	0.5	7.2	60	6	15	0.5	120	3.2	4.6	6.2	75	95	Gray	Red	Red
MAZ40820L	7.77	7.9	8.17			7.2													
MAZ40820M	8.03	8.2	8.43			7.5													
MAZ40820H	8.29	8.5	8.7			7.7													
MAZ4091	8.5	9.1	9.6	6	0.2	8	60	6	15	0.5	130	3.8	5.5	7	70	90	White	Brown	Brown
MAZ40910L	8.58	8.8	9.02			8													
MAZ40910M	8.87	9.1	9.33			8.3													
MAZ40910H	9.14	9.4	9.6			8.6													
MAZ4100	9.4	10	10.6	7	0.2	8.9	60	8	20	0.5	130	4.5	6.4	8	70	90	Brown	Black	—
MAZ41000L	9.44	9.7	9.92			8.9													
MAZ41000M	9.75	10	10.25			9.2													
MAZ41000H	10.07	10.3	10.59			9.5													
MAZ4110	10.4	11	11.6	7	0.1	9.9	60	10	20	0.5	170	5.4	7.4	9	65	85	Brown	Brown	—
MAZ41100L	10.4	10.7	10.94			9.9													
MAZ41100M	10.73	11	11.28			10.2													
MAZ41100H	11.05	11.3	11.6			10.5													
MAZ4120	11.4	12	12.7	8	0.1	10.9	60	10	25	0.5	170	6	8.4	10	65	85	Brown	Red	—
MAZ41200L	11.4	11.7	11.96			10.9													
MAZ41200M	11.73	12	12.33			11.2													
MAZ41200H	12.06	12.3	12.68			11.5													
MAZ4130	12.4	13	14.1	9	0.1	11.9	60	10	30	0.5	170	7	9.4	11	60	80	Brown	Orange	—
MAZ41300L	12.4	12.7	12.99			11.9													
MAZ41300M	12.73	13	13.4			12.2													
MAZ41300H	13.25	13.7	14.08			12.7													
MAZ41400M	13.65	14	14.35	9	0.1	13.1	60	10	30	0.5	170	7	10	13	60	80	Brown	Yellow	—
MAZ4150	13.9	15	15.6	10	0.05	13.4	60	10	30	0.5	170	9.2	11.4	13	55	75	Brown	Green	—
MAZ41500L	13.9	14.3	14.76			13.4													
MAZ41500M	14.6	15	15.35			14.1													
MAZ41500H	14.95	15.3	15.6			14.4													
MAZ4160	15.3	16	17.1	11	0.05	14.8	60	10	40	0.5	170	10.4	12.4	14	52	75	Brown	Blue	—
MAZ41600L	15.3	15.7	16.09			14.8													
MAZ41600M	15.7	16	16.5			15.2													
MAZ41600H	16.26	16.7	17.1			15.7													
MAZ4180	16.9	18	19.1	13	0.05	16.4	60	10	45	0.5	170	12.4	14.4	16	47	70	Brown	Gray	—
MAZ41800L	16.9	17.3	17.76			16.4													
MAZ41800M	17.55	18	18.45			17													
MAZ41800H	18.2	18.7	19.1			17.7													
MAZ4200	18.8	20	21.2	14	0.05	18.3	60	15	55	0.5	180	14.4	16.4	18	36	60	Red	Black	—
MAZ42000L	18.85	19.3	19.81			18.3													
MAZ42000M	19.50	20	20.5			19													
MAZ42000H	20.15	20.7	21.19			19.6													

■ Electrical characteristics within part numbers (continued) $T_a = 25°C$

• $V_Z = 22.0$ V to 24.0 V ($I_Z = 5$ mA)

Part number	Zener voltage			Reverse current				Zener operating resistance				Temperature coefficient of zener voltage			Terminal capacitance		Marking symbol (Color indication Main body: Yellowish green)		
	V_Z (V) I_Z = 5 mA			I_{R1} (μA)		I_{R2} (μA)		R_Z (Ω)		R_{ZK} (Ω)		S_Z (mV/°C) I_Z = 5 mA			C_t (pF) (V_R = 0 V) f = 1 MHz				
	Min	Nom	Max	V_R (V)	Max	V_R (V)	Max	Typ	Max	I_Z (mA)	Max	Min	Typ	Max	Typ	Max	1st.	2nd.	3rd.
MAZ4220	20.8	22	23.3	15	0.05	20.3	60	20	5.5	0.5	180	16.4	18.4	20	34	60	Red	Red	—
MAZ4220-L	20.8	21.3	21.86			20.3													
MAZ4220-M	21.45	22	22.55			20.9													
MAZ4220-H	22.1	22.7	23.24			21.6													
MAZ4240	22.8	24	25.6	17	0.05	22.3	60	25	70	0.5	180	18.4	20.4	22	33	55	Red	Yellow	—
MAZ4240-L	22.8	23.3	23.97			22.3													
MAZ4240-M	23.5	24	24.7			23													
MAZ4240-H	24.35	25	25.6			23.8													

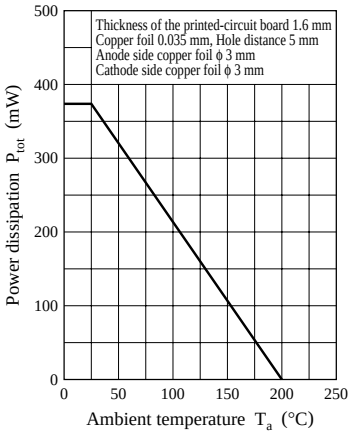
• $V_Z = 27.0$ V to 39.0 V ($I_Z = 2$ mA)

Part number	Zener voltage			Reverse current				Zener operating resistance				Temperature coefficient of zener voltage			Terminal capacitance		Marking symbol (Color indication Main body: Yellowish green)		
	V_Z (V) I_Z = 2 mA			I_{R1} (μA)		I_{R2} (μA)		R_Z (Ω)		R_{ZK} (Ω)		S_Z (mV/°C) I_Z = 2 mA			C_t (pF) (V_R = 0 V) f = 1 MHz				
	Min	Nom	Max	V_R (V)	Max	V_R (V)	Max	Typ	Max	I_Z (mA)	Max	Min	Typ	Max	Typ	Max	1st.	2nd.	3rd.
MAZ4270	25.1	27	28.9	19	0.05	24.8	60	25	80	0.5	200	21.4	23.4	25.3	30	50	Red	Purple	—
MAZ42700L	25.3	26	26.7			24.8													
MAZ42700M	26.3	27	27.7			25.8													
MAZ42700H	27.3	28	28.7			26.8													
MAZ4300	28	30	32	21	0.05	27.8	60	30	80	0.5	200	24.4	26.6	29.4	27	50	Orange	Black	—
MAZ43000L	28.3	29	29.7			27.8													
MAZ43000M	29.3	30	30.8			28.8													
MAZ43000H	30.2	31	31.8			29.7													
MAZ4330	31	33	35	23	0.05	30.7	60	35	80	0.5	200	27.4	29.7	33.4	25	45	Orange	Orange	—
MAZ43300L	31.2	32	32.8			30.7													
MAZ43300M	32.2	33	33.8			31.7													
MAZ43300H	33.2	34	34.9			32.7													
MAZ4360	34	36	38	25	0.05	33.6	60	35	90	0.5	200	30.4	33	37.4	23	45	Orange	Blue	—
MAZ43600L	34.1	35	35.9			33.6													
MAZ43600M	35.1	36	36.9			34.6													
MAZ43600H	36.1	37	37.9			35.6													
MAZ4390	37	—	41	27	0.05	36	60	—	130	0.5	250	33.4	36.4	41.2	21	45	Orange	White	—
MAZ43900L	37.1	—	39			36													
MAZ43900M	38	—	40			36													
MAZ43900H	39	—	41			36													

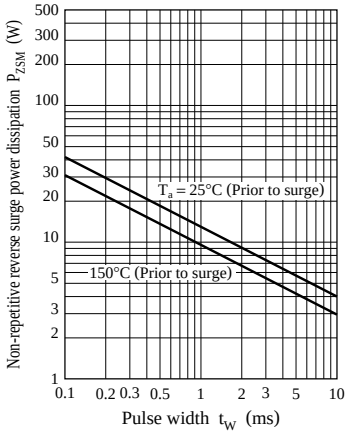
Note) 1. The V_Z value is the one after power application for 20 ms at $T_a = 25°C$.

2. The zener voltage temperature coefficient is the one for $T_j = 25°C$ to 150°C.

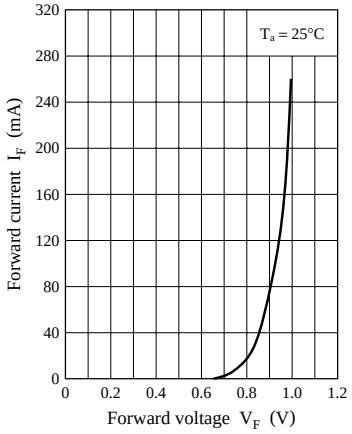
P_{tot} — T_a



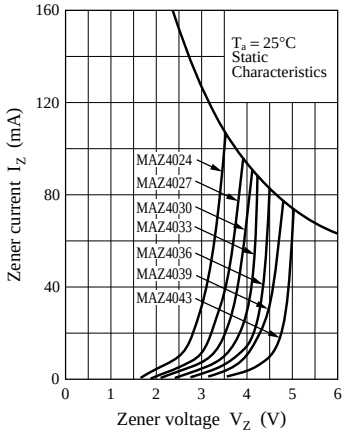
P_{ZSM} — t_W



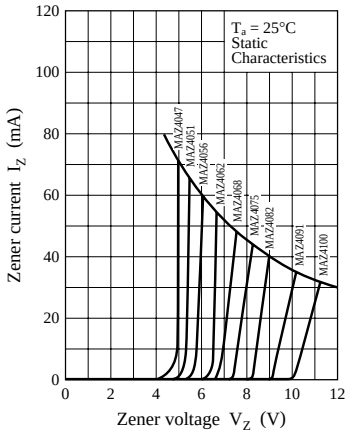
I_F — V_F



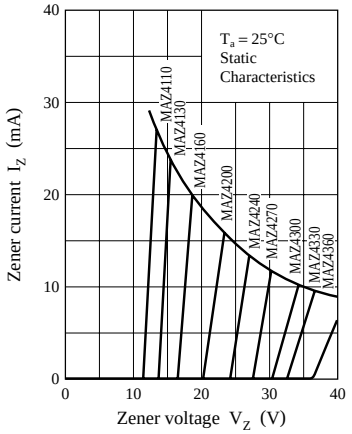
I_Z — V_Z



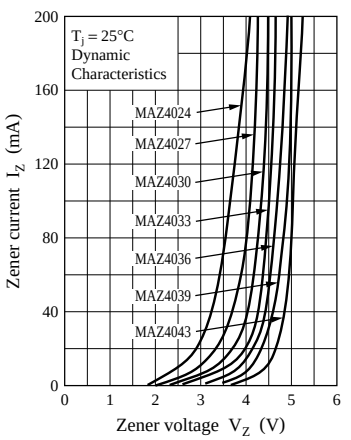
I_Z — V_Z



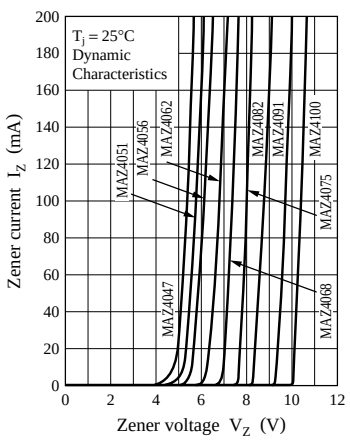
I_Z — V_Z



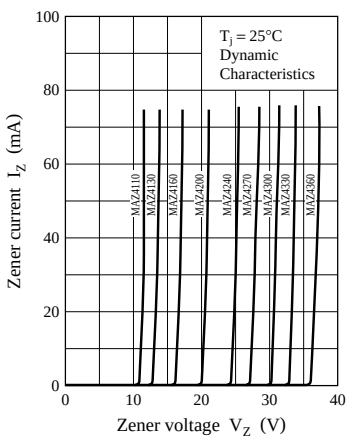
I_Z — V_Z



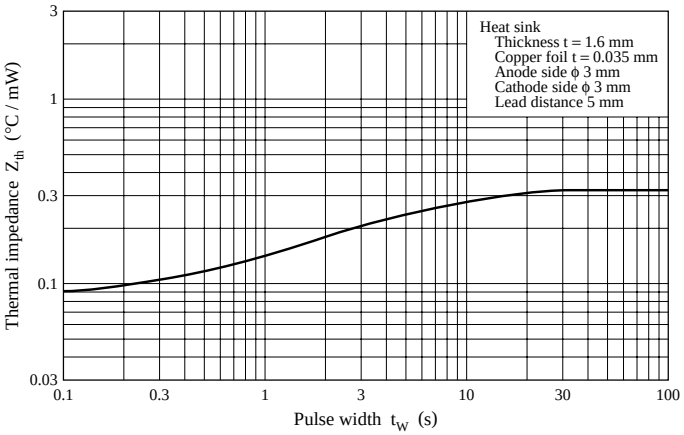
I_Z — V_Z



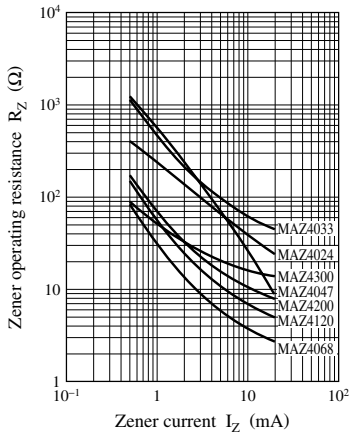
I_Z — V_Z



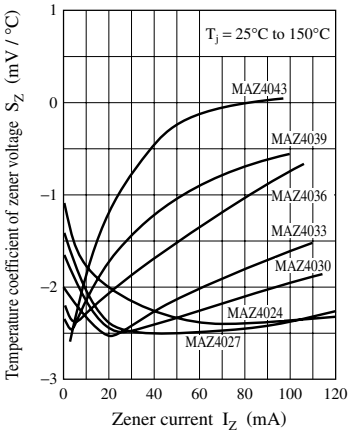
Z_{th} — t_W



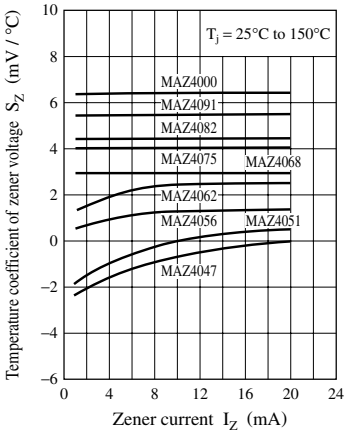
R_Z — I_Z



S_Z — I_Z



S_Z — I_Z



Request for your special attention and precautions in using the technical information and semiconductors described in this material

(1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this material and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.

(2) The technical information described in this material is limited to showing representative characteristics and applied circuit examples of the products. It does not constitute the warranting of industrial property, the granting of relative rights, or the granting of any license.

(3) The products described in this material are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
- Any applications other than the standard applications intended.

(4) The products and product specifications described in this material are subject to change without notice for reasons of modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(5) When designing your equipment, comply with the guaranteed values, in particular those of maximum rating, the range of operating power supply voltage and heat radiation characteristics. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, redundant design is recommended, so that such equipment may not violate relevant laws or regulations because of the function of our products.

(6) When using products for which dry packing is required, observe the conditions (including shelf life and after-unpacking standby time) agreed upon when specification sheets are individually exchanged.

(7) No part of this material may be reprinted or reproduced by any means without written permission from our company.

Please read the following notes before using the datasheets

A. These materials are intended as a reference to assist customers with the selection of Panasonic semiconductor products best suited to their applications.
Due to modification or other reasons, any information contained in this material, such as available product types, technical data, and so on, is subject to change without notice.
Customers are advised to contact our semiconductor sales office and obtain the latest information before starting precise technical research and/or purchasing activities.

B. Panasonic is endeavoring to continually improve the quality and reliability of these materials but there is always the possibility that further rectifications will be required in the future. Therefore, Panasonic will not assume any liability for any damages arising from any errors etc. that may appear in this material.

C. These materials are solely intended for a customer's individual use.
Therefore, without the prior written approval of Panasonic, any other use such as reproducing, selling, or distributing this material to a third party, via the Internet or in any other way, is prohibited.

2001 MAR