

$V_R$	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

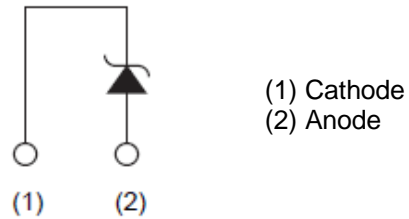
- PFC Boost Topology
- Secondary Side Rectification
- Data Center
- PV Power Conditioners

## ●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	$\text{A}^2\text{s}$
	$1 \leq PW \leq 10\text{ms}$ , $T_{vj}=150^{\circ}\text{C}$		2.4	$\text{A}^2\text{s}$
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<sub>vj</sub>=25°C unless otherwise specified)

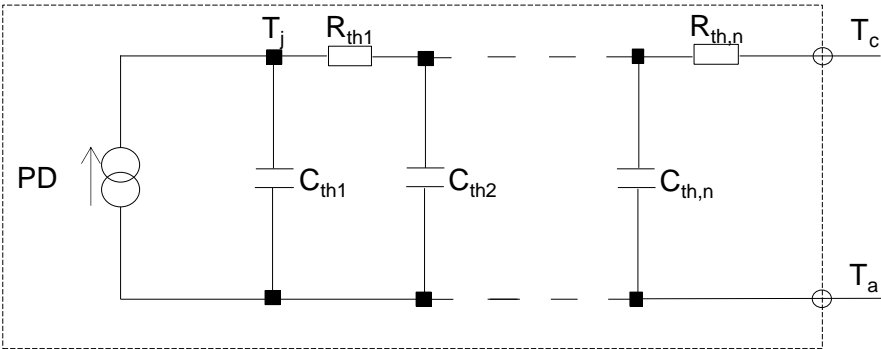
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V <sub>DC</sub>	I <sub>R</sub> =20μA	650	-	-	V
Forward voltage	V <sub>F</sub>	I <sub>F</sub> =4A, T <sub>vj</sub> =25°C	-	1.35	1.50	V
		I <sub>F</sub> =4A, T <sub>vj</sub> =150°C	-	1.44	1.71	V
		I <sub>F</sub> =4A, T <sub>vj</sub> =175°C	-	1.50	-	V
Reverse current	I <sub>R</sub>	V <sub>R</sub> =650V, T <sub>vj</sub> =25°C	-	0.012	20	μA
		V <sub>R</sub> =650V, T <sub>vj</sub> =150°C	-	0.8	80	μA
		V <sub>R</sub> =650V, T <sub>vj</sub> =175°C	-	2.4	-	μA
Total capacitance	C	V <sub>R</sub> =1V, f=1MHz	-	200	-	pF
		V <sub>R</sub> =650V, f=1MHz	-	18	-	pF
Total capacitive charge	Q <sub>C</sub>	V <sub>R</sub> =400V, di/dt=350A/μs	-	11	-	nC
Switching time	t <sub>C</sub>	V <sub>R</sub> =400V, di/dt=350A/μs	-	14	-	ns
Non-repetitive Avaranche Energy	E <sub>ava</sub>	L=1mH	-	48	-	mJ

●Thermal characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	R <sub>thJC</sub>	-	-	4.9	5.7	K/W

●Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R <sub>th1</sub>	4.95E-01	K/W	C <sub>th1</sub>	2.20E-04	Ws/K
R <sub>th2</sub>	2.26E+00		C <sub>th2</sub>	1.13E-03	
R <sub>th3</sub>	2.14E+00		C <sub>th3</sub>	2.85E-01	



●Electrical characteristic curves

Fig.1  $V_F - I_F$  Characteristics

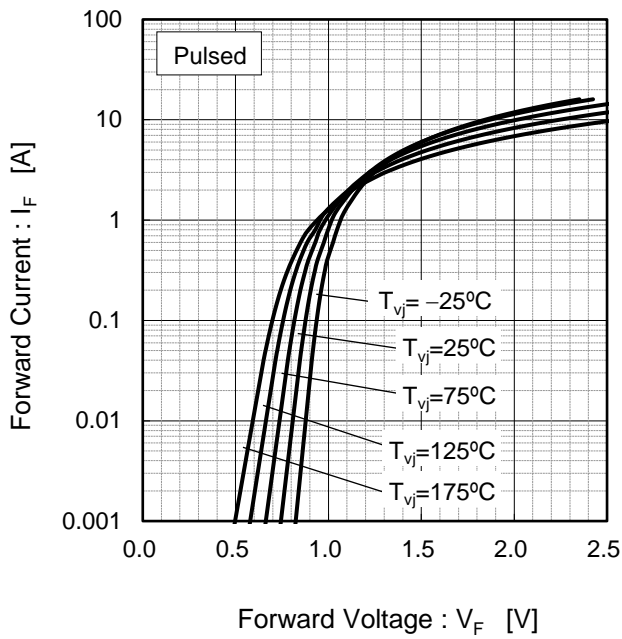


Fig.2  $V_F - I_F$  Characteristics

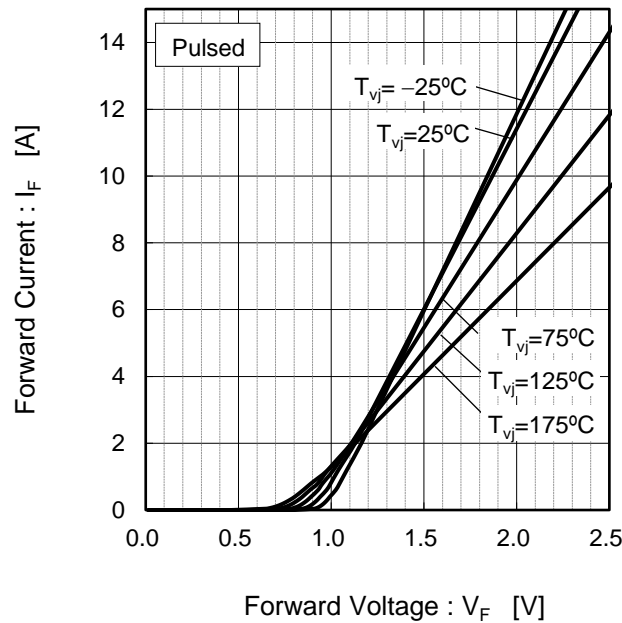


Fig.3  $V_R - I_R$  Characteristics

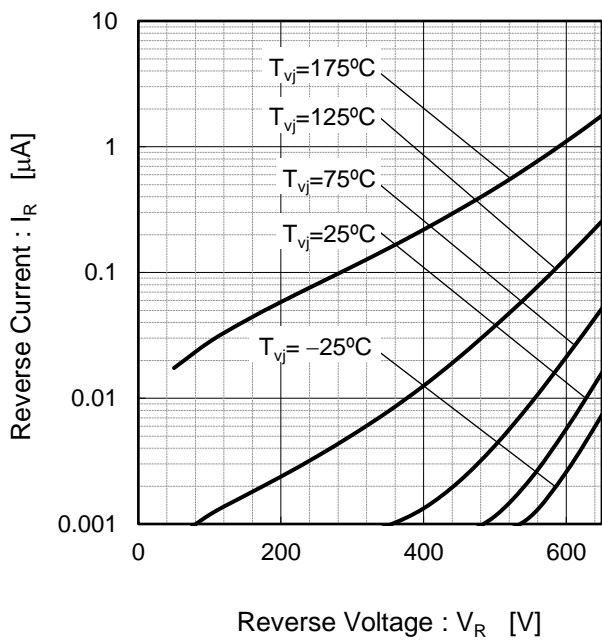
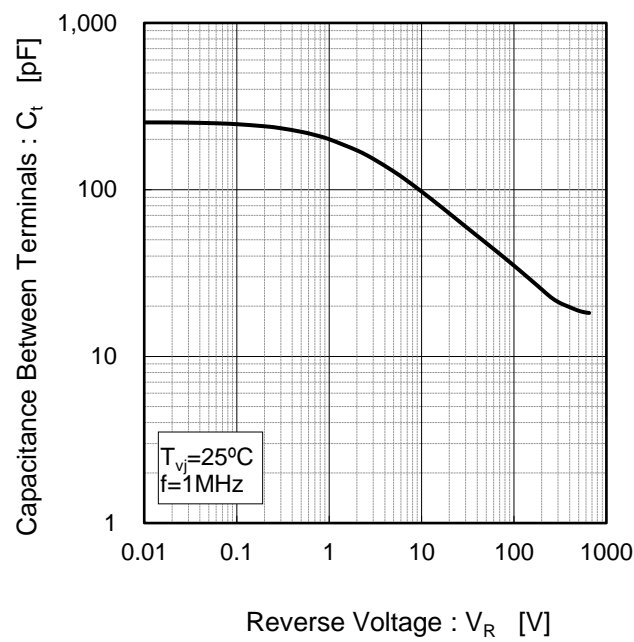


Fig.4  $V_R - C_t$  Characteristics



●Electrical characteristic curves

Fig.5 Typical Transient Thermal Impedance vs. Pulse Width

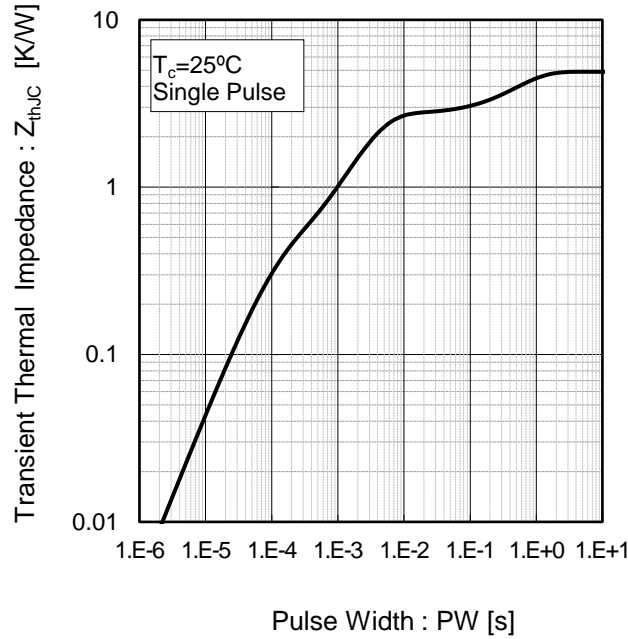


Fig.6 Power Dissipation

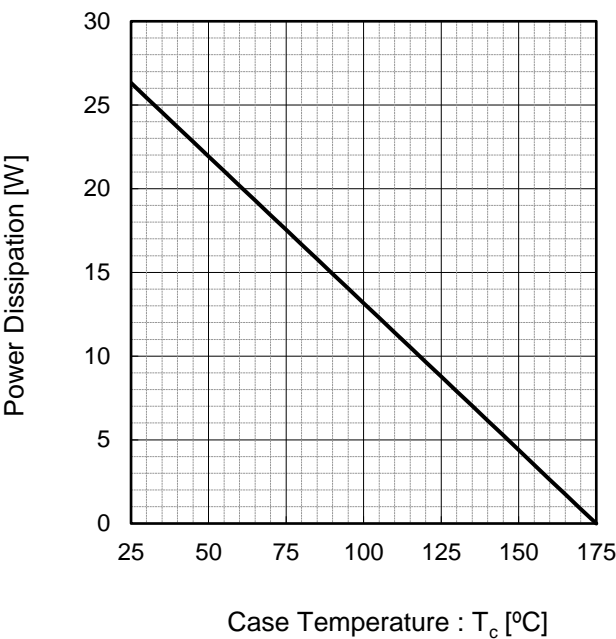
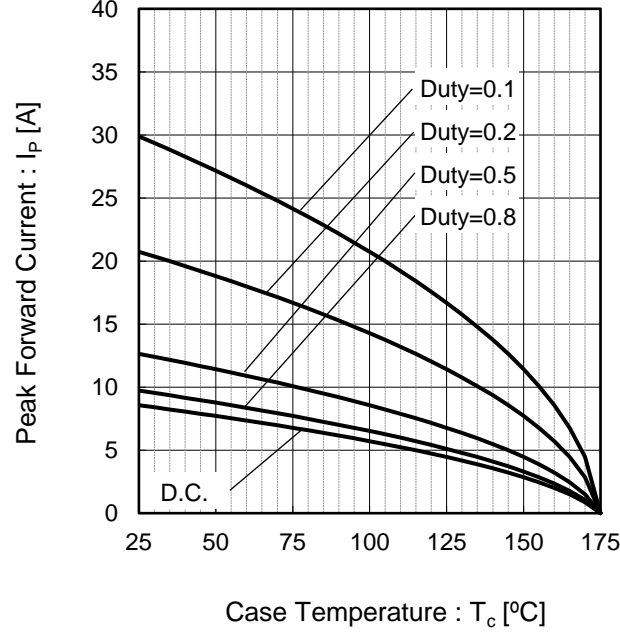
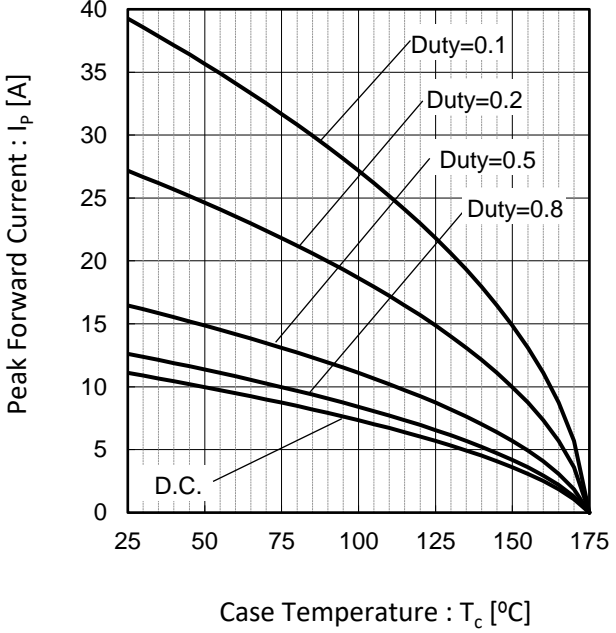


Fig.7\*4 Maximum peak forward current derating curve  $I_P - T_c$



\*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)

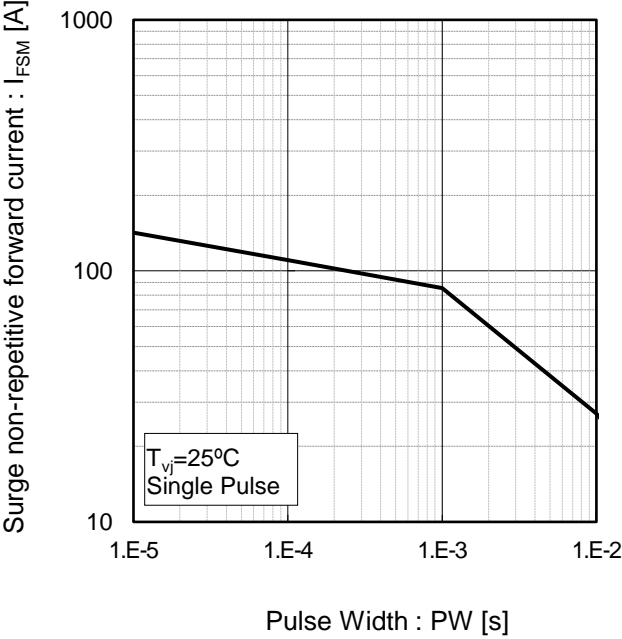
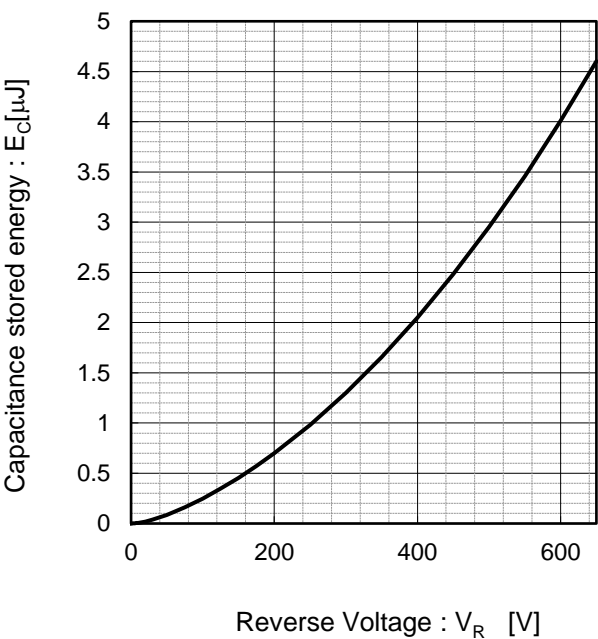
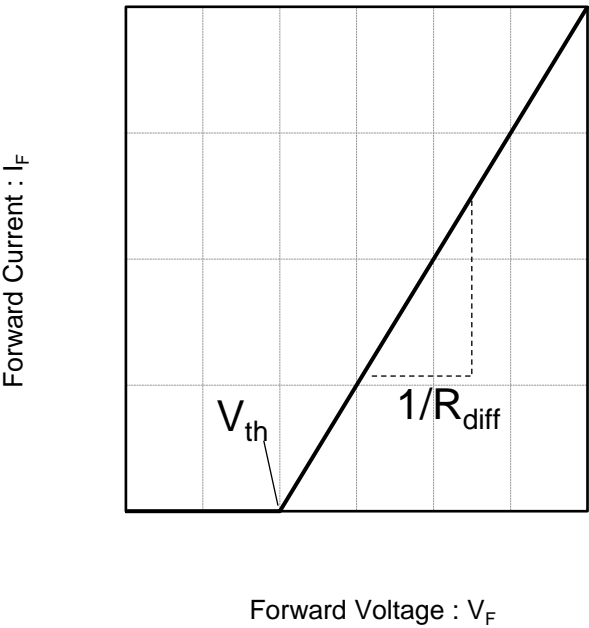


Fig.10 Typical capacitance store energy



●Simplified forward characteristic model

Fig.11 Equivalent forward current curve



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

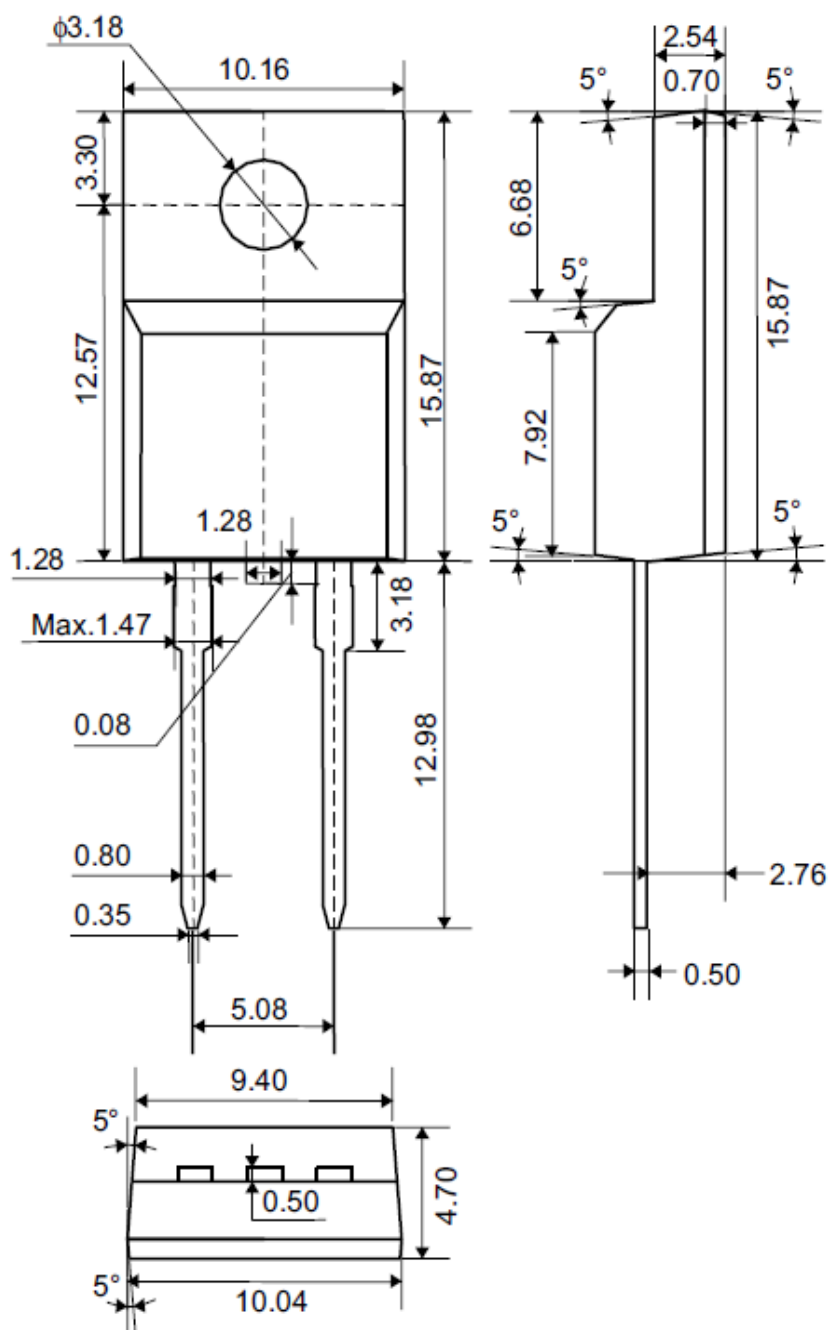
$$V_{th}(T_{vj}) = a_0 + a_1 T_{vj}$$
$$R_{diff}(T_{vj}) = b_0 + b_1 T_{vj} + b_2 T_{vj}^2$$

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

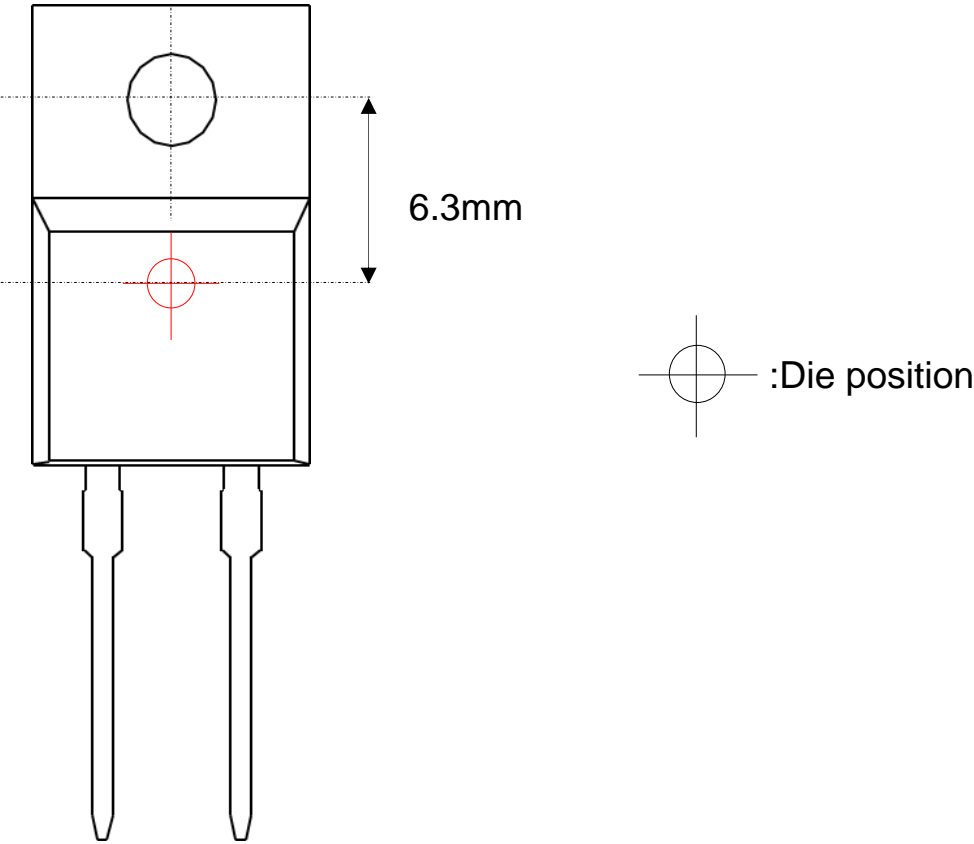
T<sub>vj</sub> in °C; -55 °C < T<sub>vj</sub> < 175°C ; I<sub>F</sub> < 8 A

● **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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