

V_R	650V
I_F	12A
Q_C	28nC

●Features

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

●Applications

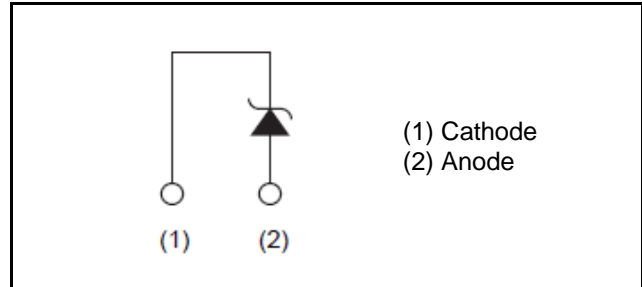
- PFC Boost Topology
- Secondary Side Rectification
- Data Center
- PV Power Conditioners

●Outline

TO-220FM-2LGE



●Inner circuit



●Packaging specifications

Type	Packaging	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	50
	Packing code	C7G
	Marking	SCS312AM

●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 ($T_c=80^{\circ}\text{C}$) *1	I_F	12	A	
Surge non-repetitive forward current	I_{FSM}	PW=10ms sinusoidal, $T_{vj}=25^{\circ}\text{C}$	96	A
		PW=10ms sinusoidal, $T_{vj}=150^{\circ}\text{C}$	81	A
		PW=10μs square, $T_{vj}=25^{\circ}\text{C}$	350	A
Repetitive peak forward current	I_{FRM}	34*2	A	
i^2t value	$\int i^2 dt$	$1 \leq PW \leq 10\text{ms}$, $T_{vj}=25^{\circ}\text{C}$	46	A^2s
		$1 \leq PW \leq 10\text{ms}$, $T_{vj}=150^{\circ}\text{C}$	32	A^2s
Total power dissipation	P_D	36*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)

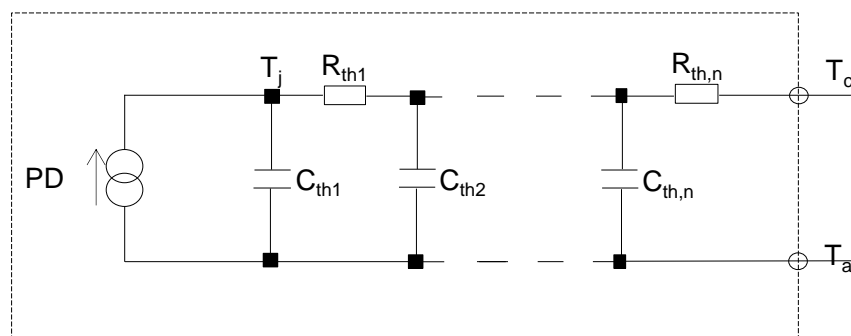
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V_{DC}	$I_R=60\mu\text{A}$	650	-	-	V
Forward voltage	V_F	$I_F=12\text{A}, T_{vj}=25^{\circ}\text{C}$	-	1.35	1.50	V
		$I_F=12\text{A}, T_{vj}=150^{\circ}\text{C}$	-	1.44	1.71	V
		$I_F=12\text{A}, T_{vj}=175^{\circ}\text{C}$	-	1.50	-	V
Reverse current	I_R	$V_R=650\text{V}, T_{vj}=25^{\circ}\text{C}$	-	0.036	60	μA
		$V_R=650\text{V}, T_{vj}=150^{\circ}\text{C}$	-	2.4	240	μA
		$V_R=650\text{V}, T_{vj}=175^{\circ}\text{C}$	-	7.2	-	μA
Total capacitance	C	$V_R=1\text{V}, f=1\text{MHz}$	-	600	-	pF
		$V_R=650\text{V}, f=1\text{MHz}$	-	55	-	pF
Total capacitive charge	Q_C	$V_R=400\text{V}, di/dt=350\text{A}/\mu\text{s}$	-	28	-	nC
Switching time	t_C	$V_R=400\text{V}, di/dt=350\text{A}/\mu\text{s}$	-	18	-	ns
Non-repetitive Avaranche Energy	E_{ava}	$L=1\text{mH}$	-	150	-	mJ

●Thermal characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	R_{thJC}	-	-	3.5	4.1	K/W

●Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R_{th1}	1.98E-01	K/W	C_{th1}	5.86E-04	Ws/K
R_{th2}	1.09E+00		C_{th2}	2.85E-03	
R_{th3}	2.21E+00		C_{th3}	2.68E-01	



●Electrical characteristic curves

Fig.1 $V_F - I_F$ Characteristics

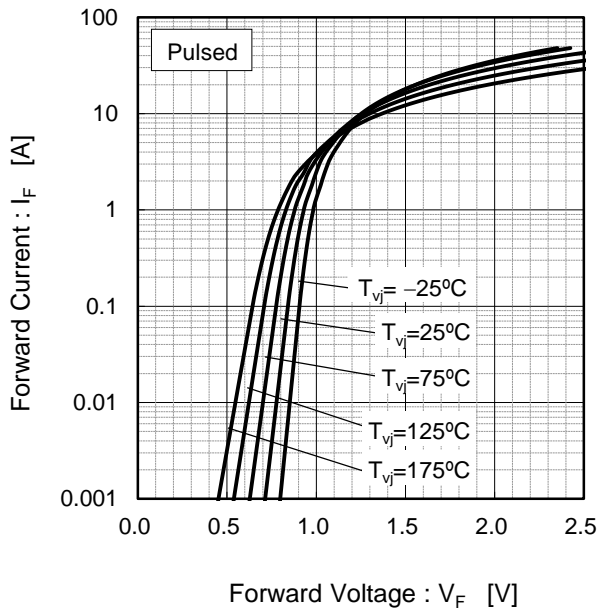


Fig.2 $V_F - I_F$ Characteristics

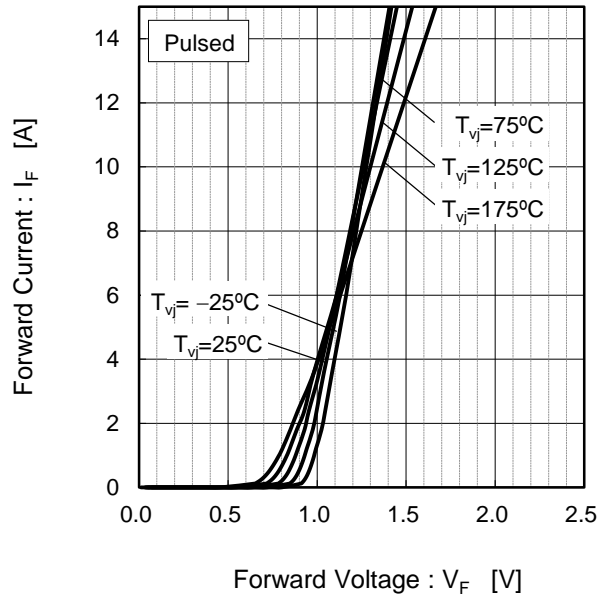


Fig.3 $V_R - I_R$ Characteristics

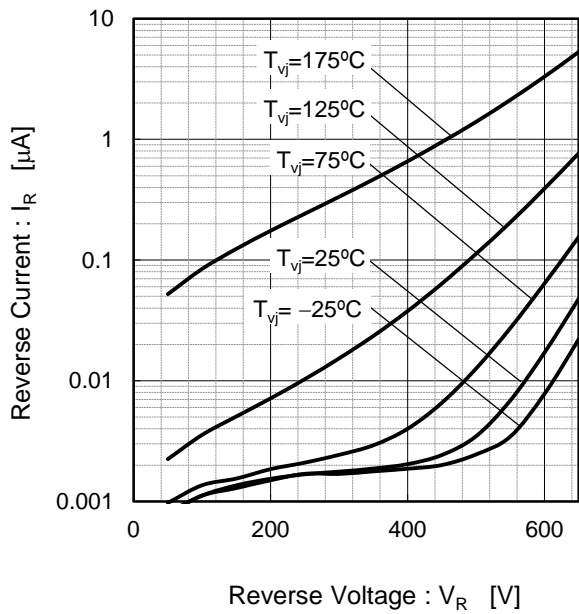
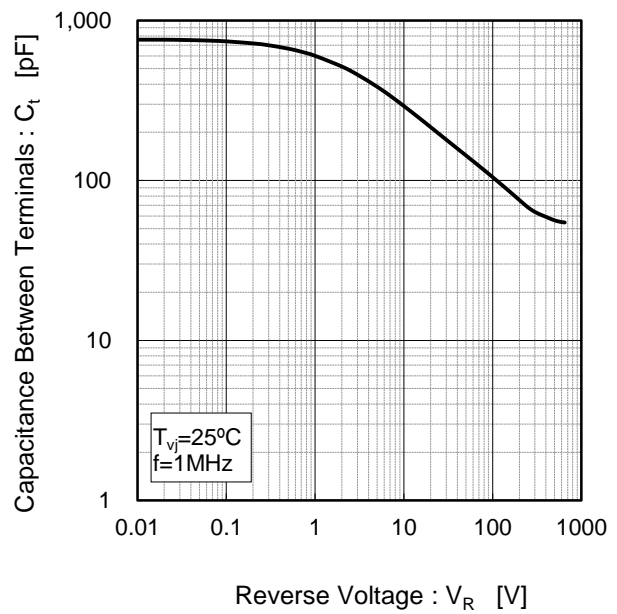


Fig.4 $V_R - C_t$ Characteristics



●Electrical characteristic curves

Fig.5 Typical Transient Thermal Impedance vs. Pulse Width

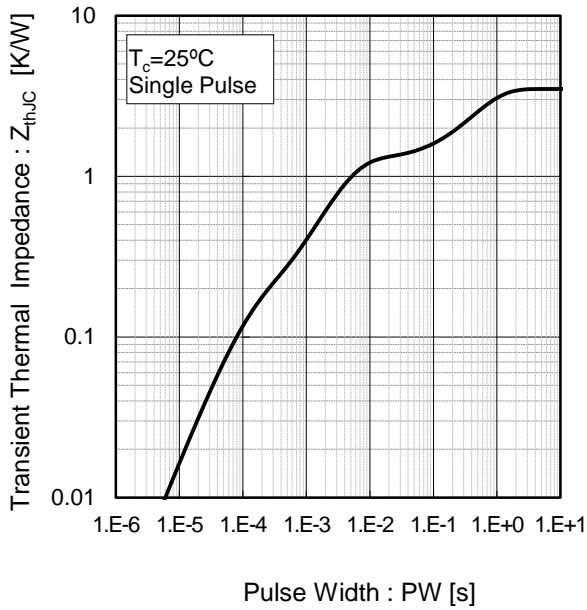


Fig.6 Power Dissipation

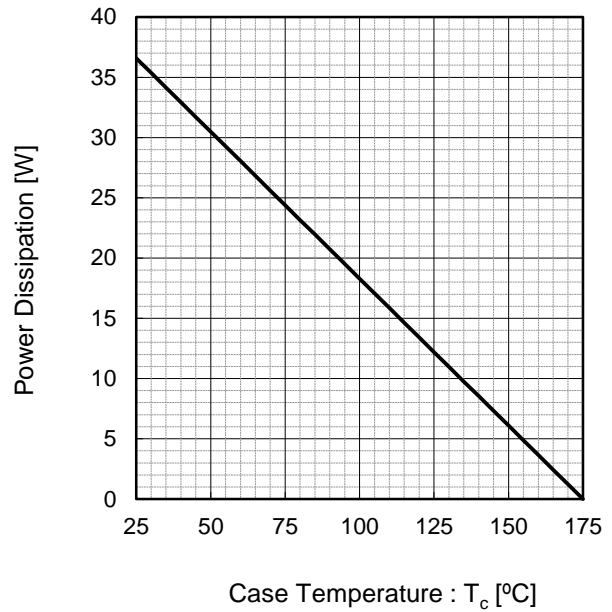
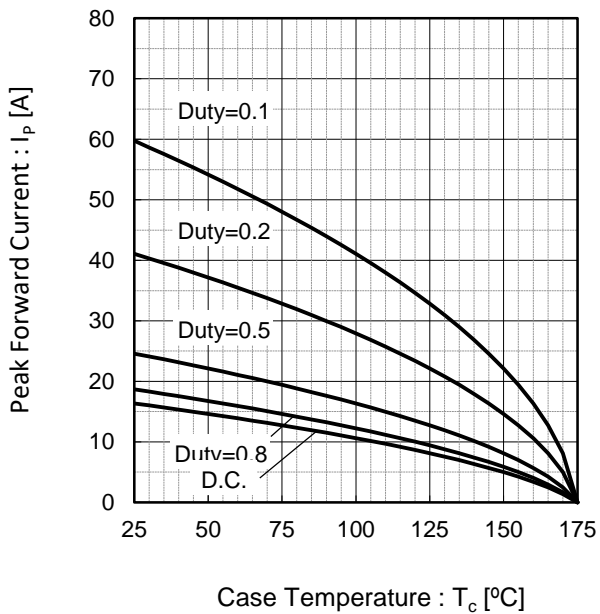
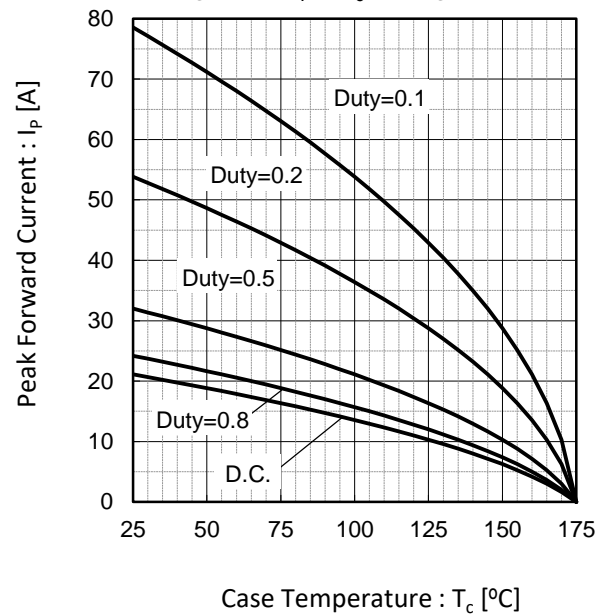


Fig.7*4 Maximum peak forward current derating curve $I_p - T_c$



*4 Based on max Vf, 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 Vf, 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)

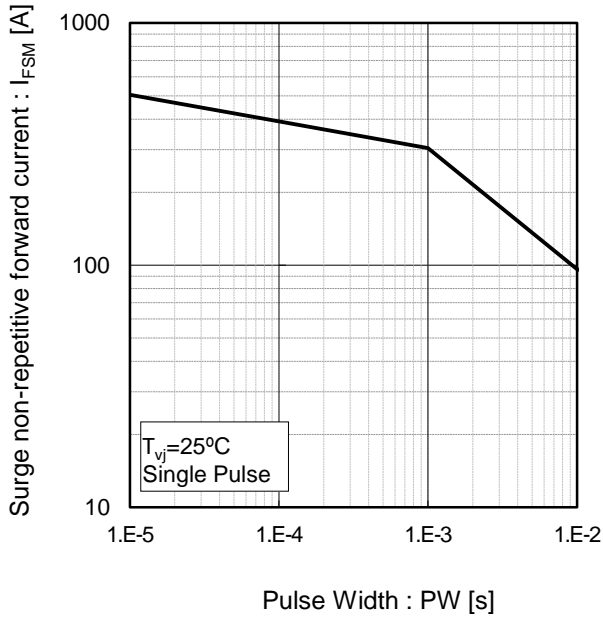
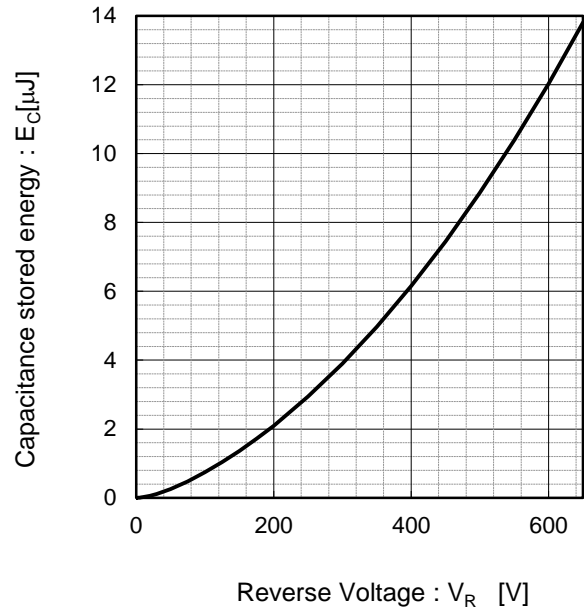
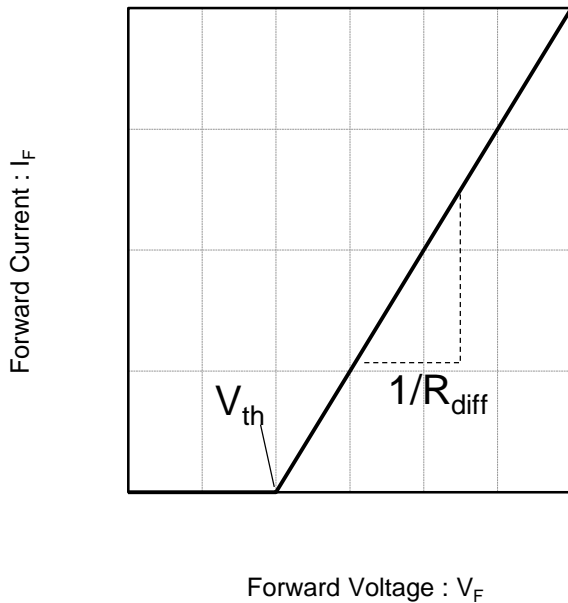


Fig.10 Typical capacitance store energy



●Simplified forward characteristic model

Fig.11 Equivalent forward current curve



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

$$V_{th} (T_{vj}) = a_0 + a_1 T_{vj}$$

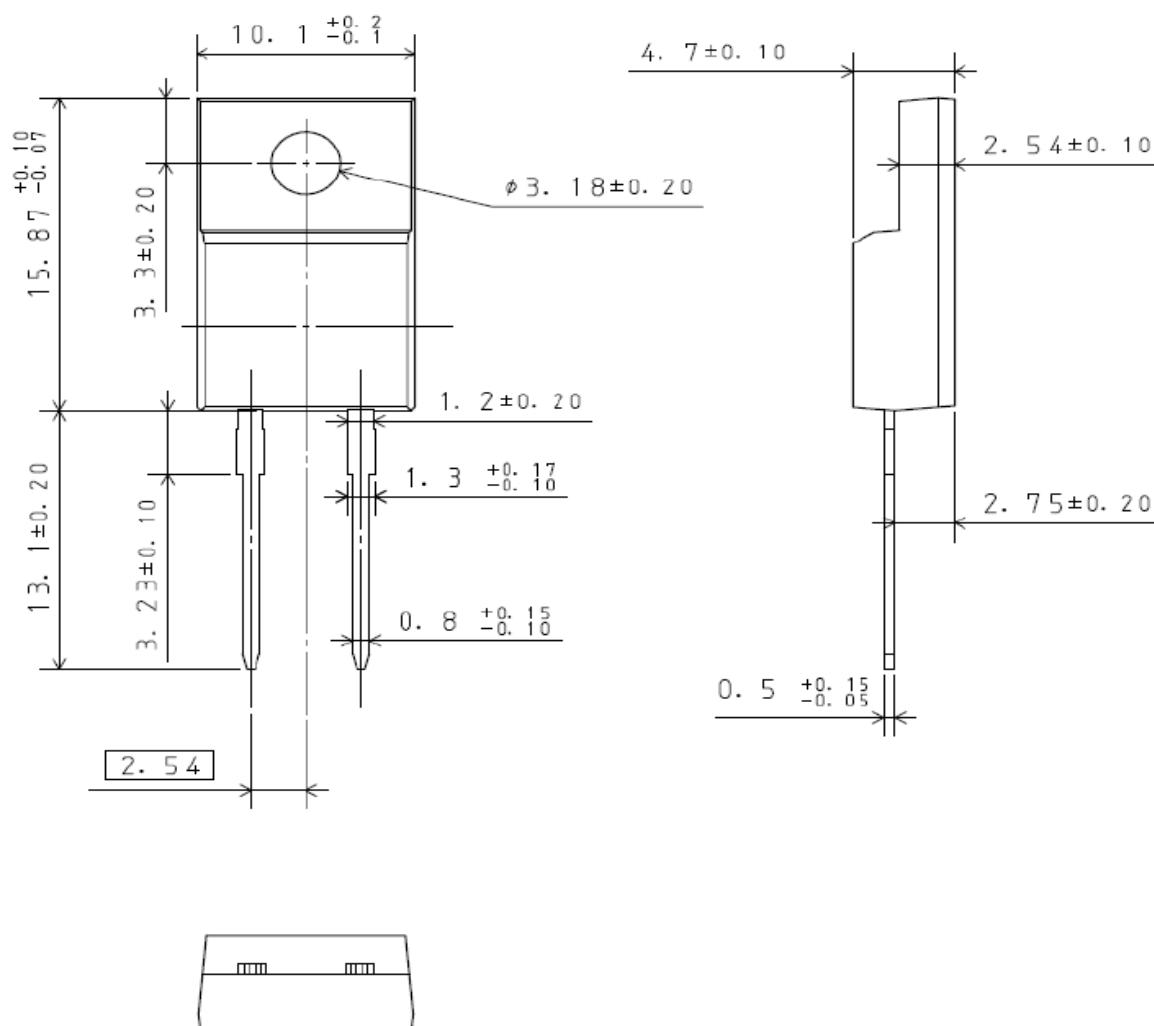
$$R_{diff} (T_{vj}) = b_0 + b_1 T_{vj} + b_2 T_{vj}^2$$

Symbol	Typical Value	Unit
a ₀	9.66E-01	V
a ₁	-1.10E-03	V/°C
b ₀	2.93E-02	Ω
b ₁	6.22E-05	Ω/°C
b ₂	6.40E-07	Ω/°C ²

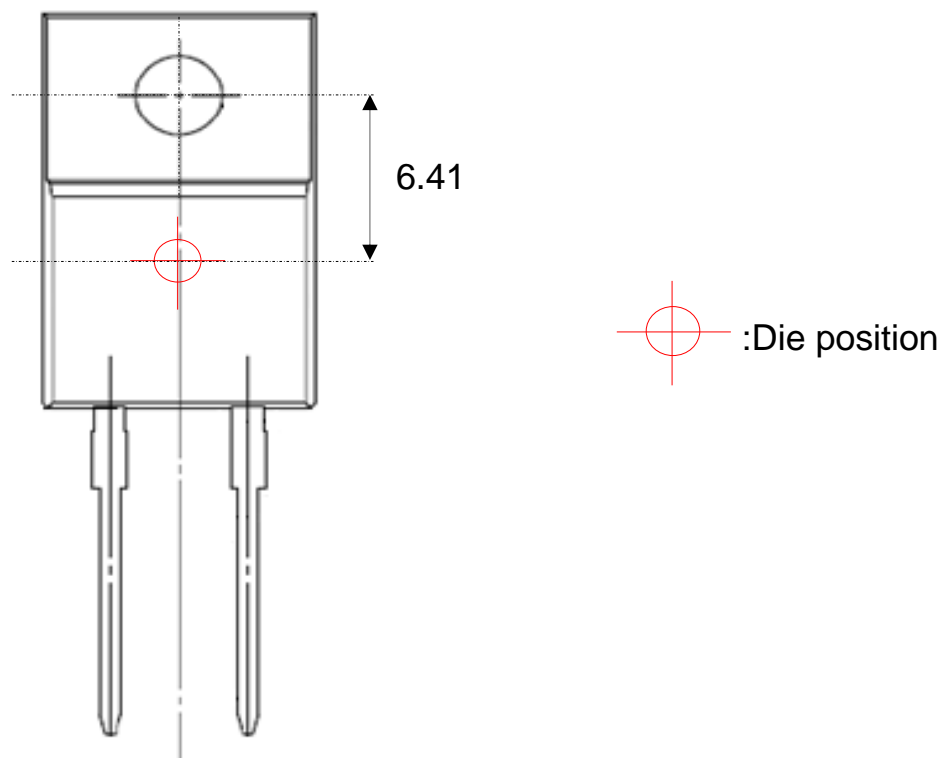
T_{vj} in °C; -55 °C < T_{vj} < 175°C ; I_F < 24 A

●Dimensions (Unit : mm)

TO-220FM-2LGE



●Die Bonding Layout (Unit : mm)



- 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.

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