

V_R	650V
I_F	4A
Q_C	11nC

●Features

- 1) Shorter recovery time
- 2) Reduced temperature dependence
- 3) High-speed switching possible
- 4) High surge current capability

●Applications

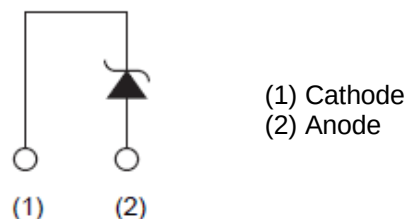
- PFC Boost Topology
- Secondary Side Rectification
- Data Center
- PV Power Conditioners

●Outline

TO-220FM



●Inner circuit



●Packaging specifications

Type	Packaging	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	50
	Packing code	C
	Marking	SCS304AM

●Absolute maximum ratings ($T_{vj}=25^{\circ}\text{C}$ unless otherwise specified)

Parameter		Symbol	Value	Unit
Reverse voltage (repetitive peak)		V_{RM}	650	V
Reverse voltage (DC)		V_R	650	V
Continuous forward current ($T_c=130^{\circ}\text{C}$)*1		I_F	4	A
Surge non-repetitive forward current	PW=10ms sinusoidal, $T_{vj}=25^{\circ}\text{C}$	I_{FSM}	27	A
	PW=10ms sinusoidal, $T_{vj}=150^{\circ}\text{C}$		22	A
	PW=10μs square, $T_{vj}=25^{\circ}\text{C}$		100	A
Repetitive peak forward current		I_{FRM}	17 *2	A
i^2t value	$1 \leq PW \leq 10\text{ms}$, $T_{vj}=25^{\circ}\text{C}$	$\int i^2 dt$	3.6	A^2s
	$1 \leq PW \leq 10\text{ms}$, $T_{vj}=150^{\circ}\text{C}$		2.4	A^2s
Total power dissipation		P_D	26 *3	W
Virtual Junction temperature		T_{vj}	175	$^{\circ}\text{C}$
Range of storage temperature		T_{stg}	-55 to +175	$^{\circ}\text{C}$

*1 Limited by maximum T_{vj} and for Max. R_{thJC} . *2 $T_c=100^{\circ}\text{C}$, $T_{vj}=150^{\circ}\text{C}$, Duty cycle=10% *3 $T_c=25^{\circ}\text{C}$

● **Electrical characteristics** ($T_{vj}=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V_{DC}	$I_R=20\mu A$	650	-	-	V
Forward voltage	V_F	$I_F=4A, T_{vj}=25^{\circ}C$	-	1.35	1.50	V
		$I_F=4A, T_{vj}=150^{\circ}C$	-	1.44	1.71	V
		$I_F=4A, T_{vj}=175^{\circ}C$	-	1.50	-	V
Reverse current	I_R	$V_R=650V, T_{vj}=25^{\circ}C$	-	0.012	20	μA
		$V_R=650V, T_{vj}=150^{\circ}C$	-	0.8	80	μA
		$V_R=650V, T_{vj}=175^{\circ}C$	-	2.4	-	μA
Total capacitance	C	$V_R=1V, f=1MHz$	-	200	-	pF
		$V_R=650V, f=1MHz$	-	18	-	pF
Total capacitive charge	Q_C	$V_R=400V, di/dt=350A/\mu s$	-	11	-	nC
Switching time	t_C	$V_R=400V, di/dt=350A/\mu s$	-	14	-	ns
Non-repetitive Avaranche Energy	E_{ava}	$L=1mH$	-	48	-	mJ

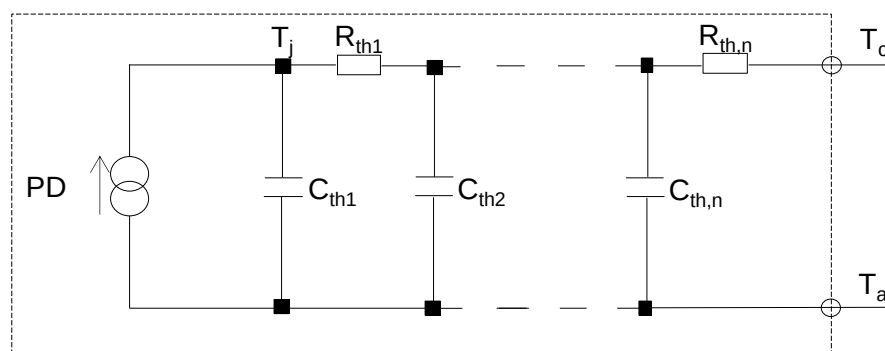
●Thermal characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	R_{thJC}	-	-	4.9	5.7	K/W

● Typical Transient Thermal Characteristics

Symbol	Value	Unit
R_{th1}	4.95E-01	K/W
R_{th2}	2.26E+00	
R_{th3}	2.14E+00	

Symbol	Value	Unit
C_{th1}	2.20E-04	Ws/K
C_{th2}	1.13E-03	
C_{th3}	2.85E-01	



●Electrical characteristic curves

Fig.1 $V_F - I_F$ Characteristics

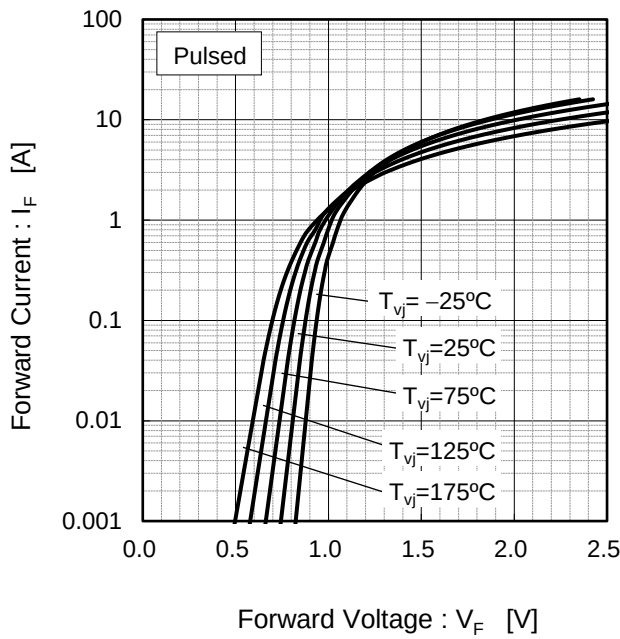


Fig.2 $V_F - I_F$ Characteristics

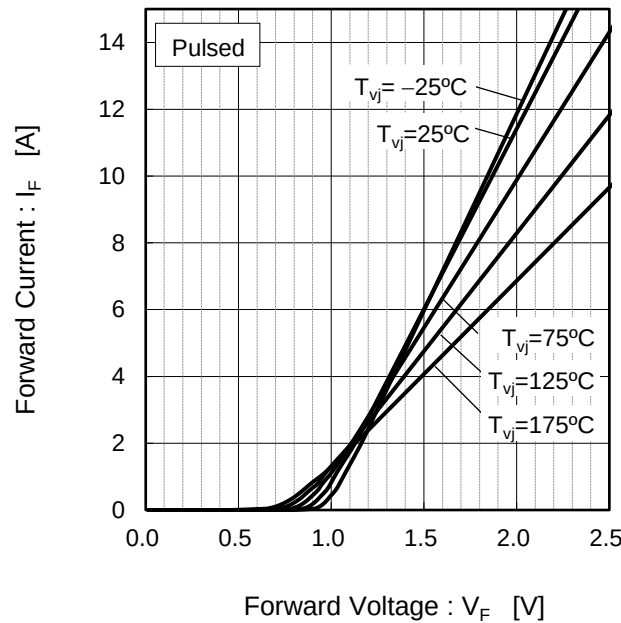


Fig.3 $V_R - I_R$ Characteristics

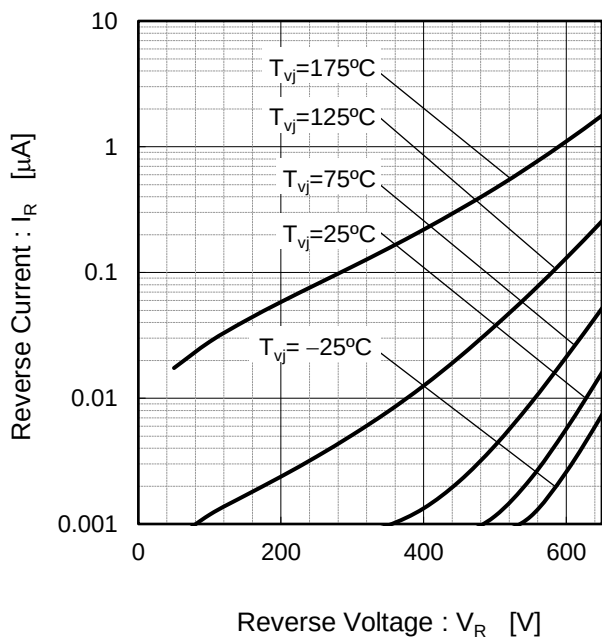
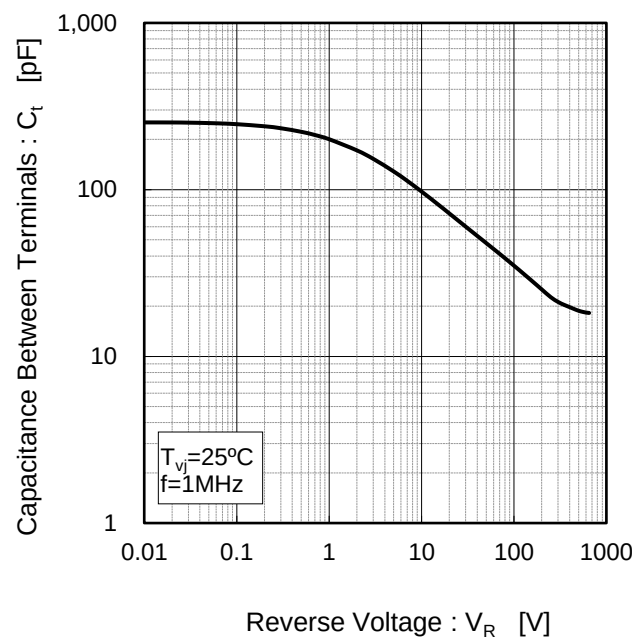


Fig.4 $V_R - C_t$ Characteristics



●Electrical characteristic curves

Fig.5 Typical Transient Thermal Impedance vs. Pulse Width

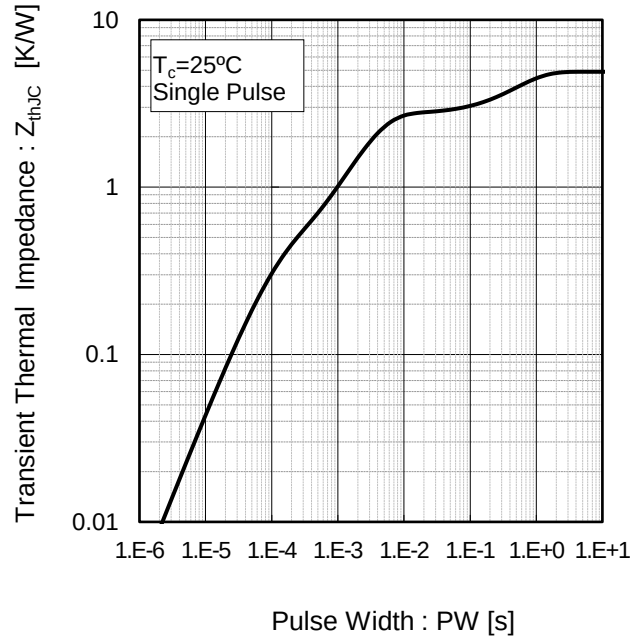


Fig.6 Power Dissipation

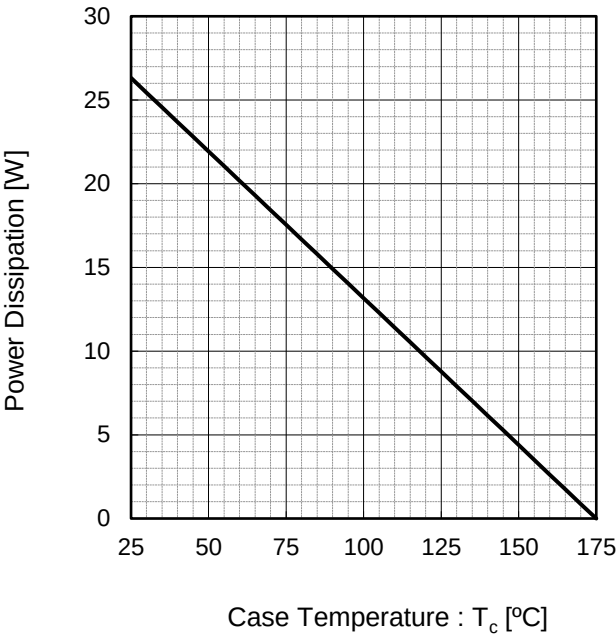
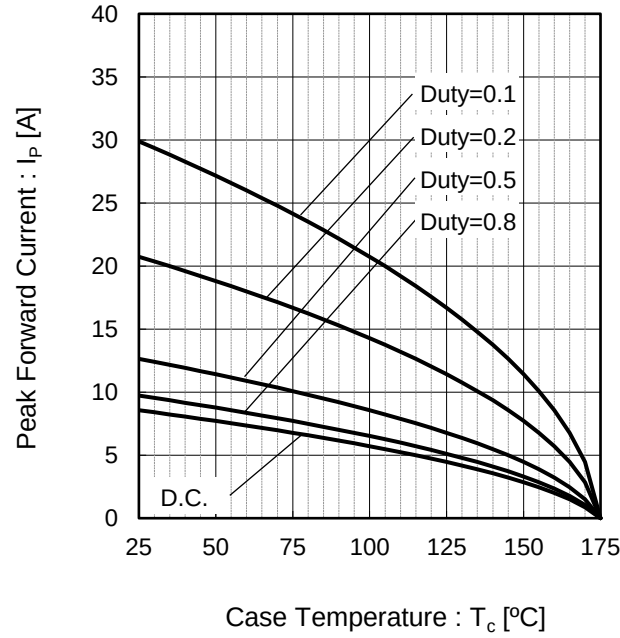
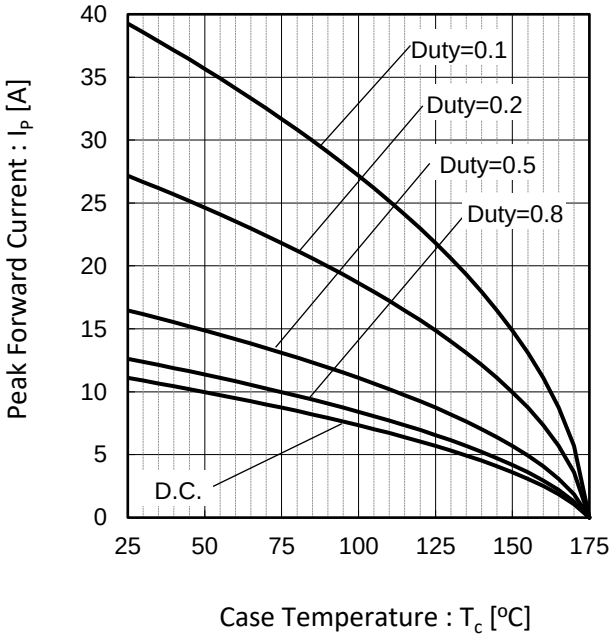


Fig.7*4 Maximum peak forward current derating curve $I_P - T_c$



*4 Based on max V_f , max R_{thJC}
Valid for switching of above 10kHz,
excluding D.C. curve.

Fig.8*5 Typical peak forward current derating curve $I_P - T_c$ (Not guaranteed)



*5 Based on typ V_f , typ R_{thJC}
Typical value, not guaranteed
Valid for switching of above 10kHz,
excluding D.C. curve

●Electrical characteristic curves

Fig.9 Surge non-repetitive forward current vs. Pulse width (Sinusoidal waveform)

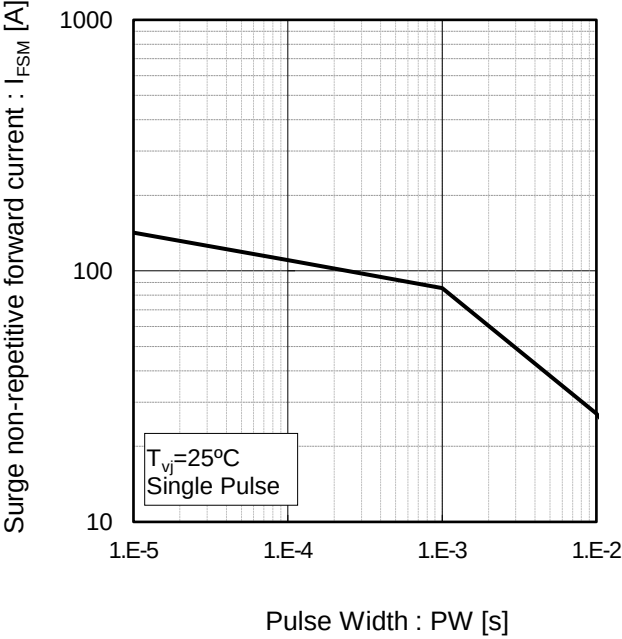
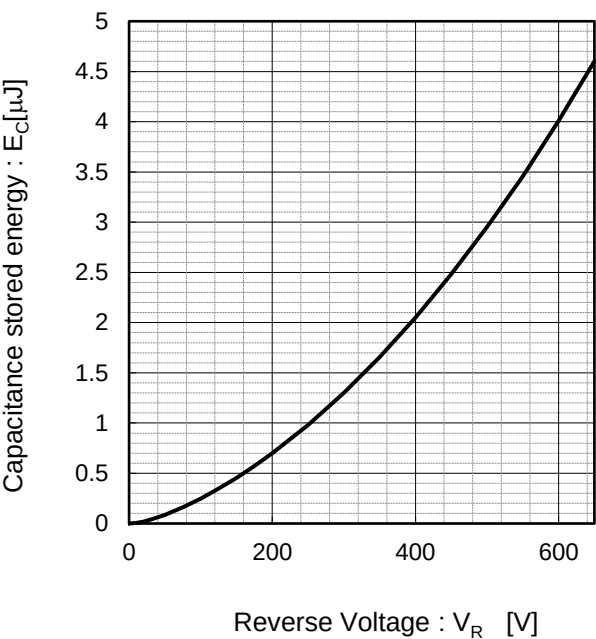
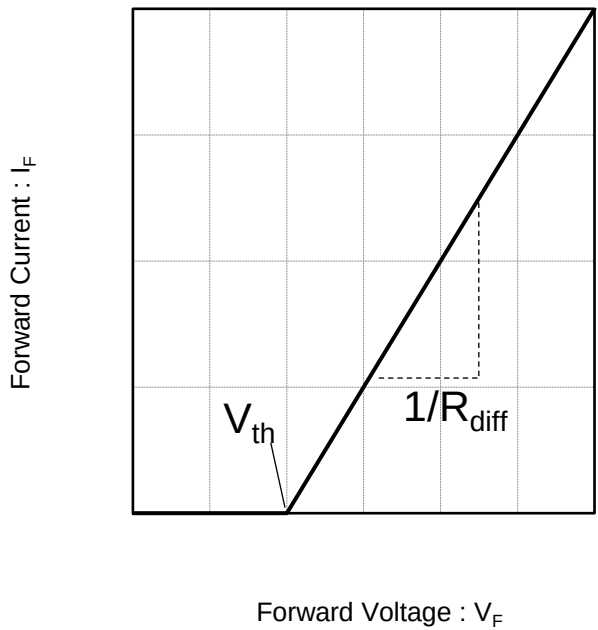


Fig.10 Typical capacitance store energy



●Simplified forward characteristic model

Fig.11 Equivalent forward current curve



$$V_F = V_{th} + R_{diff} I_F$$

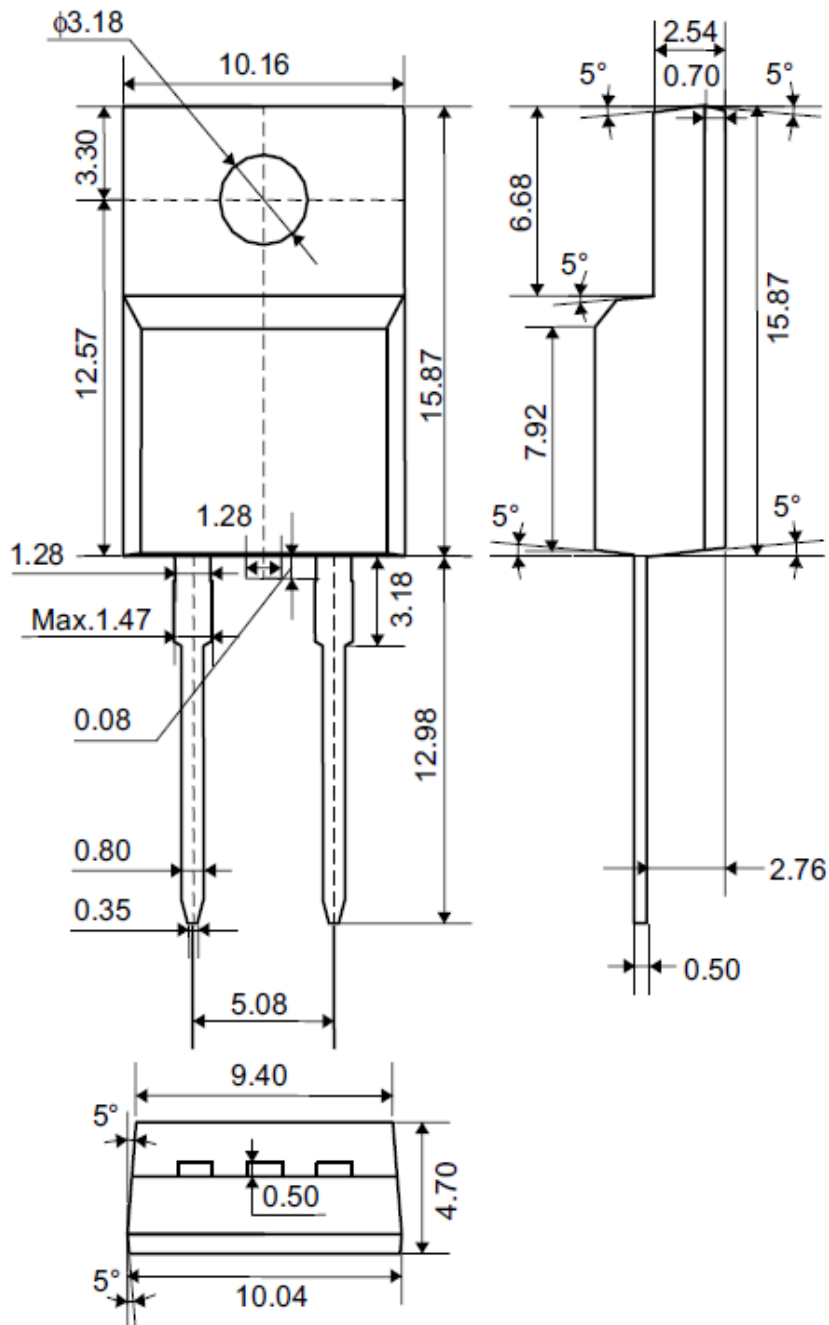
$$V_{th}(T_{vj}) = a_0 + a_1 T_{vj}$$
$$R_{diff}(T_{vj}) = b_0 + b_1 T_{vj} + b_2 T_{vj}^2$$

Symbol	Typical Value	Unit
a ₀	9.66E-01	V
a ₁	-1.10E-03	V/°C
b ₀	8.80E-02	Ω
b ₁	1.87E-04	Ω/°C
b ₂	1.92E-06	Ω/°C ²

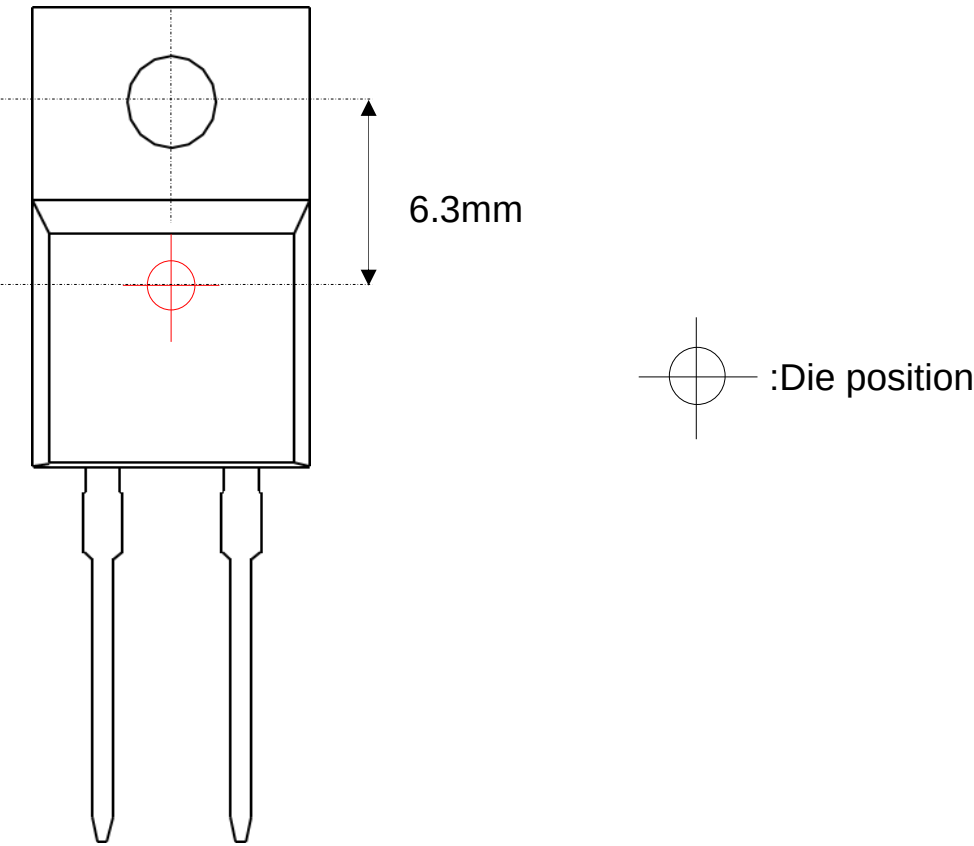
T_{vj} in °C; -55 °C < T_{vj} < 175°C ; I_F < 8 A

● **Dimensions** (Unit : mm)

TO-220FM (2pin)



●Die Bonding Layout



- Front view of the packaging.
- Dimensions are design values.
- If the heat sink is to be installed, it should be in contact with the die bonding point.

Unit: mm

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