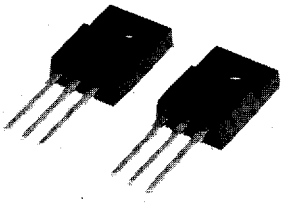
FS12KM-5

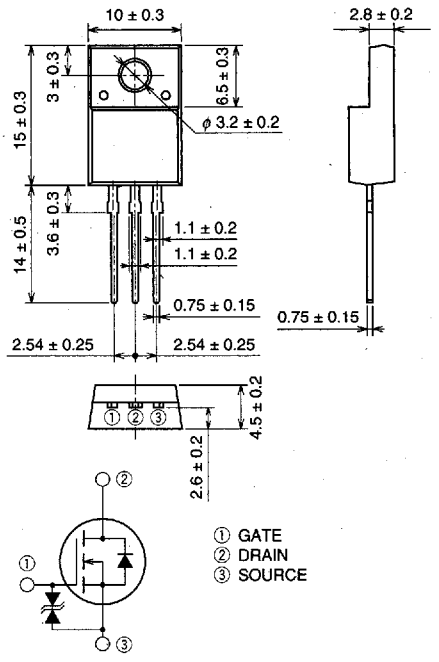
HIGH-SPEED SWITCHING USE

FS12KM-5



- V_{DSS} 250V
- $r_{DS\ (ON)}$ (MAX) 0.40Ω
- I_D 12A
- V_{iso} 2000V

OUTLINE DRAWING Dimensions in mm



TO-220FN

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)

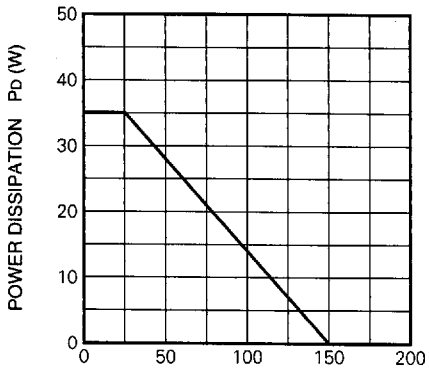
Symbol	Parameter	Conditions	Ratings	Unit
V_{DSS}	Drain-source voltage	V_{GS} = 0V	250	V
V_{GSS}	Gate-source voltage	V_{DS} = 0V	±30	V
I_D	Drain current		12	A
I_{DM}	Drain current (Pulsed)		36	A
P_D	Maximum power dissipation		35	W
T_{ch}	Channel temperature		−55 ~ +150	°C
T_{stg}	Storage temperature		−55 ~ +150	°C
V_{iso}	Isolation voltage	AC for 1minute, Terminal to case	2000	Vrms
—	Weight	Typical value	2.0	g

ELECTRICAL CHARACTERISTICS (Tch = 25°C)

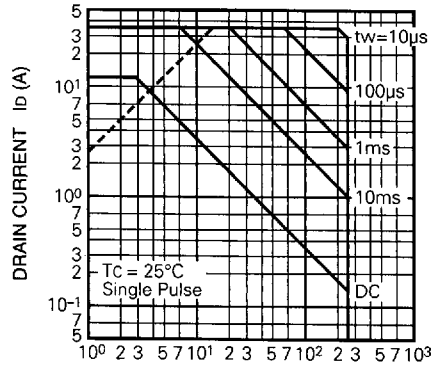
Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1mA, V_{GS} = 0V	250	—	—	V
$V_{(BR)GSS}$	Gate-source breakdown voltage	I_G = ±100μA, V_{DS} = 0V	±30	—	—	V
I_{GSS}	Gate leakage current	V_{GS} = ±25V, V_{DS} = 0V	—	—	±10	μA
I_{DSS}	Drain current	V_{DS} = 250V, V_{GS} = 0V	—	—	1	mA
$V_{GS(th)}$	Gate-source threshold voltage	I_D = 1mA, V_{DS} = 10V	2	3	4	V
$r_{DS(ON)}$	Drain-source on-state resistance	I_D = 6A, V_{GS} = 10V	—	0.32	0.40	Ω
$V_{DS(ON)}$	Drain-source on-state voltage	I_D = 6A, V_{GS} = 10V	—	1.90	2.40	V
$\|y_{fs}\|$	Forward transfer admittance	I_D = 6A, V_{DS} = 10V	5.0	7.5	—	S
C_{iss}	Input capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz	—	720	—	pF
C_{oss}	Output capacitance		—	150	—	pF
C_{rss}	Reverse transfer capacitance		—	30	—	pF
$t_{d(on)}$	Turn-on delay time	V_{DD} = 150V, I_D = 6A, V_{GS} = 10V, R_{GEN} = R_{GS} = 50Ω	—	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 = 6A, V_{GS} = 0V	—	1.5	2.0	V
$R_{th(ch-c)}$	Thermal resistance	Channel to case	—	—	3.57	°C/W

PERFORMANCE CURVES

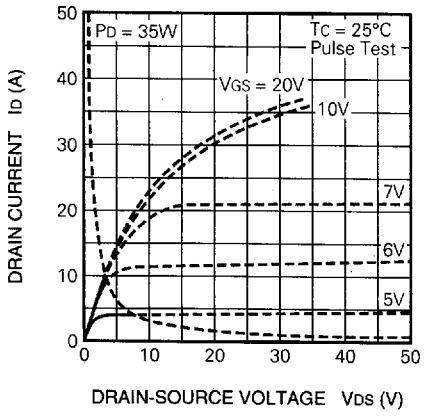
POWER DISSIPATION DERATING CURVE



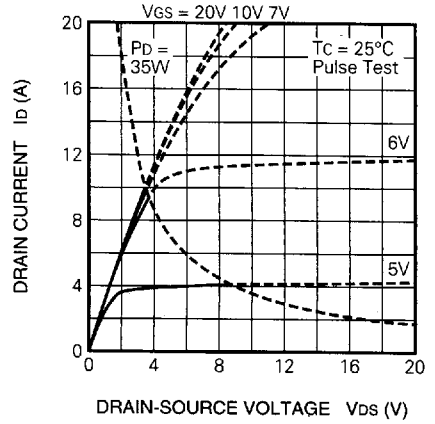
MAXIMUM SAFE OPERATING AREA



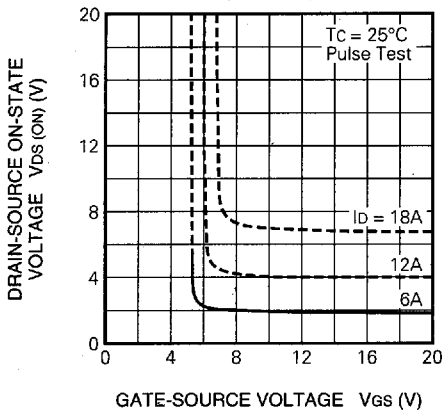
OUTPUT CHARACTERISTICS (TYPICAL)



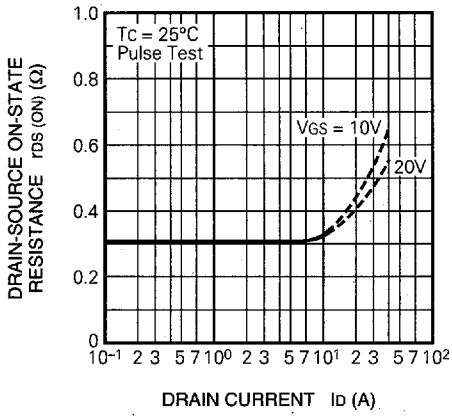
OUTPUT CHARACTERISTICS (TYPICAL)



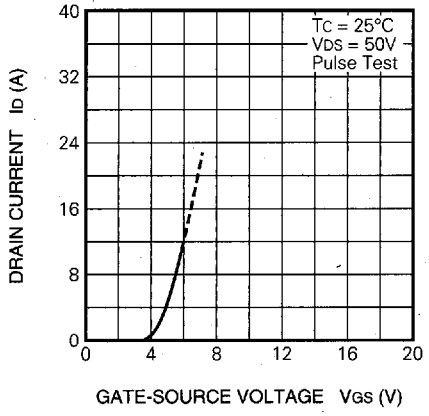
ON-STATE VOLTAGE VS. GATE-SOURCE VOLTAGE (TYPICAL)



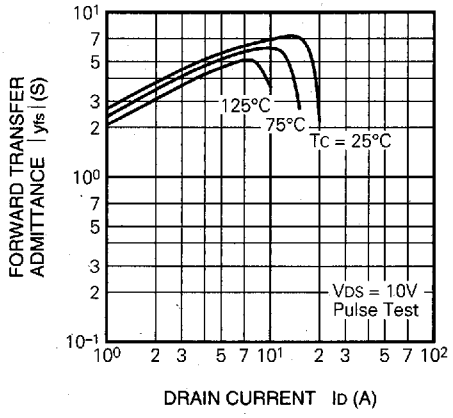
ON-STATE RESISTANCE VS. DRAIN CURRENT (TYPICAL)



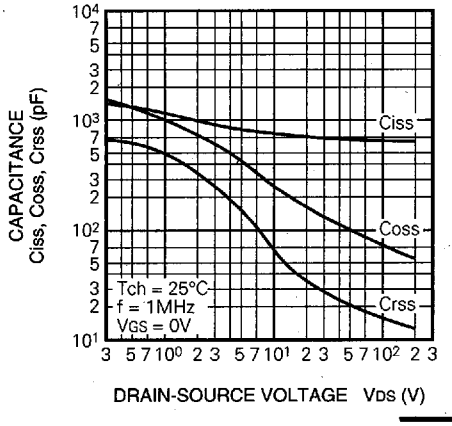
TRANSFER CHARACTERISTICS (TYPICAL)



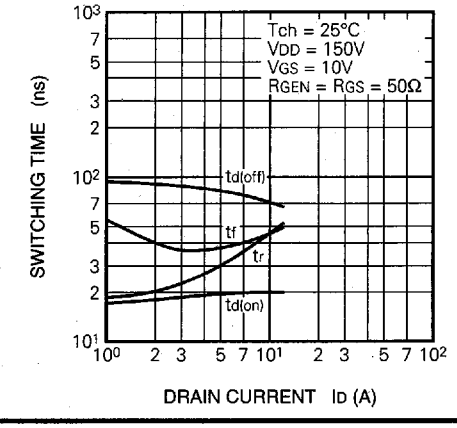
FORWARD TRANSFER ADMITTANCE VS.DRAIN CURRENT (TYPICAL)



CAPACITANCE VS. DRAIN-SOURCE VOLTAGE (TYPICAL)

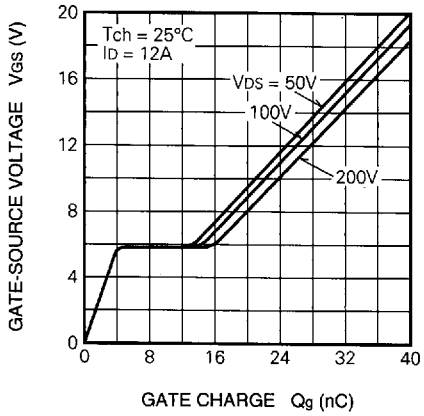


SWITCHING CHARACTERISTICS (TYPICAL)

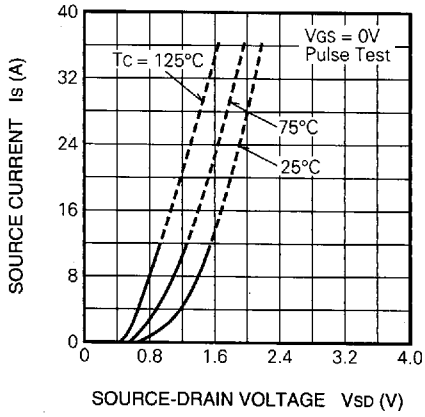


MITSUBISHI ELECTRIC

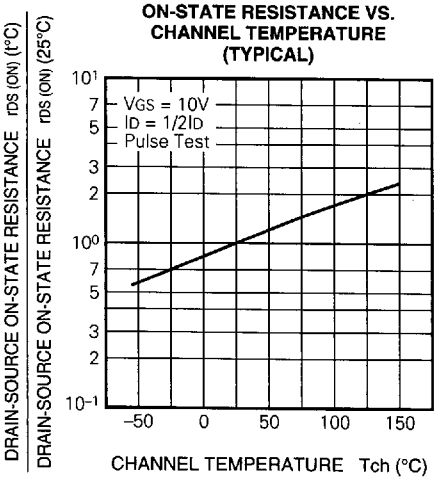
GATE-SOURCE VOLTAGE VS.GATE CHARGE (TYPICAL)



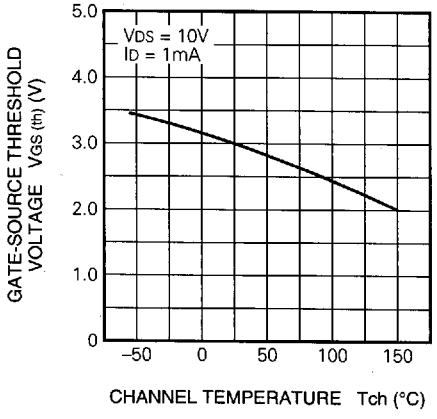
SOURCE-DRAIN DIODE FORWARD CHARACTERISTICS (TYPICAL)



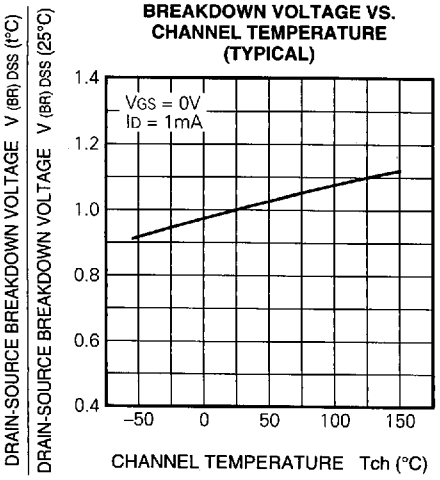
ON-STATE RESISTANCE VS. CHANNEL TEMPERATURE (TYPICAL)



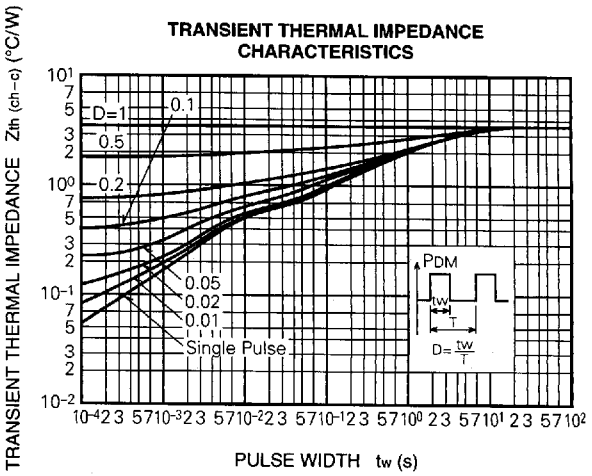
THRESHOLD VOLTAGE VS. CHANNEL TEMPERATURE (TYPICAL)



BREAKDOWN VOLTAGE VS. CHANNEL TEMPERATURE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS

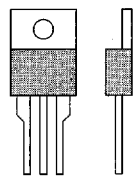
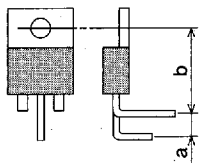
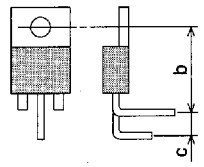
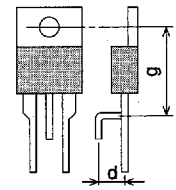
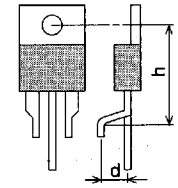
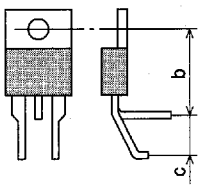
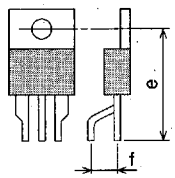
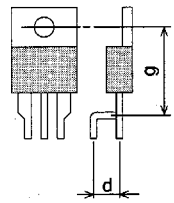
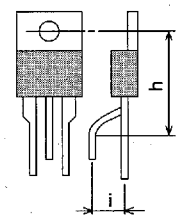


LEAD FORMING OUTLINE AND TAPING

LEAD FORMING

(1) TO-220 outline

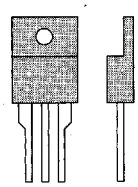
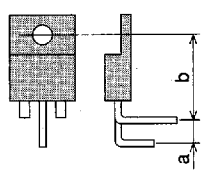
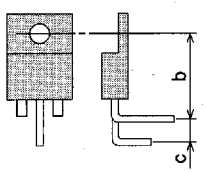
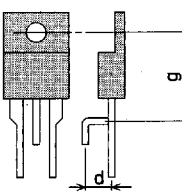
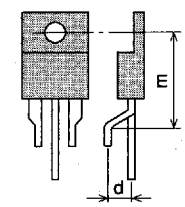
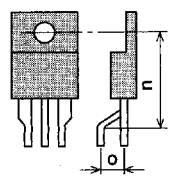
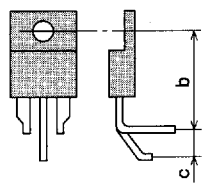
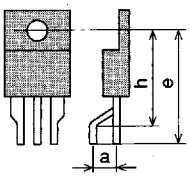
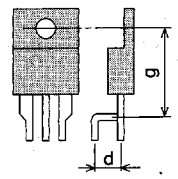
Applicable device	FS＊＊UM-＊＊A

Standard outline	Standard forming outline			
	A5	A6	A8	AA
				
AJ	AN	AS	AT	
				

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
				
AG	AH	AN	AS	
				

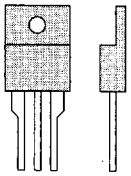
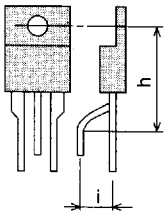
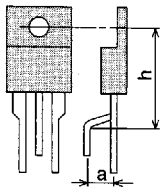
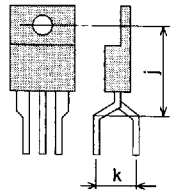
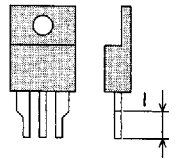
Dimensions	a=3.0±0.5, b=14.7±0.5, c=5.0±0.5, d=4.5±0.5, e=20.1±0.5, g=15.5±0.5, h=16.0±0.5, i=5.5±0.5, j=19.0±0.5, k=7.75±0.5, l=4.0±0.5, m=15.1±0.5, n=16.5±0.5, 0=3.8±0.35 ※Dimensions measured during processing	Unit : mm

MITSUBISHI ELECTRIC

LEAD FORMING OUTLINE AND TAPING

(2) TO-220 full molded outline

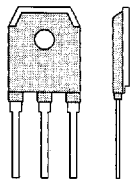
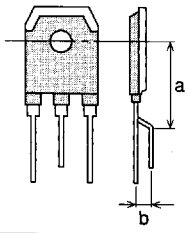
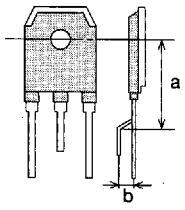
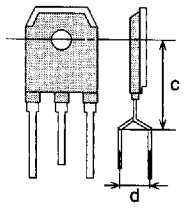
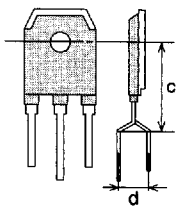
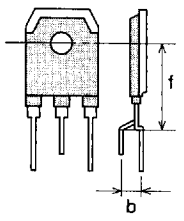
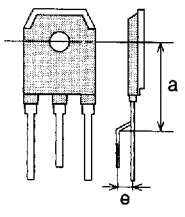
Applicable device	FS＊＊KM-＊＊A

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, 0=3.8±0.35 ※Dimensions measured during processing	Unit : mm

(3) TO-3P outline

Applicable device	FS＊＊SM-＊＊A・CT＊＊SM-＊＊

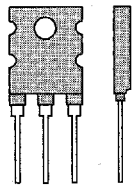
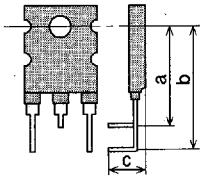
Standard outline	Standard forming outline			
	A7	A8	A9	AB
				
	AF	AN		
				

Dimensions	a=23.5, b=5.45, c=23, d=9.5, e=4, f=21.5 ※Dimensions measured during processing	Unit : mm

LEAD FORMING OUTLINE AND TAPING

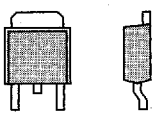
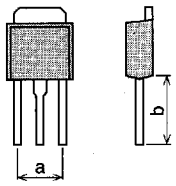
(4) TO-3PL outline

Applicable device	CT＊＊AM-＊＊＊

Standard outline	Standard forming outline AC	Dimensions	Unit : mm
		a=24±0.5 b=31.5±0.5 c=13.3±0.6 ※Dimensions measured during processing	

(5) MP-3 outline

Applicable device	FS＊＊AS-＊＊A・CT20A＊＊-8

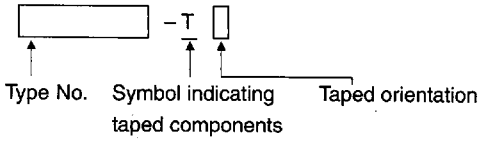
Standard outline	Standard forming outline A1	Dimensions	Unit : mm
		a=4.6 b=14min. ※Dimensions measured during processing	

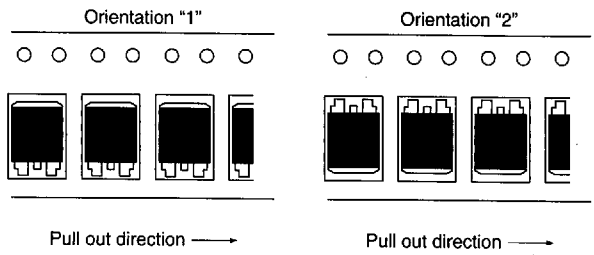
MITSUBISHI ELECTRIC

LEAD FORMING OUTLINE AND TAPING

TAPING
(1) TO-220S

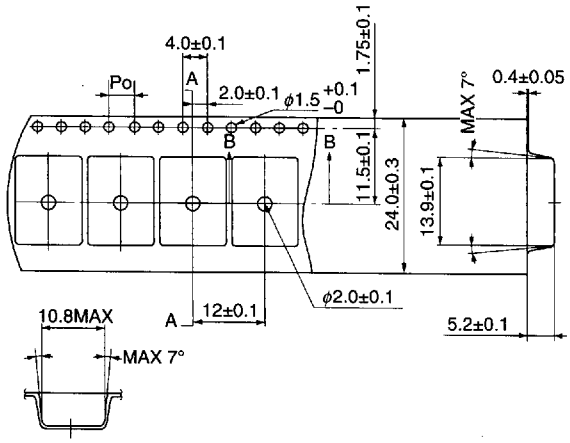
(a) Marking





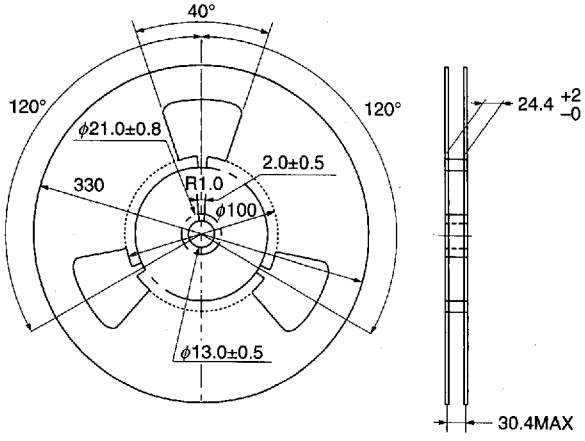
(b) Taping

• Tape shape and dimensions



Notice : The cumulative pitch error of Po (Free hole pitch) is ± 0.2mm per 10 pitches.

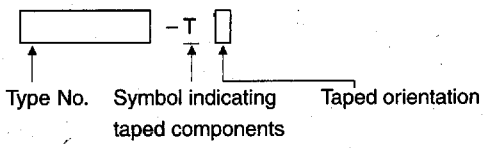
• Reel shape and dimensions

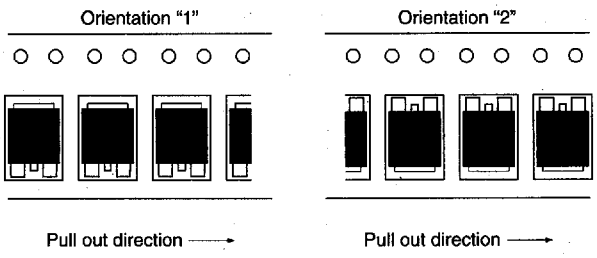


LEAD FORMING OUTLINE AND TAPING

(2) MP-3

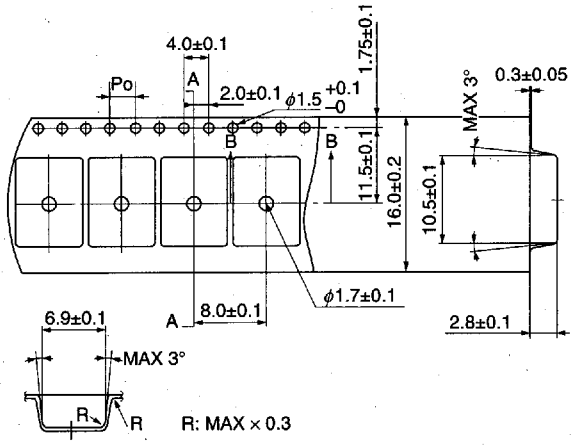
(a) Marking





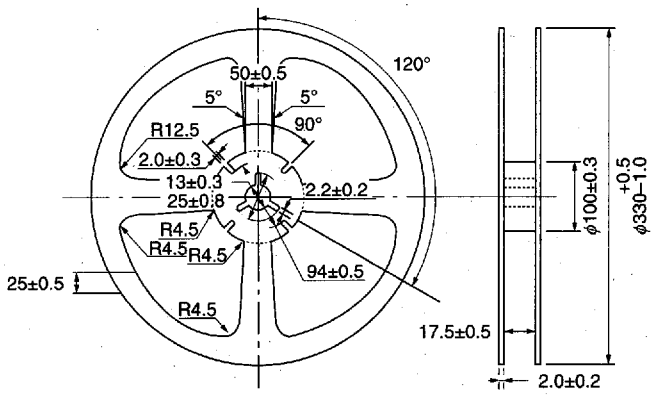
(b) Taping

• Tape shape and dimensions



Notice : The cumulative pitch error of Po (Free hole pitch) is ± 0.2mm per 10 pitches.

• Reel shape and dimensions

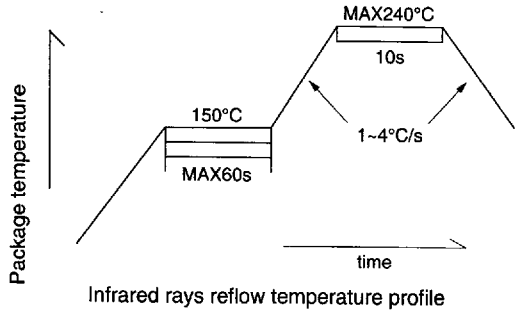


MITSUBISHI ELECTRIC

LEAD FORMING OUTLINE AND TAPING

Recommended conditions for surface mounting type
Outline : TO-220S, MP-3

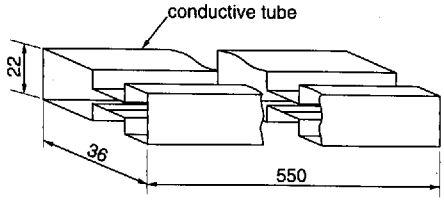
(1) Board : Alumina, Insulated metal board
(2) Solder plate thickness : 150μm~250μm
(3) Temperature profile



Infrared rays reflow temperature profile

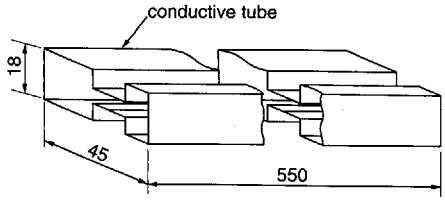
Individual package for lead forming outline

(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.)