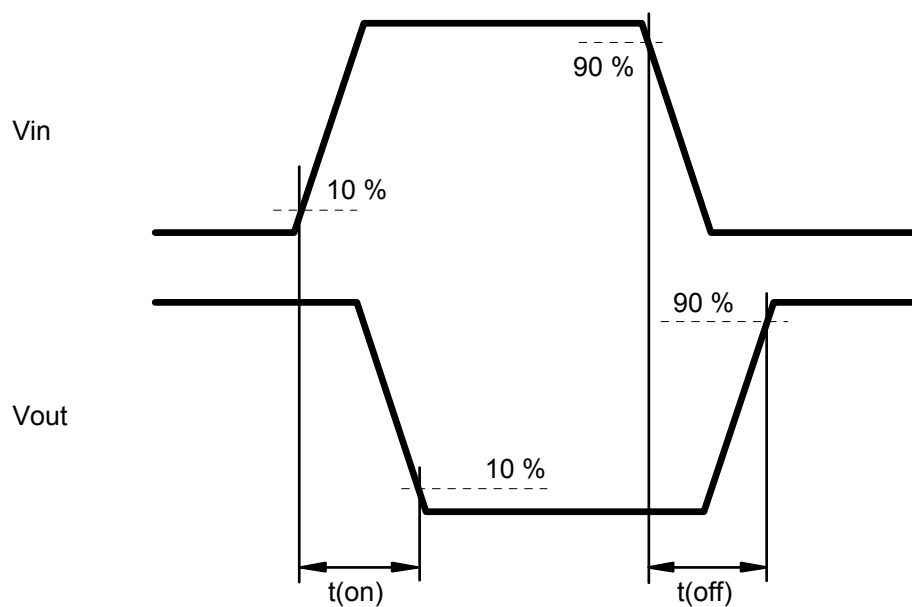
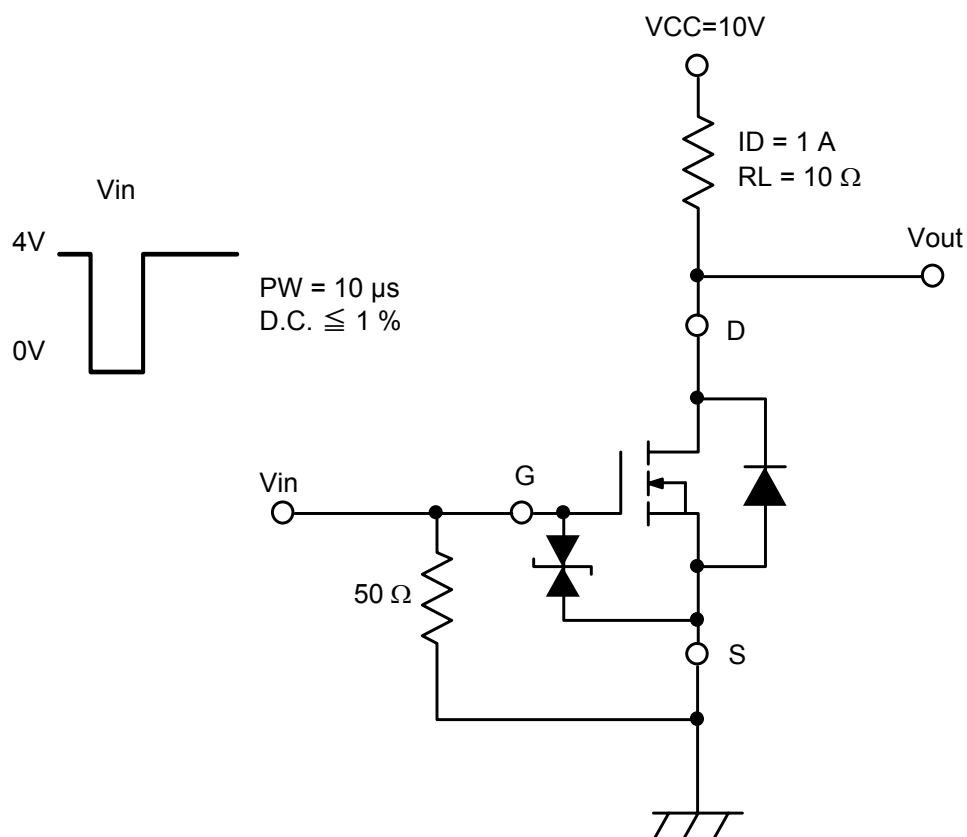


Product Specification Type Number : M T M C 8 E 2 8 0 L *2				Prepared by M.Hamada	Checked by H.Tanita	Applied by H.Shidooka	Established by
Type	Silicon Field Effect Transistors						
Application	Li-ion Battery						
Structure	Dual N-Channel MOS Type						
Outline	WMini8 - F1				Marking	4A	
Absolute Maximum Ratings	VDSS 20 (V)	VGSS ±10 (V)	ID 7.0 (A)	IDp 42 (A)	*3 PD 1.0 (W)	Tch 150 (°C)	Tstg -55 to +150 (°C)
Electrical characteristics (Ta = 25 °C ±3 °C)							
Item	Symbol	Measuring condition	Limit			Unit	
			min.	typ.	max.		
Drain-Source Voltage	VDSS	ID = 1 mA, VGS = 0 V	20			V	
Drain-Source Cutoff Current	IDSS	VDS = 20 V, VGS = 0 V			1.0	μA	
Gate-Source Cutoff Current	IGSS	VGS = ±8 V, VDS = 0 V			±10	μA	
Gate Threshold Voltage	Vth	ID = 1.0 mA, VDS = 10.0 V	0.4	0.85	1.3	V	
Drain Resistance (ON) 1	RDS(ON) 1	ID = 2.0 A, VGS = 4.5 V		15	21	mΩ	
Drain Resistance (ON) 2	RDS(ON) 2	ID = 2.0 A, VGS = 3.7 V		18	25	mΩ	
Drain Resistance (ON) 3	RDS(ON) 3	ID = 1.0 A, VGS = 2.5 V		22	33	mΩ	
Forward Transfer Admittance	Yfs	ID = 1.0 A, VDS = 10 V	3.0			S	
Small-Signal Short-Circuit Input Capacitance	Ciss	VDS = 10 V, VGS = 0 V, f = 1 MHz		1500		pF	
Small-Signal Short-Circuit Output Capacitance	Coss	VDS = 10 V, VGS = 0 V, f = 1 MHz		110		pF	
Small-Signal Reverse Transfer Capacitance	Crss	VDS = 10 V, VGS = 0 V, f = 1 MHz		100		pF	
Turn-on Time	ton *1	VDD = 10 V, VGS = 0 to 4 V, ID = 1.0 A		30		ns	
Turn-off Time	toff *1	VDD = 10 V, VGS = 4 to 0 V, ID = 1.0 A		220		ns	
<p>Note: Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 Measuring methods for transistors.</p> <p>*1 See test circuit</p> <p>*2 Packing Embossed TX Type (Thermo-compression sealing)</p> <p>*3 In case of being attached to 300mm² area or more of copper foil of a drain on a glass epoxy board (25.4 x 25.4 x 0.8 mm). Absolute maximum rating of PD without a board is 400mW.</p> <p style="text-align: right;"><u>Internally connected circuit</u></p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>1.Source1 2.Gate1 3.Source2 4.Gate2 5.Drain 6.Drain 7.Drain 8.Drain</p> </div> </div>							
2006.09.14							
Established	Revised						

Product Specification

Type Number : M T M C 8 E 2 8 0 L
*2

Test circuit



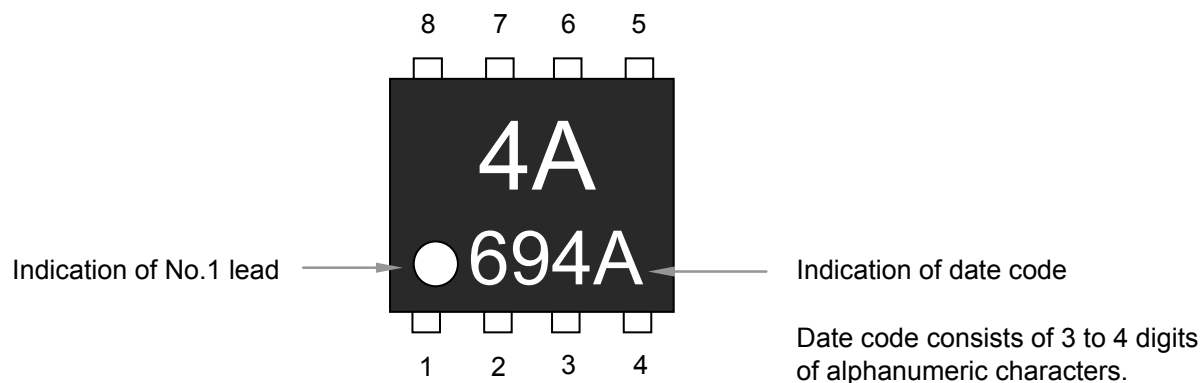
2006.09.14

Established

Revised

Product Specification

Mark Indication

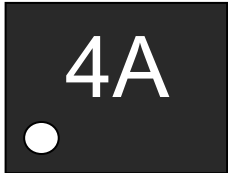
Type Number : M T M C 8 E 2 8 0 L
*2

The actual font of product symbol may differ slightly from the font shown in this specification.

Connection

1.Source1	5.Drain
2.Gate1	6.Drain
3.Source2	7.Drain
4.Gate2	8.Drain

· Factory distinction mark

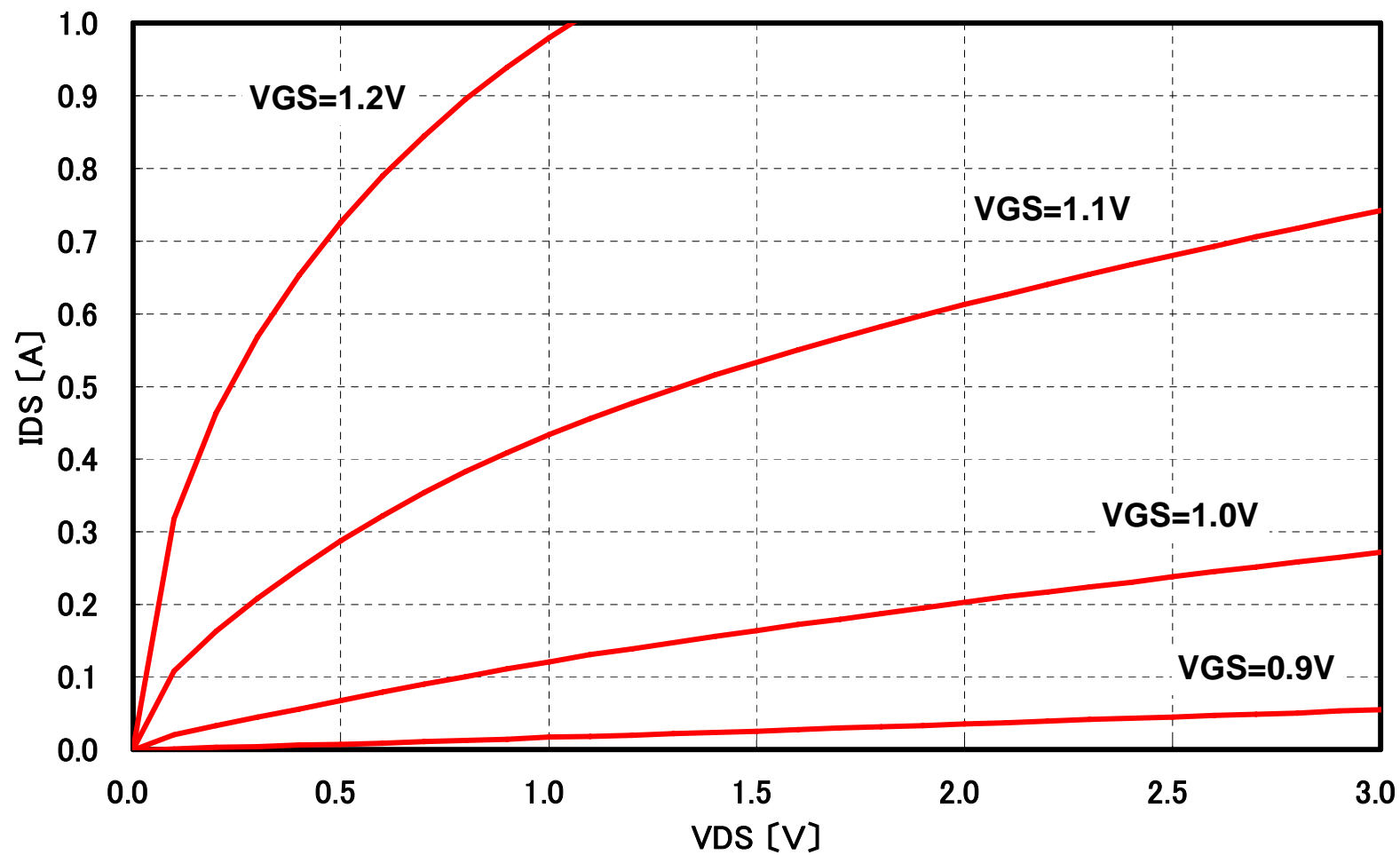
KUMAMOTO			
WMini8 - F1			
			

※ White parts are treated by laser mark.

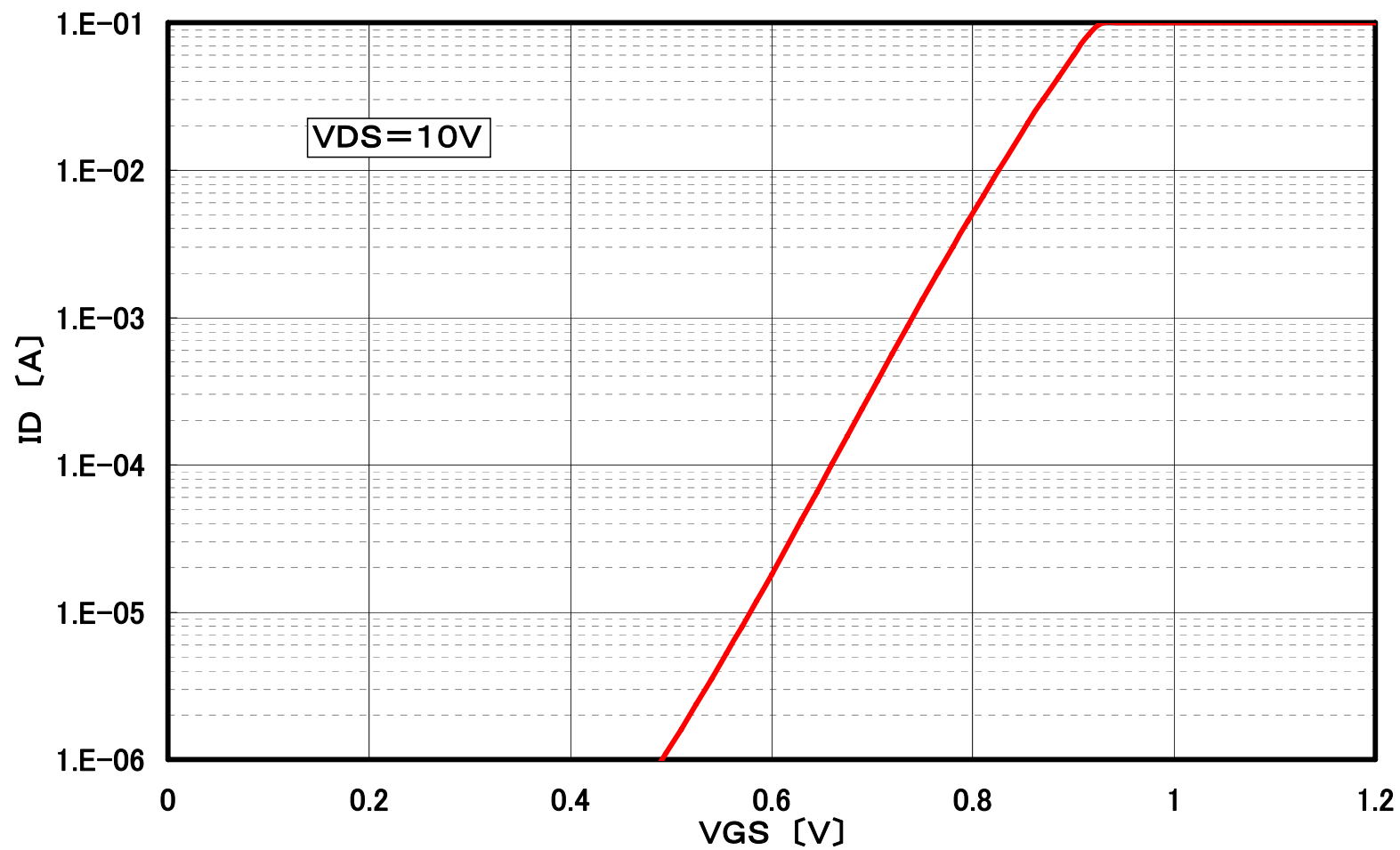
2006.09.14

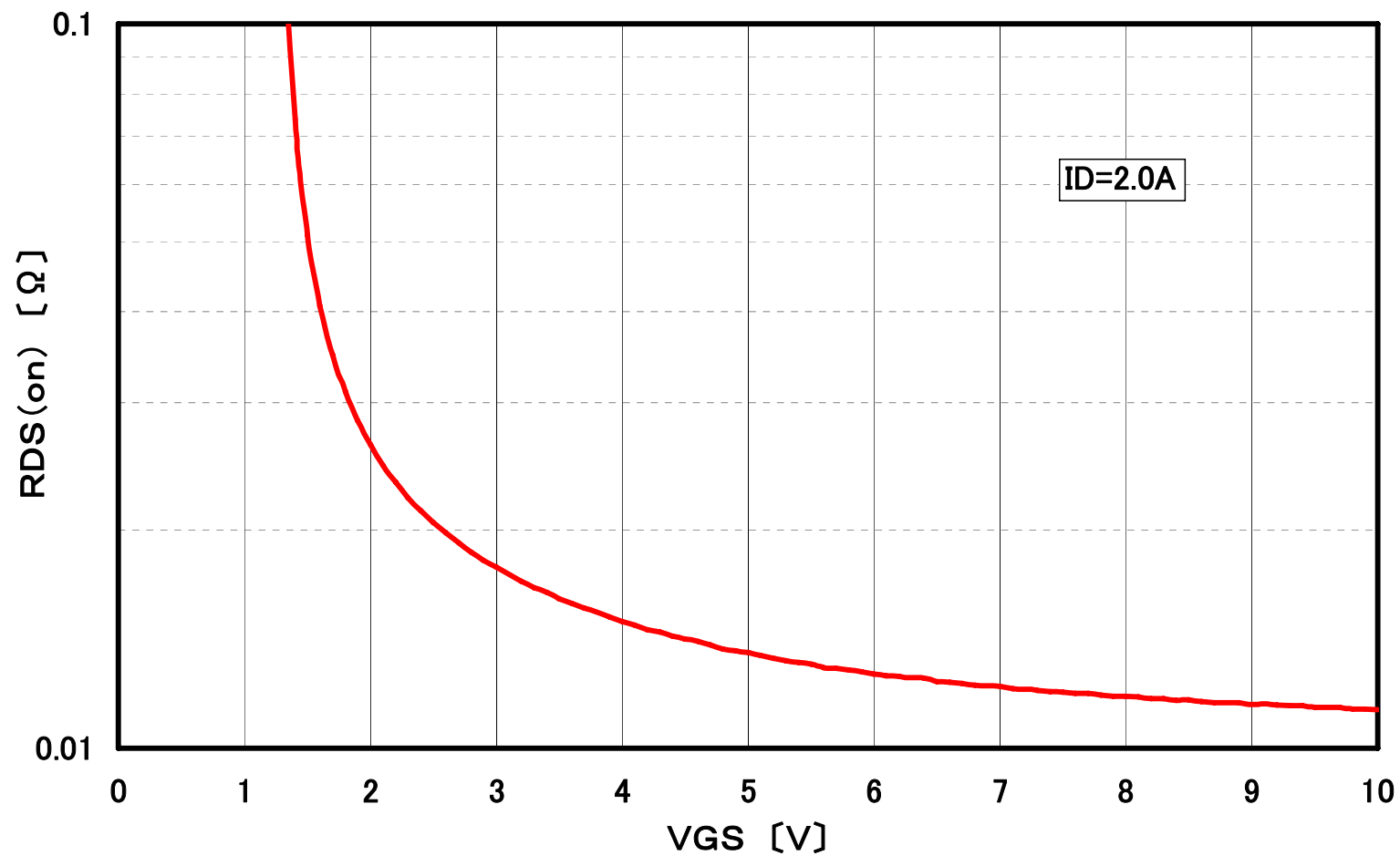
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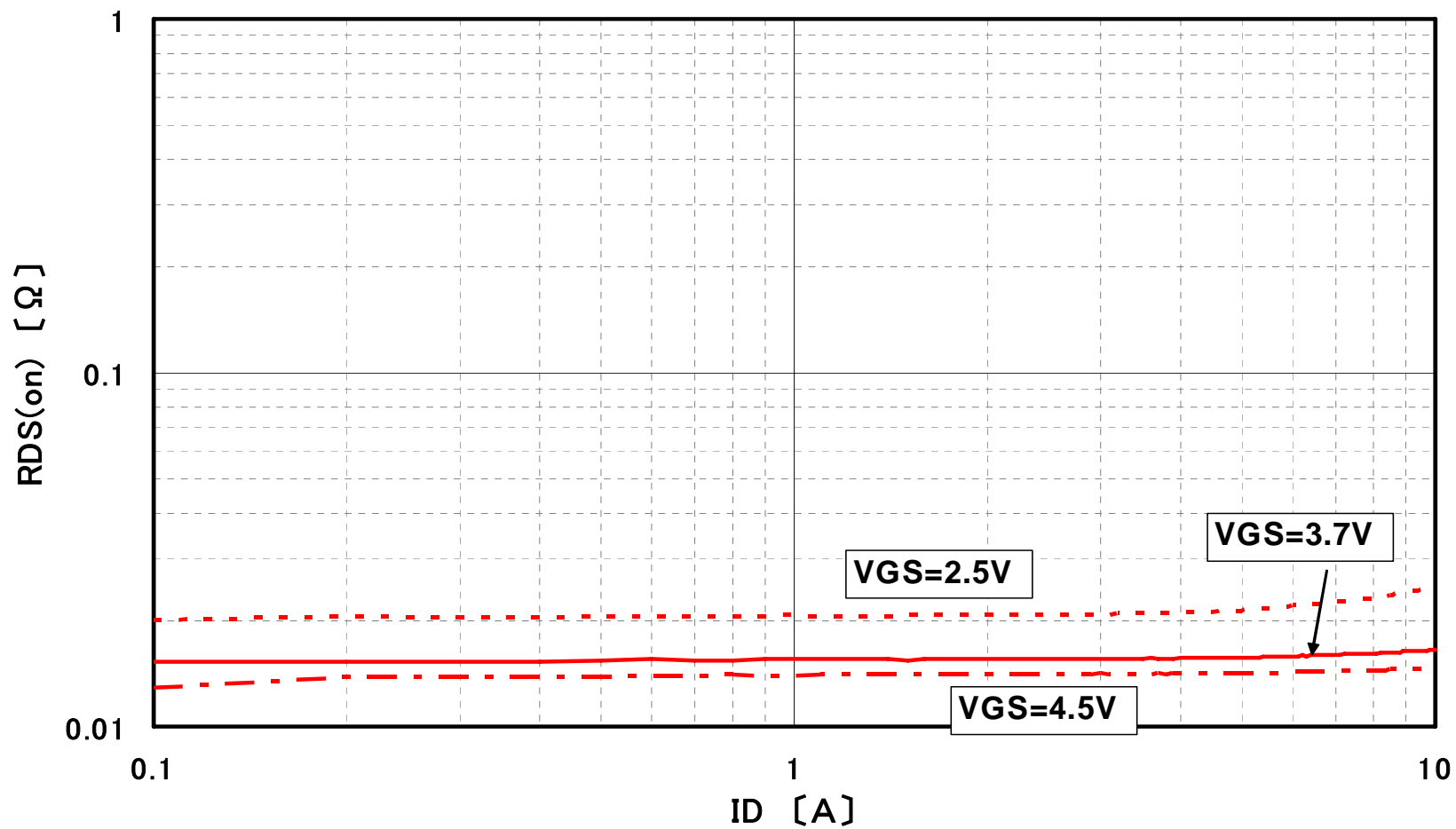
Revised

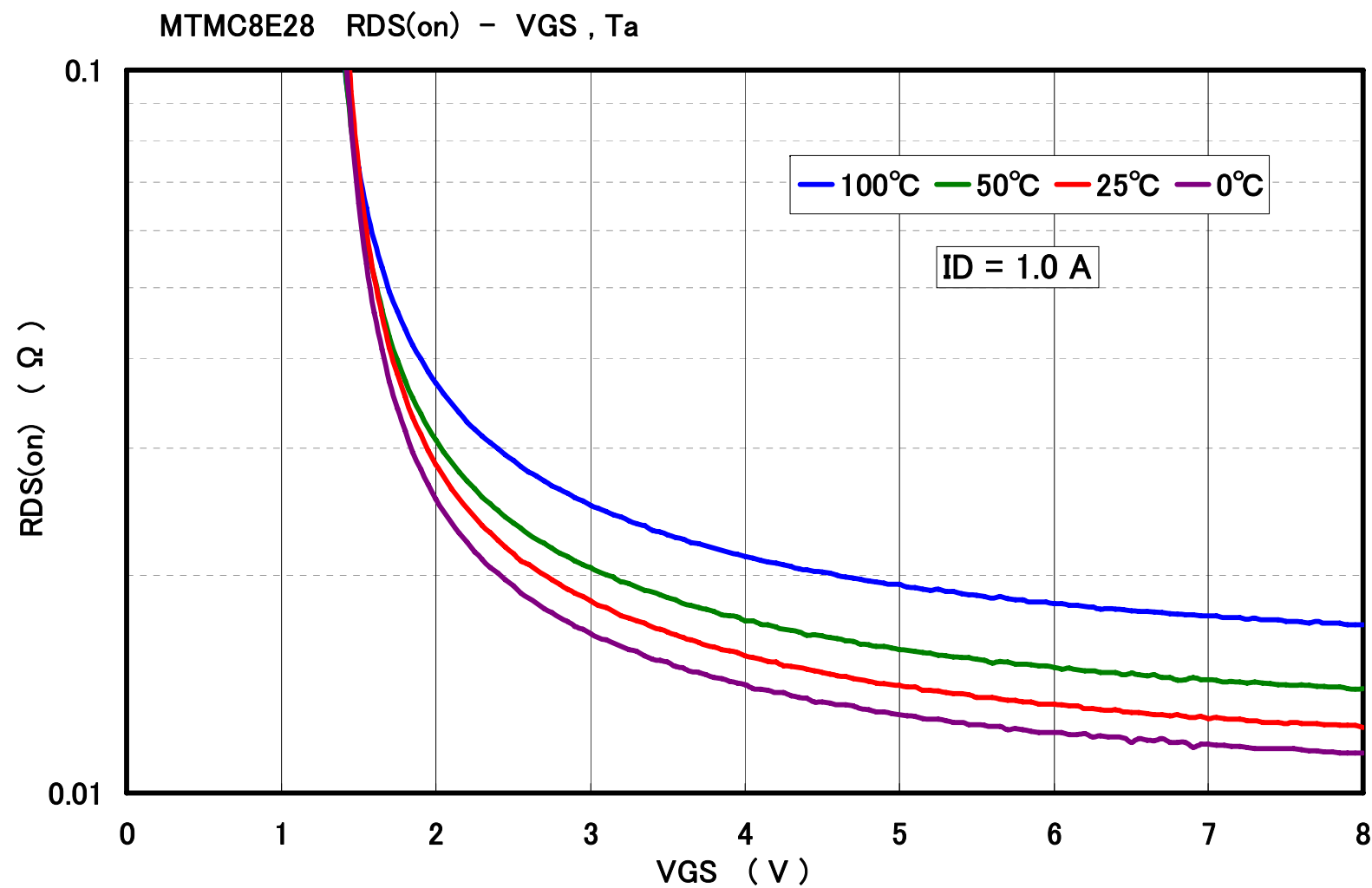
MTMC8E28 IDS - VDS

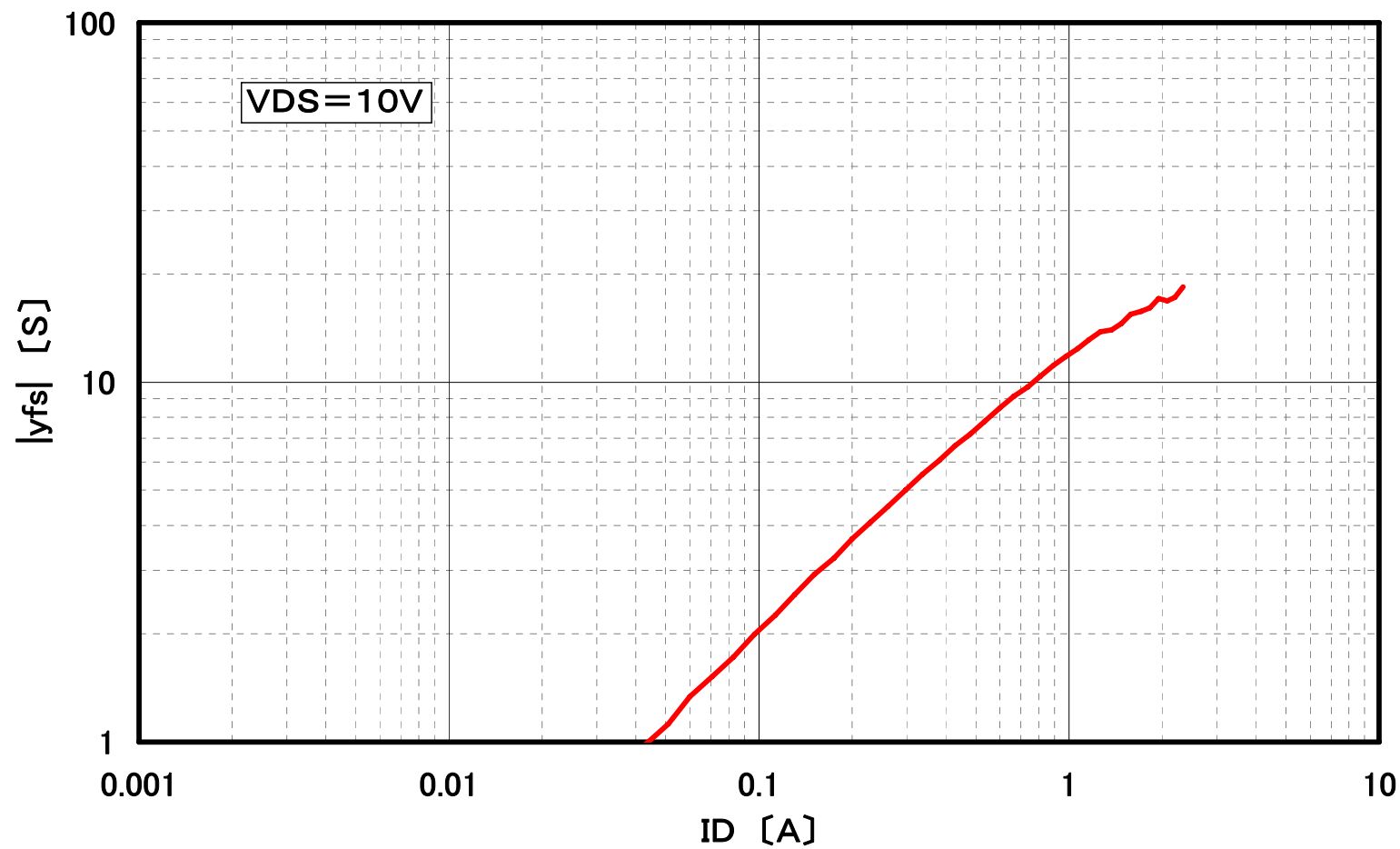
MTMC8E28 ID - VGS



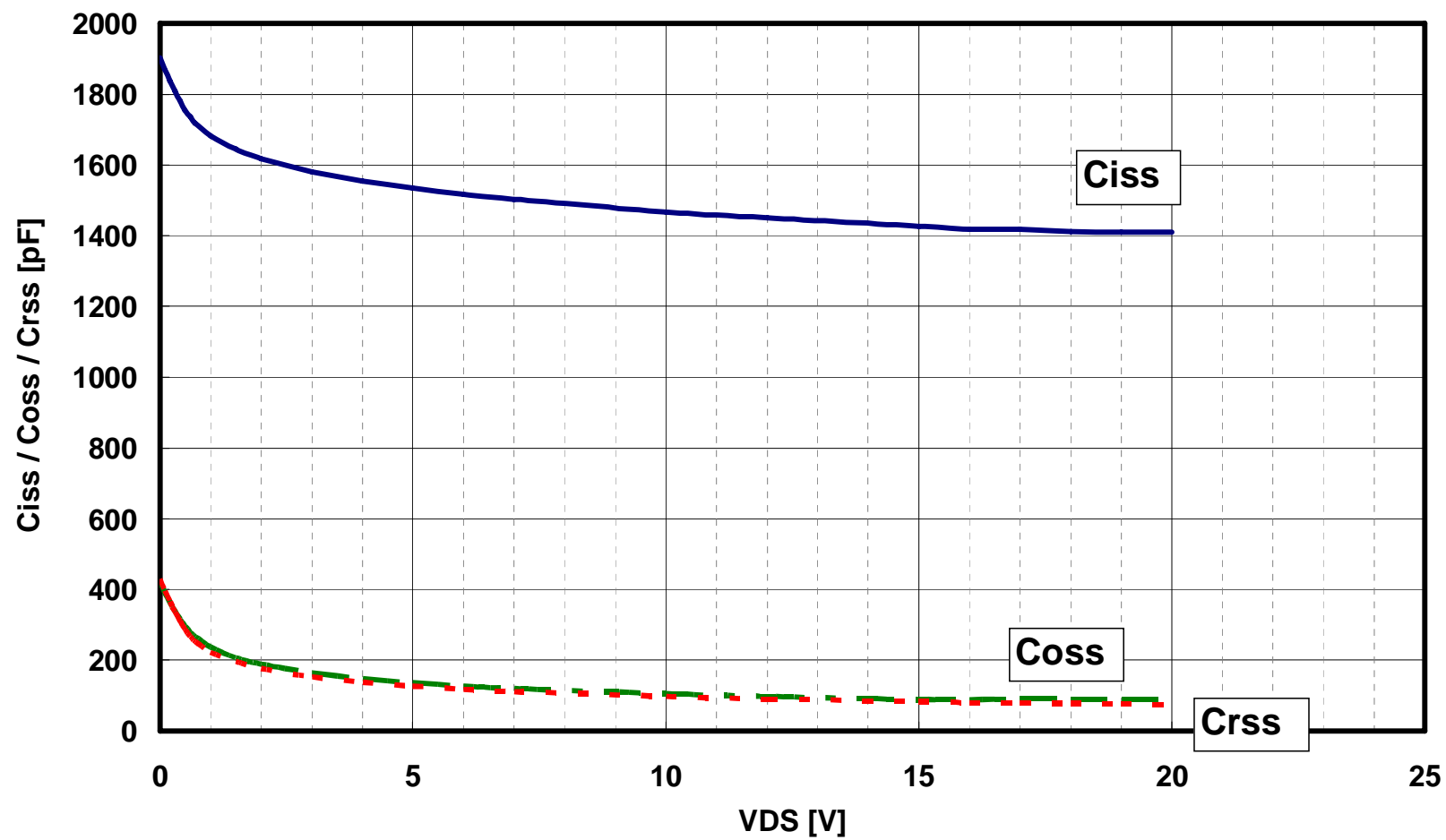
MTMC8E28 $R_{DS(on)}$ - V_{GS} 

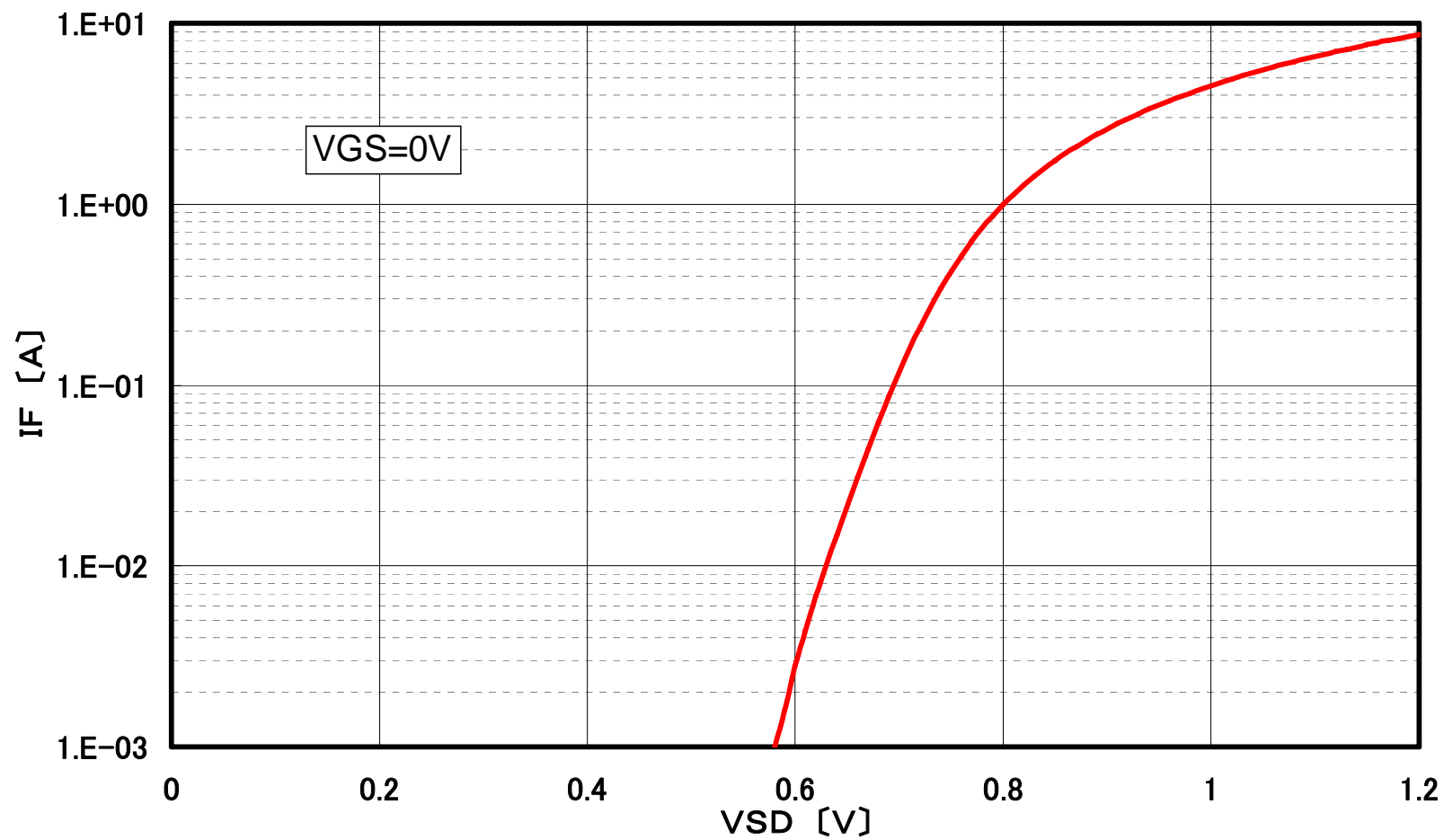
MTMC8E28 RDS(on) - ID



MTMC8E28 $|y_{fs}|$ - I_D 

MTMC8E28 Ciss, Coss, Crss - VDS characteristics



MTMC8E28 IF - VSD

PACKAGE STANDARDS

Package Code

WMini8-F1

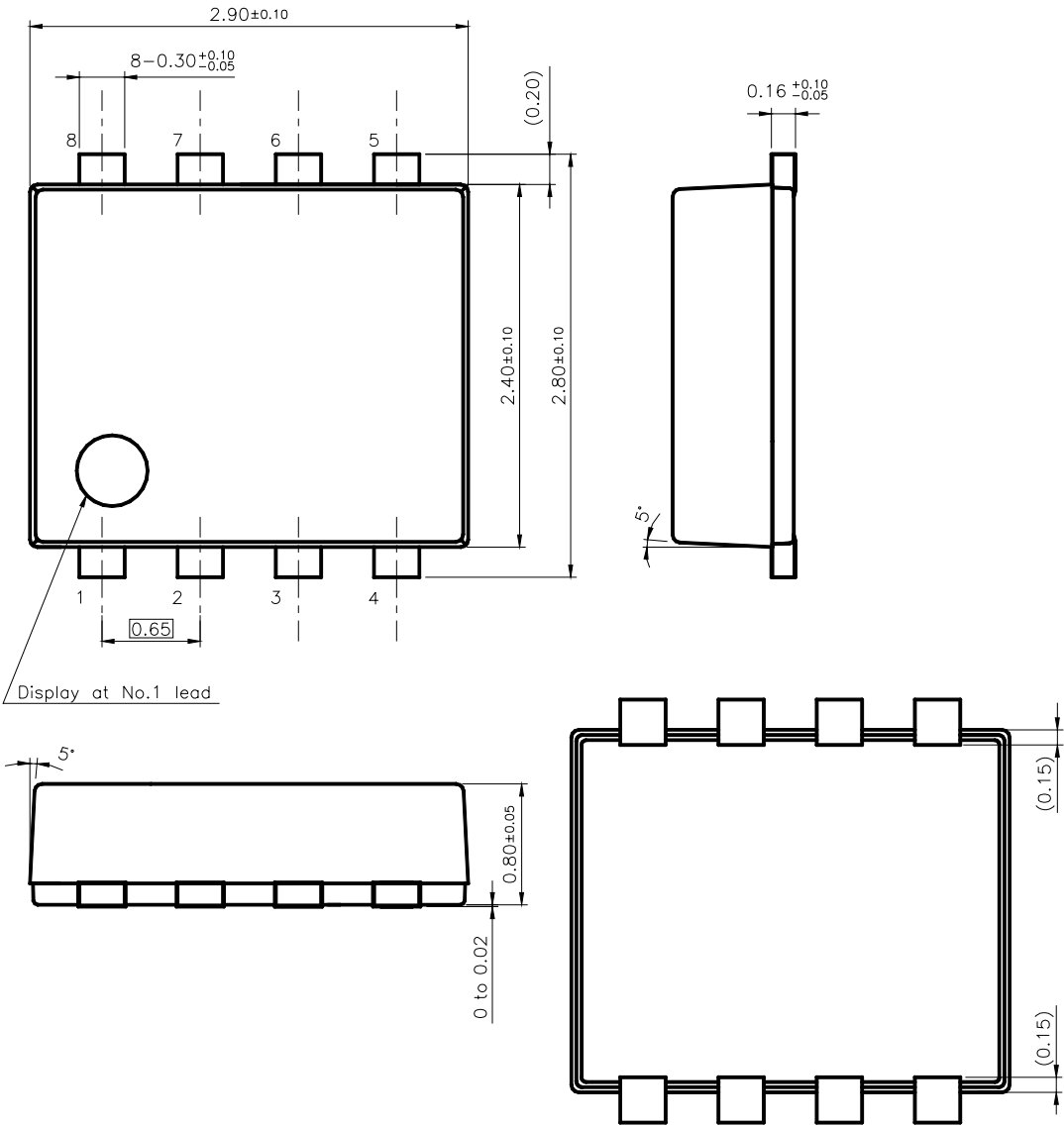
Semiconductor Company
Matsushita Electric Industrial Co., Ltd.

Established by	Applied by	Checked by	Prepared by
K.Komichi	H.Yoshida	M.Okajima	M.Kametaka

	<div>PACKAGE STANDARDS</div> <div>WMini8-F1</div>		
		Total Pages	Page
		3	2

1. Outline Drawing

Unit:mm

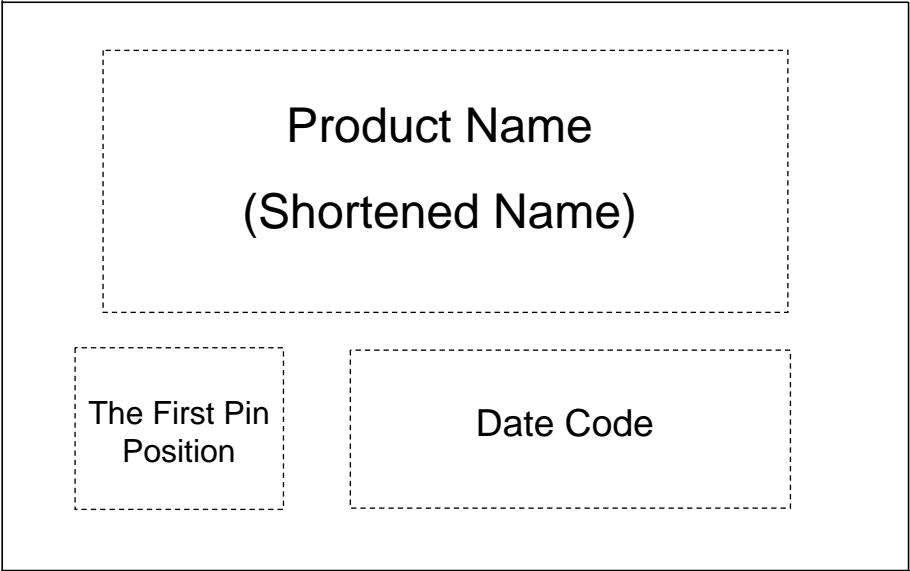


Body Material : Br/Sb free epoxy resin	
Lead Material :	Cu Alloy
Lead Finish Method : SnBi Plating	

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	PACKAGE STANDARDS WMini8-F1		
		Total Pages	Page
		3	3

2. Mark Drawing



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Content Description of Semiconductor Product			DESIGNED	CHECKED	APPROVED
			N.Kasuya	M.Fujisawa	H.Shidooka
Type	MTMC8E280L	Outline	WMini8 - F1		
Diffusion factory	Tonami Factory, Semiconductor Company, Matsushita Electric Industrial Co., Ltd. (JAPAN)				
Assembly factory	Panasonic Semiconductor Discrete Devices Kumamoto Co., Ltd. (JAPAN)				
<div>Sectional view of product</div> <div> </div> <div> <div>Front View</div> <div>Side View</div> </div>					
No.	Parameter	Content	Remark		
1	Chip structure and Kind	N-Channel MOS Type	a		
2	Chip size	2.40 mm × 0.80 mm (2 chip)			
3	Chip coating material	No chip coating			
4	Die bond method	Soft solder			
5	Wire material and method	Au thermo-compression bonding	b		
6	Molding method	Transfer molding			
7	Molding material	Epoxy resin (UL94V-0)	c		
8	Lead frame material and finish	Cu alloy ・Sn-2Bi plating	d		
2006.09.14					

Product Specification Taping Specification Type Number : WMini8-F1 (TX)/L	Prepared by N.Kasuya	Checked by N.Kasuya	Applied by H.Shidooka	Established by
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1. Scope

This standard should be applied to the specification of thermo compression sealing for WMini8-F1 package.

2. Structure

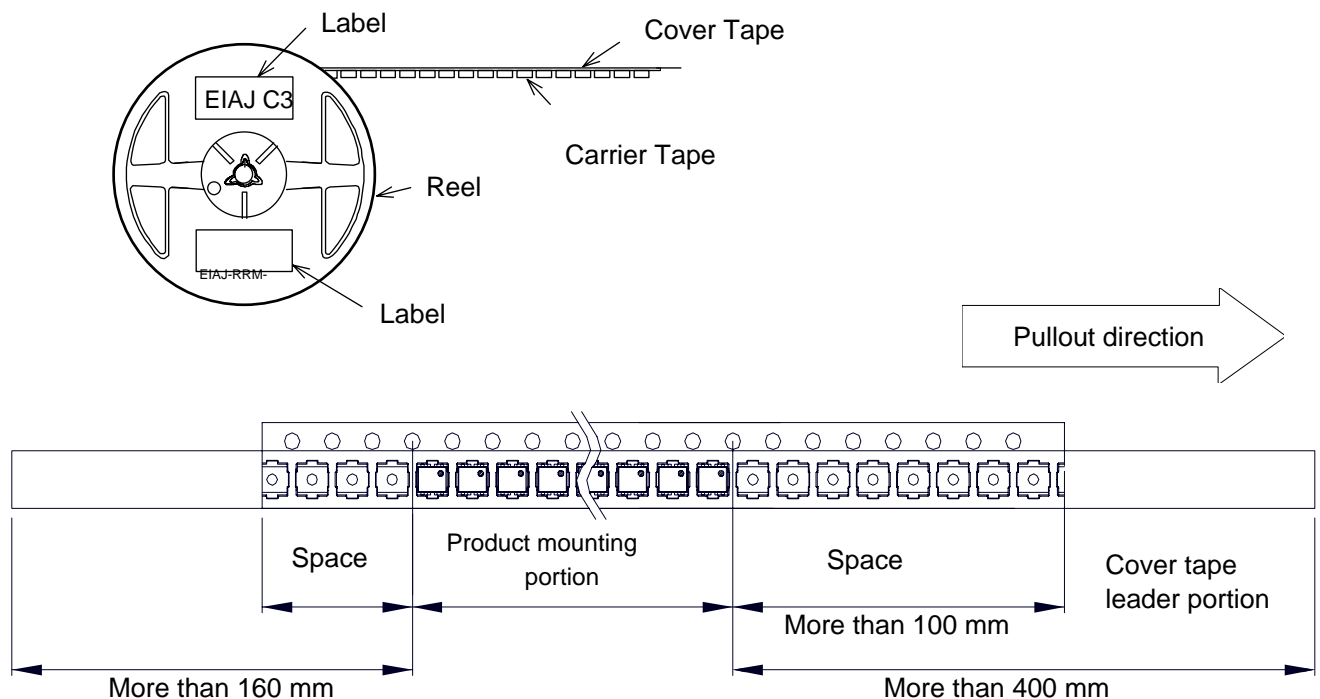
1) Structure and Dimensions

Compliant with IEC 60286

<Structure>

1. Carrier tape : For dimensions, refer to sheet No.4.
2. Cover tape : For dimensions, refer to sheet No.4.
3. Reel : For dimensions, refer to sheet No.5.

2) Structure of taping



- (1) Sprocket holes shall be on the right side of pullout direction.
- (2) The direction which has No.1 pin on the sprocket hole side shall be X direction or L direction.
- (3) Length of leader tape shall be more than 400mm including more than 100 mm of empty carrier tape.
The empty carrier tape shall be covered more than 100mm by cover tape.
- (4) The end of tape shall be more than 160mm including empty carrier tape.

2006.09.12		
Established	Revised	

Product Specification
Taping Specification
Type Number : WMini8-F1 (TX)/L

3. Quantity and Indication of Package

1) Taping quantity

The standard quantity shall be 3000 pcs / reel.

5 reels shall be packed in the specified carton case.

2) Indication

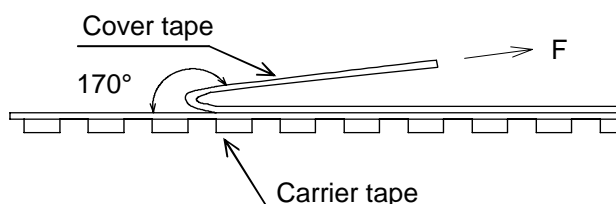
Name, direction, quantity and serial no.(symbol) shall be shown on one side of the reel.

4. Mechanical Characteristics and Specifications

1) Peel strength of cover tape

$F = 0.1 \text{ N to } 1.0 \text{ N}$

Note; There shall be no damage on tape in peeling.



2) Specifications

- (1) When already mounted tape is bent by radius 25 mm, there shall be neither dropped product nor damaged tape.
- (2) Products shall not adhere to cover tape when separating the tape.
- (3) For electrical characteristics and external specifications, individual product specification shall be referred.
- (4) Taped products shall be stored at temperature of 5 to 35 °C and humidity of 45 to 75%, and also protected against direct sun light.
- (5) If tape pulled out from a reel needs to be left for long hours, the tape shall be rewound on the reel temporarily.
- (6) As a rule, taped products shall not be turned upside down, reversed or partially absent in product arrangement.
- (7) Deviation between cover and carrier tape shall be 0.3mm or less.

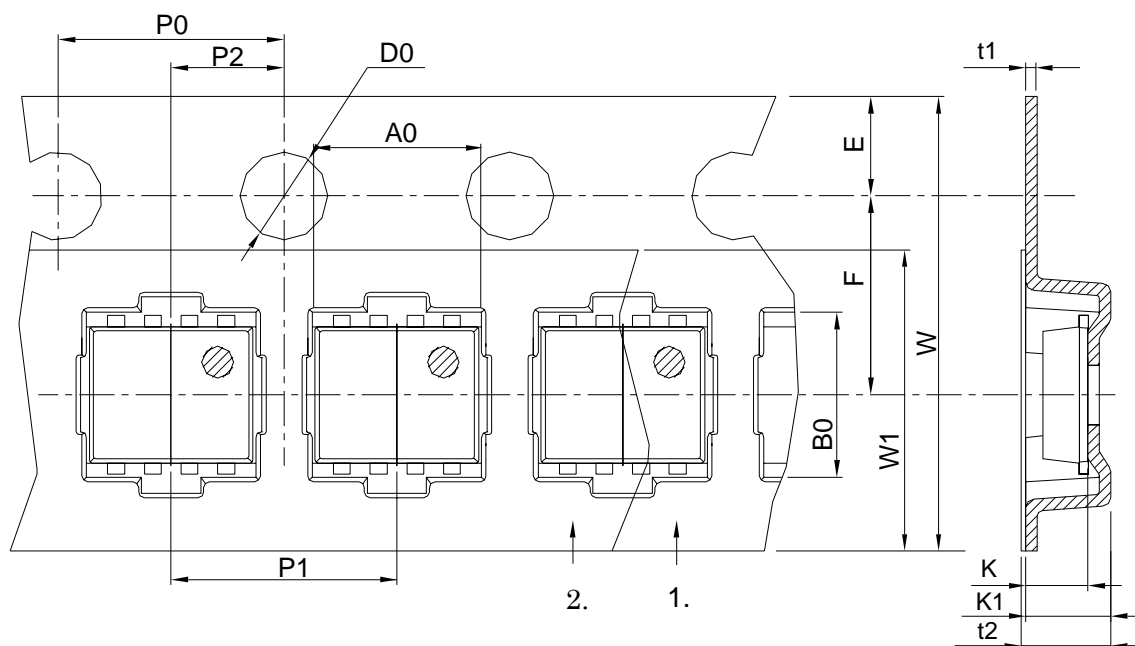
2006.09.12

Established

Revised

Product Specification
Taping Specification
Type Number : WMini8-F1 (TX)/L

5. Taping form and Dimensions



1. Carrier tape
2. Cover tape

Item		Symbol	Dimensions	Remarks
Dented square hole for product insertion	Length	A0	3.10+0.10/-0.09	
	Width	B0	3.00+0.10/-0.09	
	Depth	K	0.96±0.10	
	Pitch	P1	4.00±0.10	Accumulated error ±0.2max/10 pitches
Sprocket hole	Diameter	D0	1.55+0.10/-0.00	
	Pitch	P0	4.00±0.10	Accumulated error ±0.2max/10 pitches
	Position	E	1.75±0.10	
Center-to-center distance	Longitudinal	P2	2.00±0.05	
	Traverse	F	3.50±0.05	
Cover tape	Width	W1	5.4±0.1	
	Material	P.P		
Carrier tape	Width	W	8.0±0.3	
	Thickness	t1	0.20±0.10	
	Material	PS		Antistatic
Hole outer depth		K1	1.16±0.10	
Total thickness		t2	1.25±0.20	

Note : 1) Radius at each corner shall be 0.25R or less.

2006.09.12

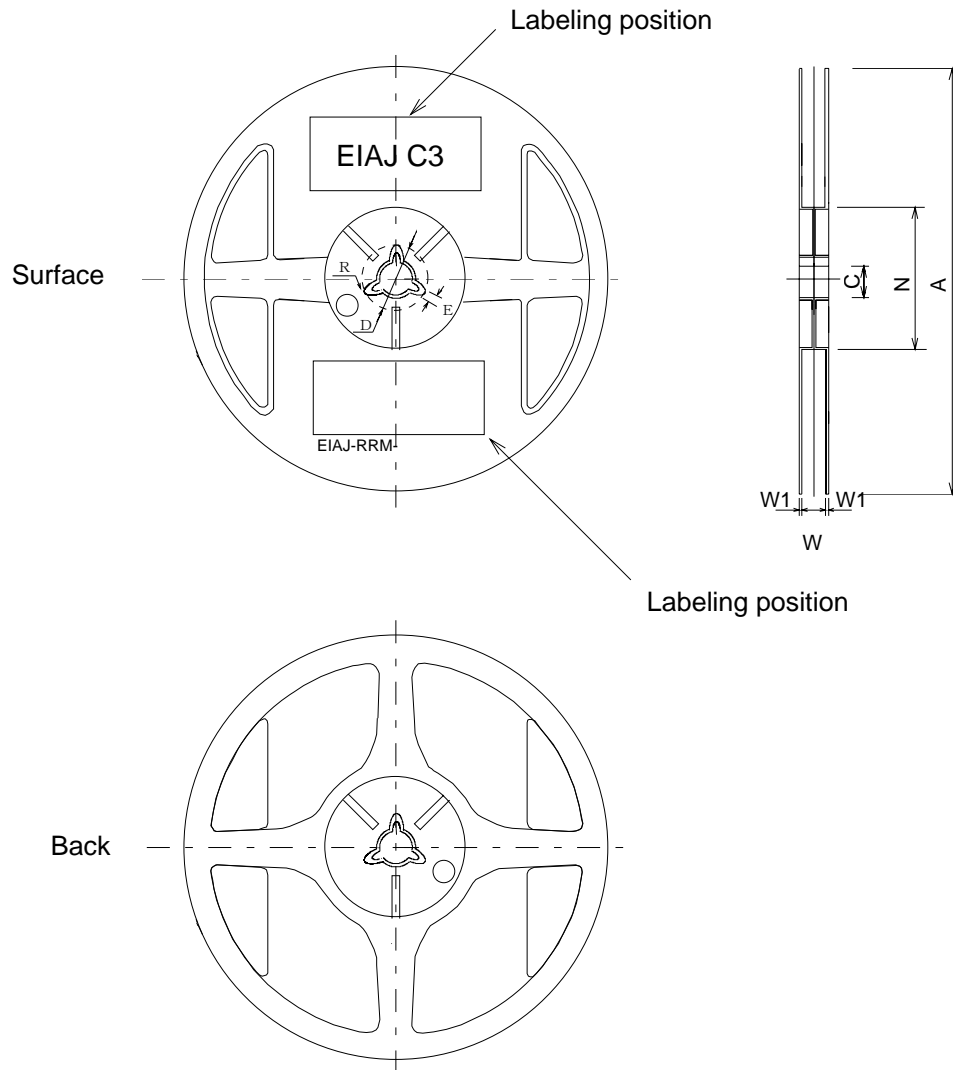
Established

Revised

Product Specification
Taping Specification
Type Number : WMini8-F1 (TX)/L

6. Reel and Dimensions

Unit:mm



Item			Symbol	Dimensions	Remarks
Flange	Diameter		A	180+0.0/-3.0	
	Thickness		W1	1.2	
	Distance between flanges		W	9.0±0.3	
Hub	Outer diameter		N	60+1.0/-0.0	
	Spindle hole diameter		C	13.0±0.2	
	Keyway	Width	E	2.0±0.5	
		Depth	D	21.0±0.8	
		Radius at corner	R	1.0	
Material		Polystyrene		Antistatic	
Indication of the type		Mark on one side of flange.			
		Indicate type name, quantity and serial no. etc.			

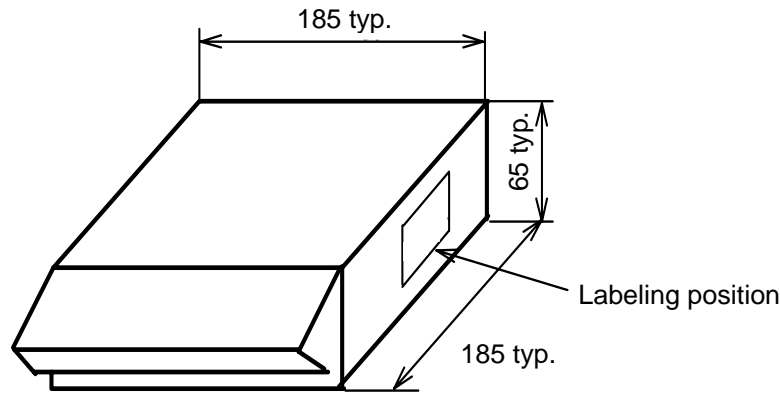
2006.09.12

Established

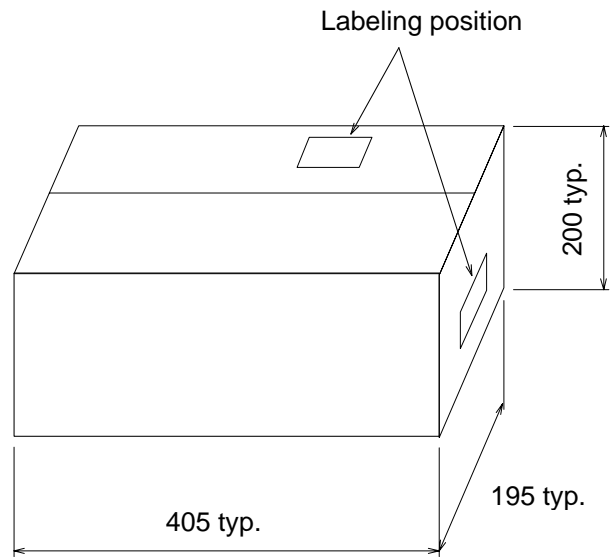
Revised

Product Specification
Taping Specification
Type Number : WMini8-F1 (TX)/L

7. Carton case (Reel box)



8. Packing case (Outside packing case)



Quantity and Contents

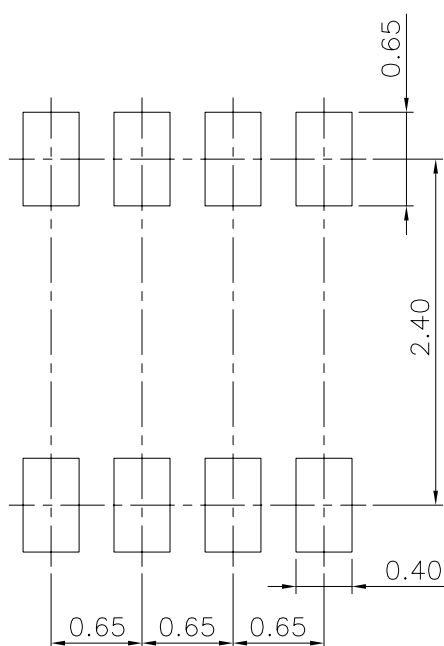
Form	Quantity	Contents	Material
Carton case	15,000 pcs	5 reels	Corrugated paper
Packing case	90,000 pcs	6 carton cases	Corrugated paper

2006.09.12	
Established	Revised

Technical Report
Package : WMini8-F1

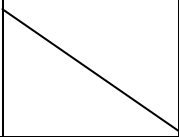

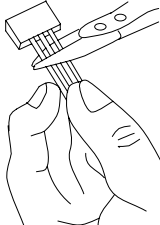
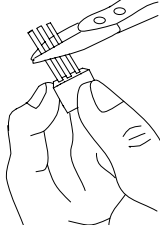
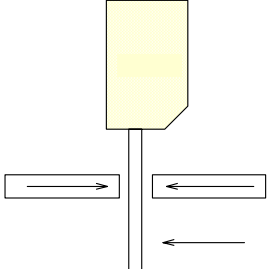

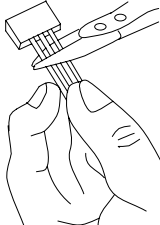
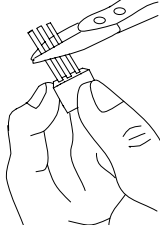
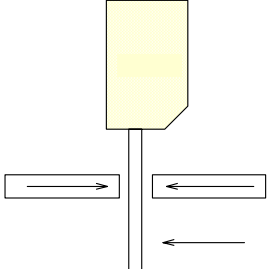

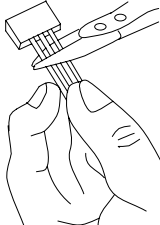
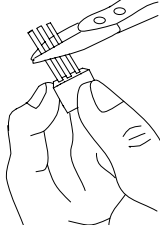
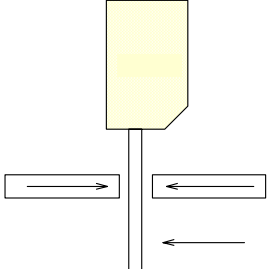
(PWB pad dimensions)

Unit : mm



2006.09.14

RELIABILITY TEST RESULT Type Number : MTMC8E280L		DESIGNED	CHECKED	APPROVED																		
		S.Miyata	N.Kasuya	M.Fujisawa																		
3)																						
PARAMETER		CONDITIONS		RESULT																		
Power Dissipation Test	1)	PD = 400 mW ton/toff = 5 min t = 500 h		0/15																		
High Temperature Reverse Bias Test	1)	VDS = 20 V Ta = 125 °C t = 500 h		0/15																		
Thermal Humidity Reverse Bias Test	1)	VDS = 16 V Ta = 85 °C, 85 %RH t = 500 h		0/15																		
High Temperature Storage Test	1)	Ta = 150 °C t = 500 h		0/15																		
Temperature Cycle Test	1)	<table border="1"> <thead> <tr> <th>Step</th><th>Temperature</th><th>Duration</th></tr> </thead> <tbody> <tr> <td>1</td><td>Ta = -55 °C</td><td>t = 30 min</td></tr> <tr> <td>2</td><td>Ta = 5 to 35 °C</td><td>t = 5 min</td></tr> <tr> <td>3</td><td>Ta = 150 °C</td><td>t = 30 min</td></tr> <tr> <td>4</td><td>Ta = 5 to 35 °C</td><td>t = 5 min</td></tr> <tr> <td colspan="3">f = 100 Cycles</td></tr> </tbody> </table>		Step	Temperature	Duration	1	Ta = -55 °C	t = 30 min	2	Ta = 5 to 35 °C	t = 5 min	3	Ta = 150 °C	t = 30 min	4	Ta = 5 to 35 °C	t = 5 min	f = 100 Cycles			0/45
Step	Temperature	Duration																				
1	Ta = -55 °C	t = 30 min																				
2	Ta = 5 to 35 °C	t = 5 min																				
3	Ta = 150 °C	t = 30 min																				
4	Ta = 5 to 35 °C	t = 5 min																				
f = 100 Cycles																						
Pressure Cooker Test	1)	P = 2.0×10 ⁵ Pa t = 100 h		0/15																		
Terminal Strength Test	Tension	F = 1 N t = 30 s		0/15																		
	Fold Bending	F = 0.5 N, θ = 20 ° t = 2 Cycles		0/15																		
Solder Heat Resistance Test		Tsol = 260 °C ±5 °C t = 10 s		0/30																		
Solderability Test		Tsol = 230 °C ±5 °C, t = 5 s ±0.5 s Stick more than 95 %		0/30																		
JUDGMENT STANDARD 2)																						
ITEM	LOWER LIMIT	UPPER LIMIT																				
VDSS, Yfs	L×0.8	—																				
Vth	L×0.8	U×1.2																				
RDS(on)	—	U×1.2																				
IDSS, IGSS	—	U×2.0																				
<p>NOTE : 1) Pretreatment : Resistance to Soldering Heat Test</p> <p>2) L : Lower Limit of Product Specification U : Upper Limit of Product Specification</p> <p>3) Pb Free</p>																						
2006.09.05																						

Precautions for using discrete semiconductor devices	DESIGNED <i>M. Fujisawa</i>	CHECKED 	APPROVED <i>H. Shidooka</i>						
<p>1. Maximum ratings</p> <ul style="list-style-type: none"> In general, maximum ratings are regulated as the absolute maximum ratings, and they are device limit values which shall be never exceeded in any condition at any time. By exceeding the rating a device will be deteriorated or destroyed and its characteristics will not be restored. Applied voltage, current, reverse voltage, dissipation power, junction temperature, and storage temperature etc., have their maximum ratings. Please refer to product specifications for the ratings. <p>2. Storage, transportation and measurement</p> <p>1) · Storage condition and term Expiration date for device storage is for two years from the date shown in the packing label at normal temperature (5 °C - 35 °C) and normal humidity (45 % RH – 75 %RH). Please be careful not to pass this period. As for an expired device, please confirm the solderability before using.</p> <p>2) · Transportation During transportation, please do not expose devices to excessive mechanical vibration and shock, and also prevent them from being wet with water.</p> <p>3) · Measurement When you inspect characteristics of devices, please give attention to surge voltage prevention from measuring instruments, wrong connections and short circuits between terminals. Also, an inspection over product ratings should not be conducted. As for high frequency or electrostatic sensitive devices, human body and machines should be grounded.</p> <p>3. Precautions for mounting</p> <ul style="list-style-type: none"> When you assemble or mount discrete devices, the following cautions should be kept in mind because of their structural design and mounting operation. Explaining below is about lead forming and cutting, mounting on a printed board, soldering and cleaning which need attention in designing and mounting. In order not to damage electrical characteristics and reliability, the following cautions are required. <p>1) · Lead forming and cutting</p> <p>a. In bending lead wires, please fasten lead wires between a bending point and package body so as not to stress the body. As for forming and cutting with a large quantity by mold press, please set a function to fasten leads in order not to stress.</p> <table border="1" data-bbox="328 1630 1406 1984"> <thead> <tr> <th data-bbox="328 1630 687 1675"></th> <th data-bbox="687 1630 1046 1675">✕</th> <th data-bbox="1046 1630 1406 1675"></th> </tr> </thead> <tbody> <tr> <td data-bbox="328 1675 687 1984"></td> <td data-bbox="687 1675 1046 1984"></td> <td data-bbox="1046 1675 1406 1984"></td> </tr> </tbody> </table>					✕				
	✕								
									
2006.09.14									

Precautions for using discrete semiconductor devices

b. Please avoid contamination, foreign objects and damages which degrade solderability in lead forming and cutting.

2) · Mounting on a printed circuit board(PCB)

a. Please align leads of a device with mounting holes on a printed circuit board, and take care not to produce excessive stress during or after device insertion.

b. Please keep a certain clearance between device and printed circuit board.

c. After device mounting on a printed circuit board, please do not stress between the lead and device in assembling.

3) · Soldering

- To leave a semiconductor device at high temperature for many hours is undesirable, and also, soldering should be conducted at low temperature in a short time whichever you use a solder iron, dipping (dipping /flow), or reflow method.

- The standard of solder heat resistance test for discrete devices is at 270 °C for 10 seconds and at 350 °C for 3 seconds in keeping distance with a device body by 1 to 1.5 mm.
(Surface mounted device is for 10 seconds at 260 °C.)

- We conduct solderability test with flux at 230 °C for 5 seconds.
When you use high acid or alkaline flux, it might cause lead corrosion or peculiar influence.
Please note the usage.

- When a printed circuit board has warpage by soldering, please note that a semiconductor device has stress.

- The condition for a soldering iron and solder tub is no electric leakage. Especially for FET type transistors and high frequency devices, consideration such as earthing of soldering instruments is required.

■ Mounting method of surface mounted device (SMD)

Mounting methods for SMD are classified by supply methods of melting solder.
The methods are dip soldering, flow soldering, and reflow soldering etc.
Please refer to each recommended condition.

2006.09.14			

Precautions for using discrete semiconductor devices

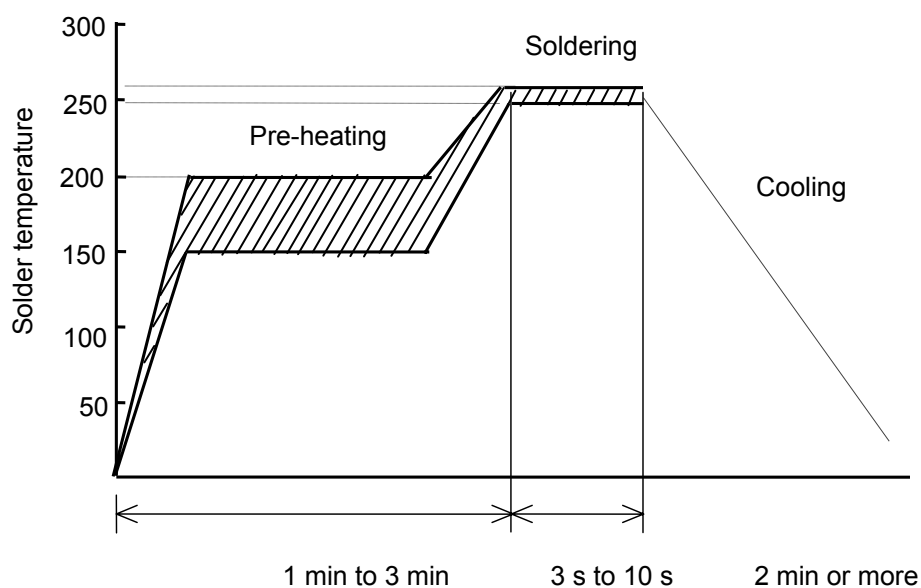
Recommended flow soldering condition

In flow soldering process, exact temperature-cycle management is essential.

We recommend pre-heating before soldering, so that you can prevent not only package damages or strains but also warpage strains on a printed circuit board.

The following shows temperature profile when you conduct pre-heating.

- ◆ Pre-heating temperature : 150 °C to 200 °C
- ◆ Pre-heating time. : 1 min to 3 min
- ◆ Maximum heating temperature. : max. 260 °C
- ◆ Maximum heating time : 3 s to 10 s
- ◆ Cooling: Leave at ambient temperature.
- ◆ Cooling time. : 2 min or more



Precautions for using discrete semiconductor devices

Dip soldering

Maximum solder temperature is 270 °C (260 °C for SMD). Please conduct solder dipping within 10 seconds at a maximum.

Soldering iron

You can solder manually with small type of soldering irons, but it would cause to shift the soldering position or to damage a package. We recommend that this soldering method be only for repair or experiment.

The following cautions are required in soldering iron use.

- Soldering iron (for SMD device) 350 °C Within 3 s
- To fix a mini type package please use flux and a solder iron with the diameter $\Phi 0.5$ mm which has a sharp edge.
(Please note that excessive flux causes low workability.)
- Since strong press causes lead form change and solderability degradation, if package pressing is necessary it should be not over 49 N.
- Please use a soldering iron with earth.
- Please solder at low temperature in a short time.

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Precautions for using discrete semiconductor devices

Recommended reflow soldering condition

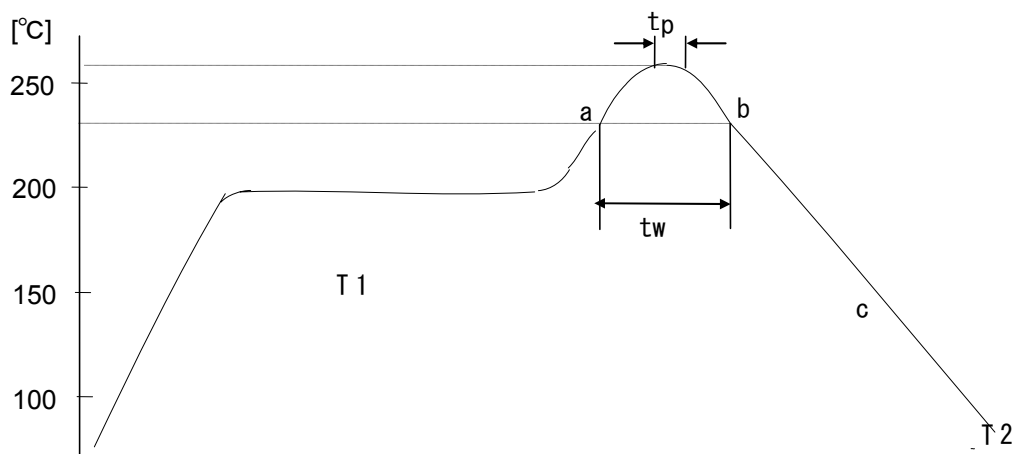
* THD is not applicable.

In reflow soldering process, exact temperature-cycle management is essential.

We recommend pre-heating before soldering, so that you can prevent not only package damages or stains but also damages on a printed circuit board, and your process becomes stable.

※ The following shows our recommended reflow temperature profile.

◆ Pre-heating temperature (T1)	150 °C to 200 °C (No time regulation)
◆ Heating speed (a)	2 °C/s to 3 °C/s
◆ Peak temperature (Tp)	max. 260 °C
◆ Heating time (tp)	10 s or below (260 °C)
◆ Storage time at high temperature (tw)	30 s to 40 s (over 230 °C)
◆ Cooling speed (b - c)	1.5 °C/s or below
◆ Taking off temperature (T2)	100 °C
◆ Reflow soldering times	Twice



※ Above-mentioned temperature is package surface temperature.

Precautions for using discrete semiconductor devices

4) Cleaning (Flux cleaning)

Generally flux cleaning after soldering is necessary for system reliability. Neglecting cleaning will cause a trouble such as corrosion or lower isolation, and it might result in an electronic circuit trouble.

On account of corrosion, please use rosin type flux and remove it after soldering. When you conduct flux cleaning, please handle it in a short time.

Although we recommend a dipping method, If you conduct ultrasonic cleaning, please follow as below.

Ultrasonic cleaning condition

- ◆ Ultrasonic frequency : 28 kHz (Tolerance=10 %)
- ◆ Ultrasonic output : 10 W/L
- ◆ Cleaning time : Within 30 s (Within 1 min for power devices)

- ① You should make devices and printed circuit boards not to touch to ultrasonic source. This may cause lead broken, wire broken and reliability degradation.
- ② For an ink-marked device, please do not touch the marking surface before being dried.
- ③ Please do not conduct ultrasonic cleaning for a hermetic molding device.

Cleaning solvent

Freon and Trichloroethan are regulated now. Each manufacturer produces the substitutes. If you choose a substitute, please check its characteristics and ask us.

As for optical devices, please do not use these substitutes. (Package appearance will be changed.)

For optical device cleaning, please conduct a dipping method with alcohol.