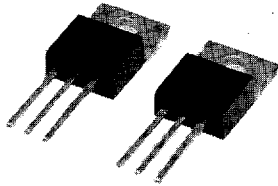


FS12UM-5

HIGH-SPEED SWITCHING USE

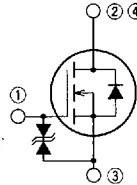
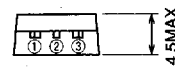
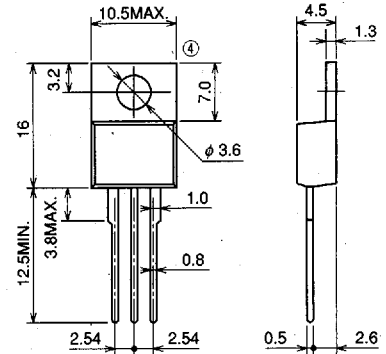
FS12UM-5



- V_{DSS} 250V
- r_{DS (ON)} (MAX) 0.40Ω
- I_D 12A

OUTLINE DRAWING

Dimensions in mm



- ① GATE
- ② DRAIN
- ③ SOURCE
- ④ DRAIN

TO-220

APPLICATION

SMPS, DC-DC Converter, battery charger, power supply of printer, copier, HDD, FDD, TV, VCR, personal computer etc.

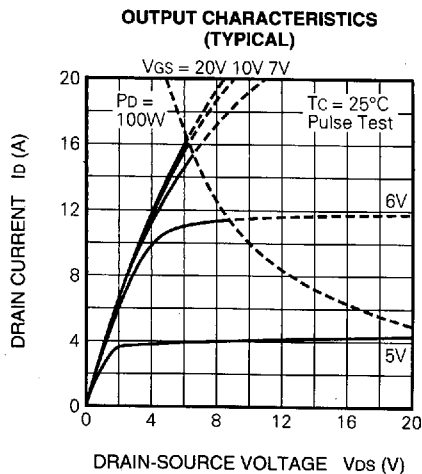
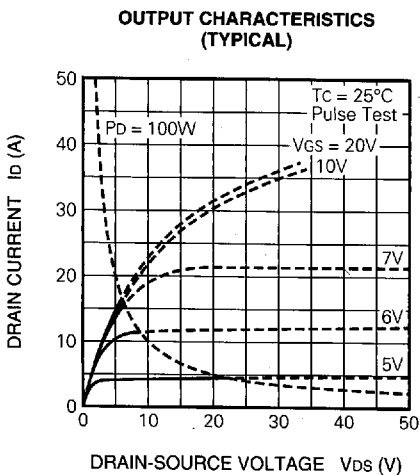
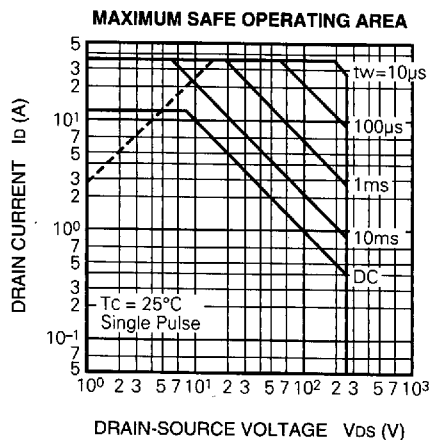
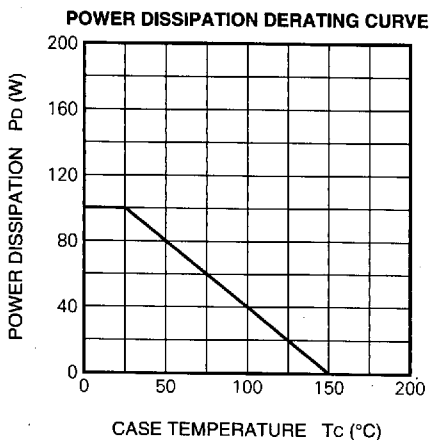
MAXIMUM RATINGS (T_c = 25°C)

Symbol	Parameter	Conditions	Ratings	Unit
V _{DSS}	Drain-source voltage	V _{GS} = 0V	250	V
V _{GSS}	Gate-source voltage	V _{DS} = 0V	±30	V
I _D	Drain current		12	A
I _{DM}	Drain current (Pulsed)		36	A
P _D	Maximum power dissipation		100	W
T _{ch}	Channel temperature		-55 ~ +150	°C
T _{stg}	Storage temperature		-55 ~ +150	°C
—	Weight	Typical value	2.0	g

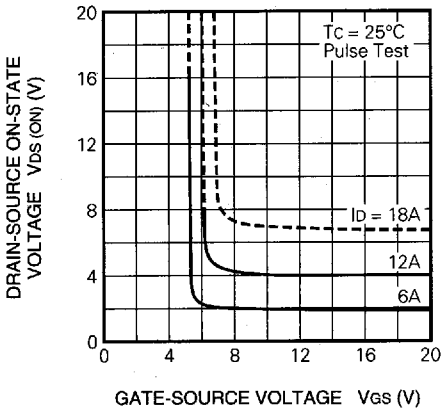
ELECTRICAL CHARACTERISTICS (Tch = 25°C)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
V(BR)DSS	Drain-source breakdown voltage	$I_D = 1\text{mA}, V_{GS} = 0\text{V}$	250	—	—	V
V(BR)GSS	Gate-source breakdown voltage	$I_G = \pm 100\mu\text{A}, V_{DS} = 0\text{V}$	± 30	—	—	V
I _{GSS}	Gate leakage current	$V_{GS} = \pm 25\text{V}, V_{DS} = 0\text{V}$	—	—	± 10	μA
I _{DSS}	Drain current	$V_{DS} = 250\text{V}, V_{GS} = 0\text{V}$	—	—	1	mA
V _{GS(th)}	Gate-source threshold voltage	$I_D = 1\text{mA}, V_{DS} = 10\text{V}$	2	3	4	V
r _{DS(on)}	Drain-source on-state resistance	$I_D = 6\text{A}, V_{GS} = 10\text{V}$	—	0.32	0.40	Ω
V _{DS(on)}	Drain-source on-state voltage	$I_D = 6\text{A}, V_{GS} = 10\text{V}$	—	1.90	2.40	V
y _{fs}	Forward transfer admittance	$I_D = 6\text{A}, V_{DS} = 10\text{V}$	5.0	7.5	—	S
C _{iss}	Input capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	—	720	—	pF
C _{oss}	Output capacitance		—	150	—	pF
C _{rss}	Reverse transfer capacitance		—	30	—	pF
t _{d(on)}	Turn-on delay time	$V_{DD} = 150\text{V}, I_D = 6\text{A}, V_{GS} = 10\text{V}, R_{GEN} = R_{GS} = 50\Omega$	—	18	—	ns
t _r	Rise time		—	35	—	ns
t _{d(off)}	Turn-off delay time		—	80	—	ns
t _f	Fall time		—	40	—	ns
V _{SD}	Source-drain voltage	$I_S = 6\text{A}, V_{GS} = 0\text{V}$	—	1.5	2.0	V
R _{th(ch-c)}	Thermal resistance	Channel to case	—	—	1.25	$^{\circ}\text{C/W}$

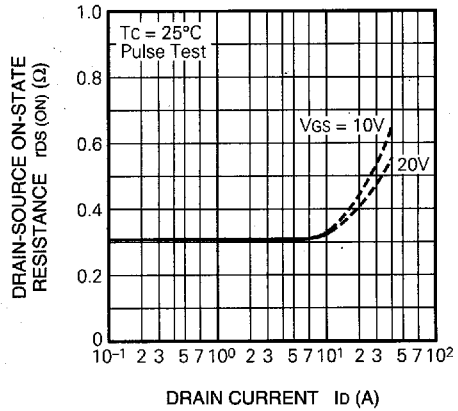
PERFORMANCE CURVES



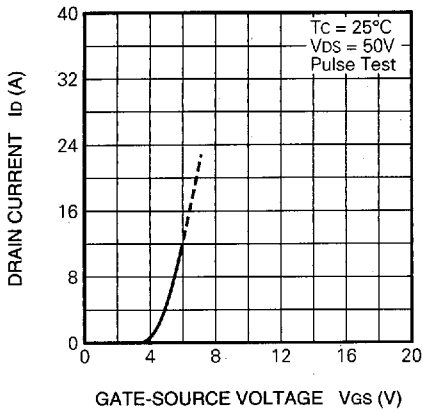
ON-STATE VOLTAGE VS. GATE-SOURCE VOLTAGE (TYPICAL)



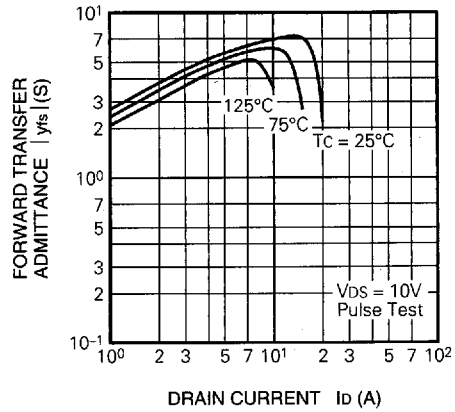
ON-STATE RESISTANCE VS. DRAIN CURRENT (TYPICAL)



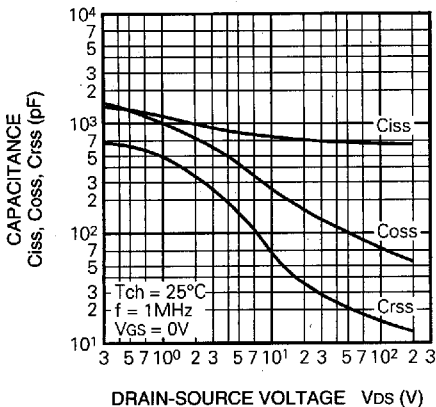
TRANSFER CHARACTERISTICS (TYPICAL)



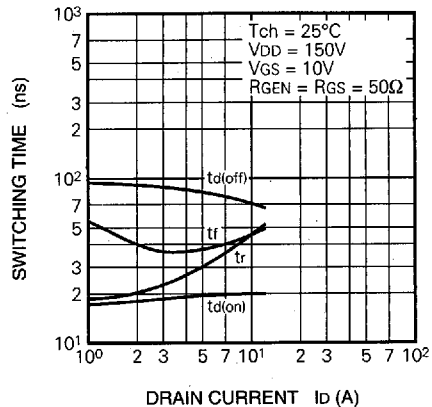
FORWARD TRANSFER ADMITTANCE VS. DRAIN CURRENT (TYPICAL)



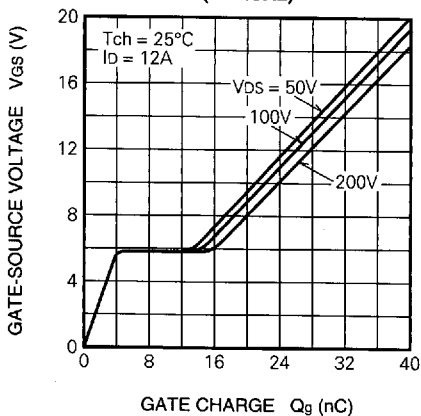
CAPACITANCE VS. DRAIN-SOURCE VOLTAGE (TYPICAL)



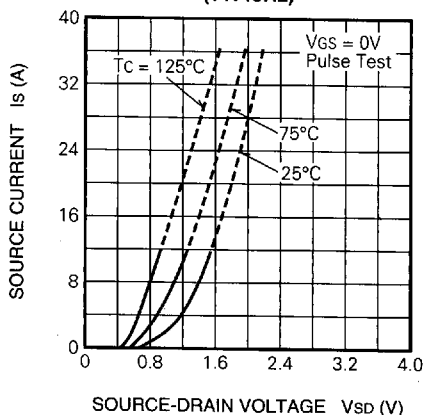
SWITCHING CHARACTERISTICS (TYPICAL)



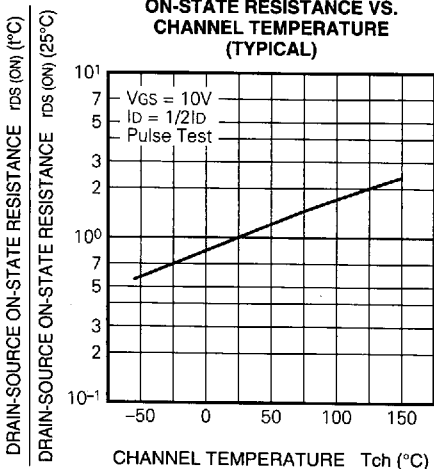
GATE-SOURCE VOLTAGE VS. GATE CHARGE (TYPICAL)



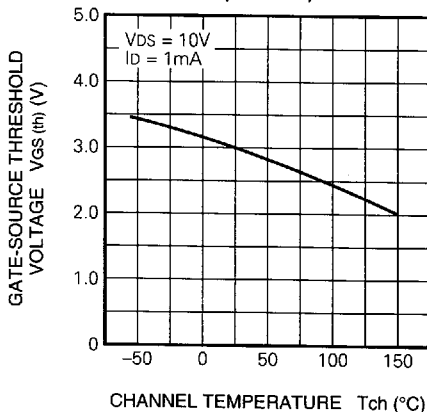
SOURCE-DRAIN DIODE FORWARD CHARACTERISTICS (TYPICAL)



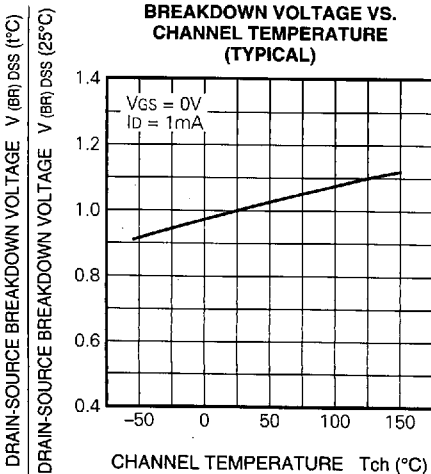
ON-STATE RESISTANCE VS. CHANNEL TEMPERATURE (TYPICAL)



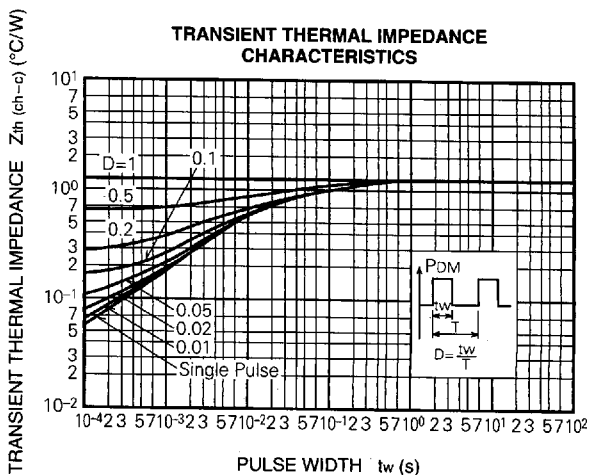
THRESHOLD VOLTAGE VS. CHANNEL TEMPERATURE (TYPICAL)



BREAKDOWN VOLTAGE VS. CHANNEL TEMPERATURE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS



MITSUBISHI POWER MOSFET LEAD FORMING OUTLINE AND TAPING

LEAD FORMING

(1) TO-220 outline

Applicable device FS**UM-***A

Standard outline	Standard forming outline			
	A5	A6	A8	AA
Dimensions a=3.0±0.5, b=14.7±0.5, c=5.0±0.5, d=4.5±0.5, e=20.1±0.5, f=3.0±0.5, g=15.5±0.5 h=16.0±0.5, i=5.5±0.5 ※Dimensions measured during processing				Unit: mm

(1) TO-220 full molded outline

Applicable device FS**KM-***A

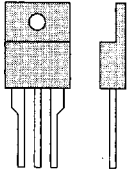
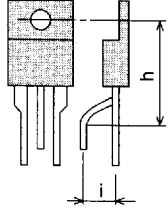
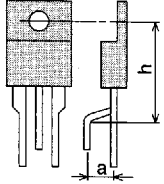
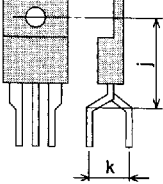
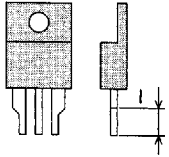
Standard outline	Standard forming outline			
	A5	A6	A8	AA
Dimensions a=3.0±0.5, b=14.7±0.5, c=5.0±0.5, d=4.5±0.5, e=20.1±0.5, g=15.5±0.5, h=16.0±0.5, i=5.5±0.5, j=19.0±0.5, k=7.75±0.5, l=4.0±0.5, m=15.1±0.5, n=16.5±0.5, o=3.8±0.35 ※Dimensions measured during processing				Unit: mm

6249829 0019591 140

MITSUBISHI POWER MOSFET
LEAD FORMING OUTLINE AND TAPING

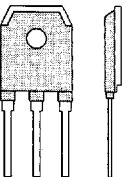
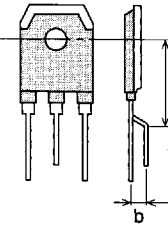
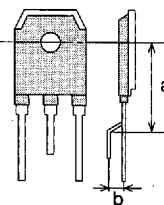
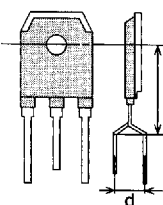
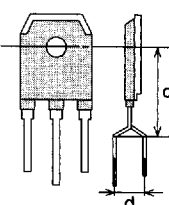
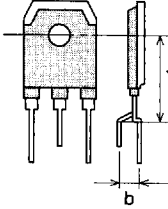
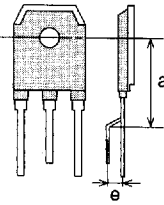
(2) TO-220 full molded outline

Applicable device	FS**KM**A
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Standard outline	Standard forming outline				
	AT	AU	AV	AW	
					
Dimensions	a=3.0±0.5, b=14.7±0.5, c=5.0±0.5, d=4.5±0.5, e=20.1±0.5, g=15.5±0.5, h=16.0±0.5, i=5.5±0.5, j=19.0±0.5, k=7.75±0.5, l=4.0±0.5, m=15.1±0.5, n=16.5±0.5, o=3.8±0.35 ※Dimensions measured during processing				Unit : mm

(3) TO-3P outline

Applicable device	FS**SM**A · CT**SM**
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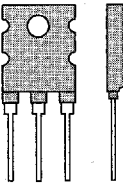
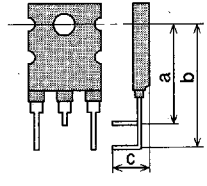
Standard outline	Standard forming outline				
	A7	A8	A9	A8	
					
					
Dimensions	a=23.5, b=5.45, c=23, d=9.5, e=4, f=21.5 ※Dimensions measured during processing				Unit : mm

MITSUBISHI POWER MOSFET

LEAD FORMING OUTLINE AND TAPING

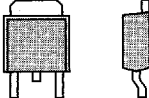
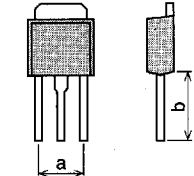
(4) TO-3PL outline

Applicable device	CT**AM-***
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Standard outline	Standard forming outline AC		
		Dimensions	$a=24\pm 0.5$ $b=31.5\pm 0.5$ $c=13.3\pm 0.6$ ※Dimensions measured during processing
			Unit : mm

(5) MP-3 outline

Applicable device	FS**AS-**A · CT20A**-8
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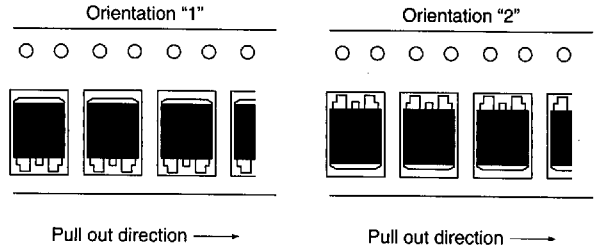
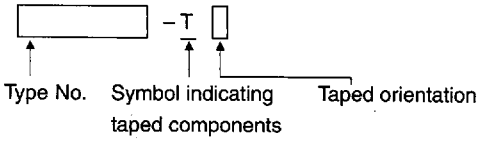
Standard outline	Standard forming outline A1		
		Dimensions	$a=4.6$ $b=14\text{min.}$ ※Dimensions measured during processing
			Unit : mm

LEAD FORMING OUTLINE AND TAPING

TAPING

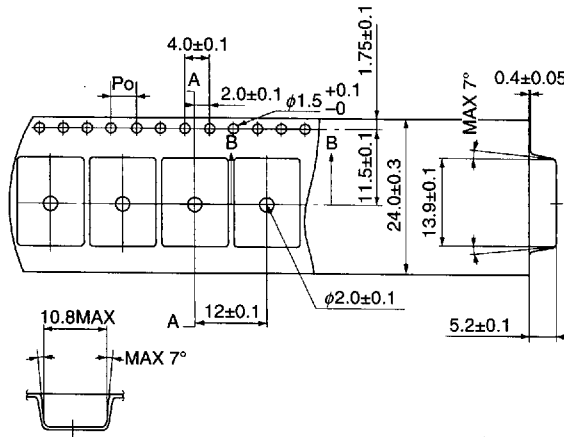
(1) TO-220S

(a) Marking



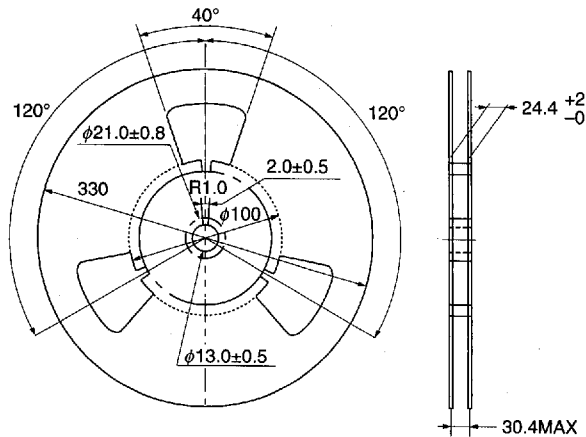
(b) Taping

- Tape shape and dimensions



Notice : The cumulative pitch error of Po (Free hole pitch) is $\pm 0.2\text{mm}$ per 10 pitches.

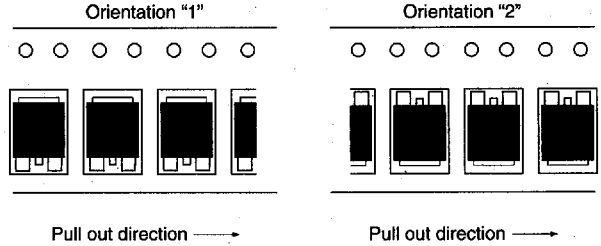
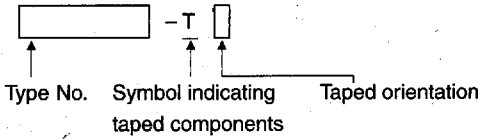
- Reel shape and dimensions



LEAD FORMING OUTLINE AND TAPING

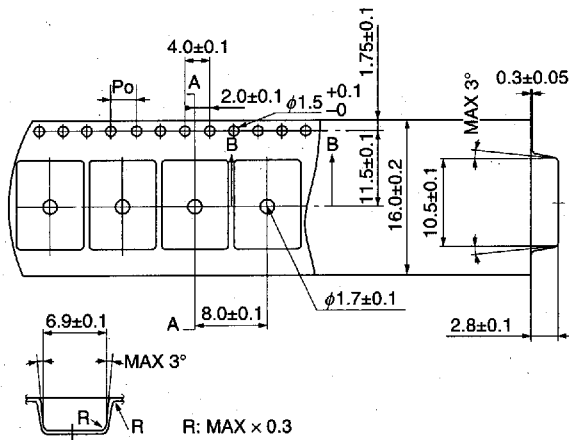
(2) MP-3

(a) Marking



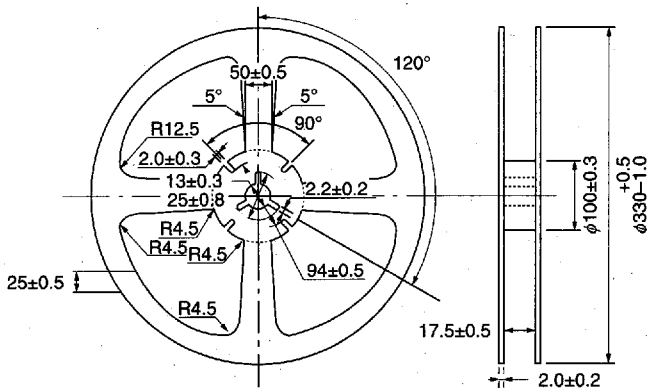
(b) Taping

- Tape shape and dimensions



Notice : The cumulative pitch error of P_o (Free hole pitch) is $\pm 0.2\text{mm}$ per 10 pitches.

- Reel shape and dimensions

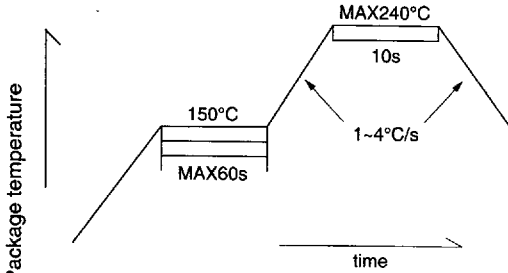


LEAD FORMING OUTLINE AND TAPING

Recommended conditions for surface mounting type

Outline : TO-220S, MP-3

- (1) Board : Alumina, Insulated metal board
- (2) Solder plate thickness : 150 μ m-250 μ m
- (3) Temperature profile

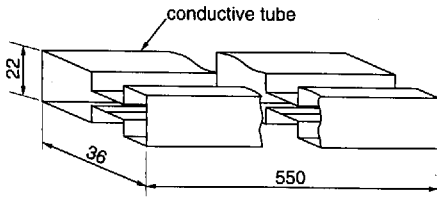


Infrared rays reflow temperature profile

Individual package for lead forming outline

- (1) TO-220, TO-220FN, TO-220C, TO-220S

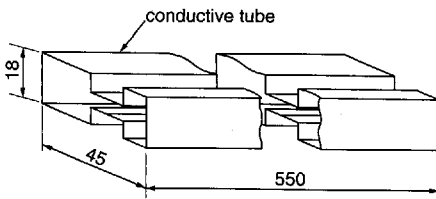
Dimensions in (Unit : mm)



The capacity is 50 p.c.s. (max.)

- (2) TO-3P

Dimensions in (Unit : mm)



The capacity is 30 p.c.s. (max.)