

**$V_{CE} = 600\text{ V}$ ,  $I_C = 18\text{ A}$**   
**Trench IGBT**  
**FGM623S**

**Description**

The FGM623S is 600 V trench IGBT. Sanken original trench structure decreases gate capacitance, and achieves high speed switching and switching loss reduction. Thus, the IGBT can improve the efficiency of your circuit.

**Features**

- Low Saturation Voltage
  - High Speed Switching
  - Bare Lead Frame: Pb-free (RoHS Compliant)
- 
- $V_{CE}$ ----- 600 V
  - $I_C$  ( $T_C = 100\text{ }^\circ\text{C}$ )----- 18 A
  - $V_{CE(sat)}$ -----1.5 V typ.
  - $t_f$  ( $T_J = 25\text{ }^\circ\text{C}$ )----- 120 ns typ.

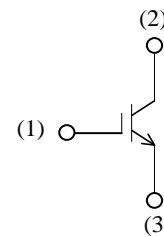
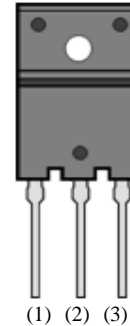
**Applications**

The following applications including partial switching PFC circuit:

- Air Conditioner
- Power Conditioner

**Package**

TO3PF-3L



(1) Gate  
(2) Collector  
(3) Emitter

Not to scale

## FGM623S

### Absolute Maximum Ratings

Unless otherwise specified,  $T_A = 25\text{ }^\circ\text{C}$ .

Parameter	Symbol	Conditions	Rating	Unit
Collector to Emitter Voltage	$V_{CE}$		600	V
Gate to Emitter Voltage	$V_{GE}$		$\pm 30$	V
Continuous Collector Current	$I_C$	$T_C = 25\text{ }^\circ\text{C}$	30	A
		$T_C = 100\text{ }^\circ\text{C}$	18	A
Pulsed Collector Current	$I_{C(PULSE)}$	$P_W \leq 1\text{ ms}$ , duty cycle $\leq 1\%$	100	A
Power Dissipation	$P_D$	$T_C = 25\text{ }^\circ\text{C}$	60	W
Operating Junction Temperature	$T_J$		150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$		-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

Unless otherwise specified,  $T_A = 25\text{ }^\circ\text{C}$ .

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal Resistance (Junction to Case)	$R_{\theta JC}$		—	—	2.08	$^\circ\text{C/W}$

## FGM623S

### Electrical Characteristics

Unless otherwise specified,  $T_A = 25\text{ }^\circ\text{C}$ .

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Collector to Emitter Breakdown Voltage	$V_{(BR)CES}$	$I_C = 100\text{ }\mu\text{A}$ , $V_{GE} = 0\text{ V}$	600	—	—	V
Collector to Emitter Leakage Current	$I_{CES}$	$V_{CE} = 600\text{ V}$ , $V_{GE} = 0\text{ V}$	—	—	100	$\mu\text{A}$
Gate to Emitter Leakage Current	$I_{GES}$	$V_{GE} = \pm 30\text{ V}$	—	—	$\pm 500$	nA
Gate Threshold Voltage	$V_{GE(TH)}$	$V_{CE} = 10\text{ V}$ , $I_C = 1\text{ mA}$	3	—	6	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$	—	1.5	1.7	V
Input Capacitance	$C_{ies}$	$V_{CE} = 20\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1.0\text{ MHz}$	—	2500	—	pF
Output Capacitance	$C_{oes}$		—	150	—	
Reverse Transfer Capacitance	$C_{res}$		—	80	—	
Gate Charge	$Q_g$	$V_{CE} = 300\text{ V}$ , $I_C = 30\text{ A}$ , $V_{GE} = 15\text{ V}$	—	65	—	nC
Gate to Emitter Charge	$Q_{ge}$		—	20	—	
Gate to Collector Charge	$Q_{gc}$		—	20	—	
Turn-on Delay Time	$t_{d(on)}$	$T_J = 25\text{ }^\circ\text{C}$ ; see Figure 1	—	100	—	ns
Rise Time	$t_r$		—	80	—	
Turn-off Delay Time	$t_{d(off)}$		—	300	—	
Fall Time	$t_f$		—	120	—	
Turn-on Delay Time	$t_{d(on)}$	$T_J = 125\text{ }^\circ\text{C}$ ; see Figure 1	—	100	—	ns
Rise Time	$t_r$		—	100	—	
Turn-off Delay Time	$t_{d(off)}$		—	300	—	
Fall Time	$t_f$		—	200	—	

Test Circuits and Waveforms

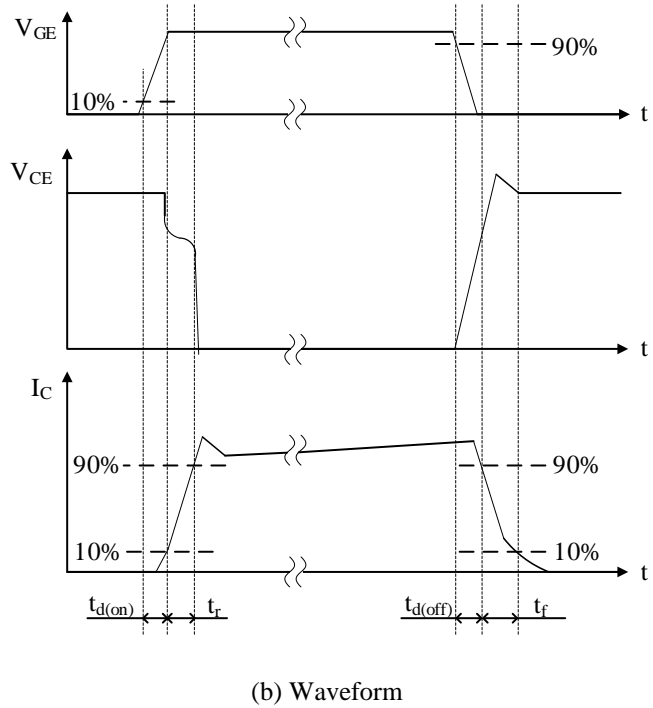
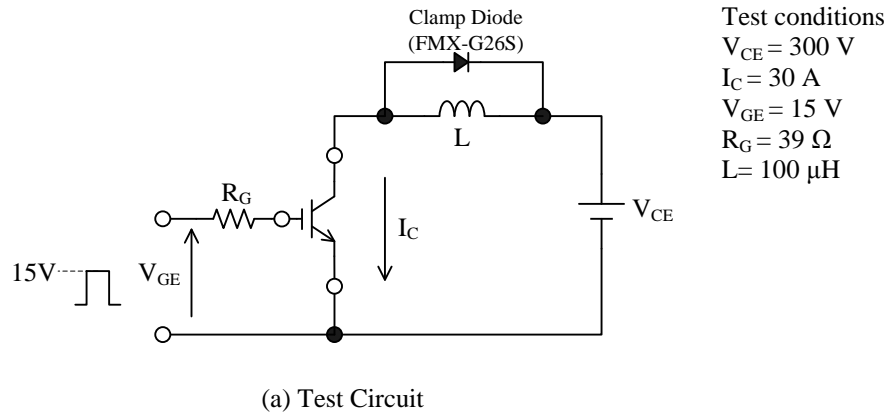


Figure 1. Test Circuits and Waveforms of  $dv/dt$  and Switching Time

Rating and Characteristic Curves

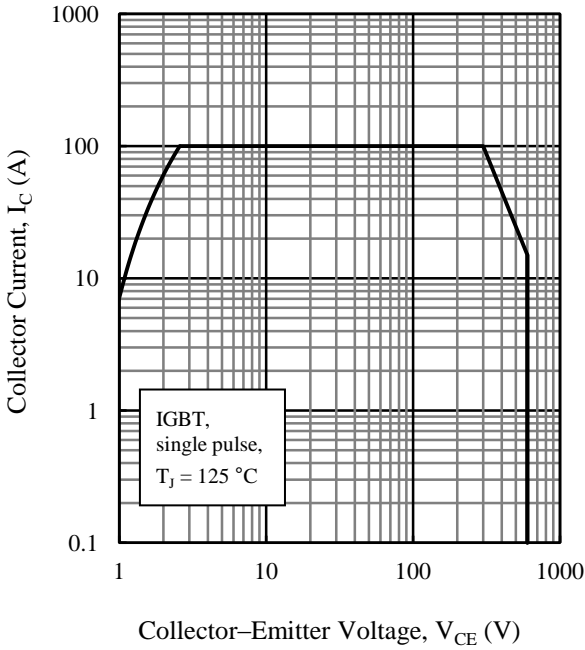


Figure 2. IGBT Reverse Bias Safe Operating Area

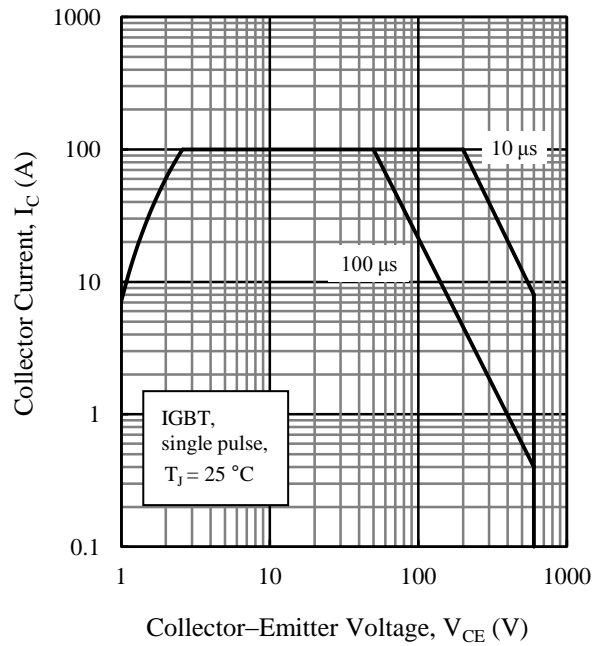


Figure 3. IGBT Safe Operating Area

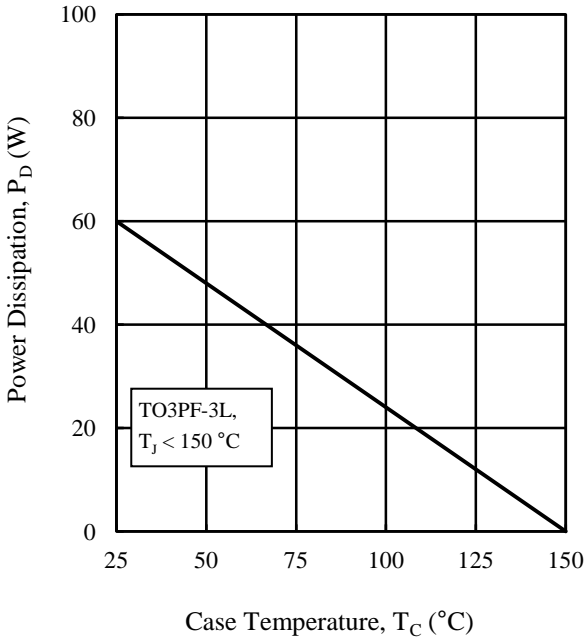


Figure 4. Power Dissipation vs. Case Temperature

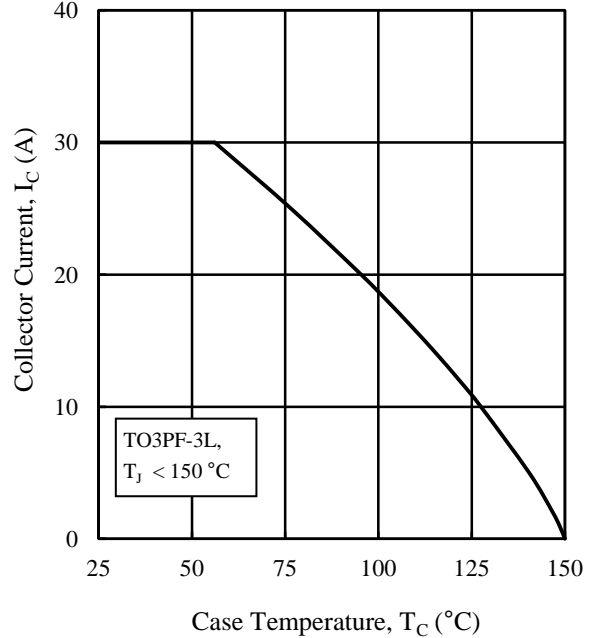


Figure 5. Collector Current vs. Case Temperature

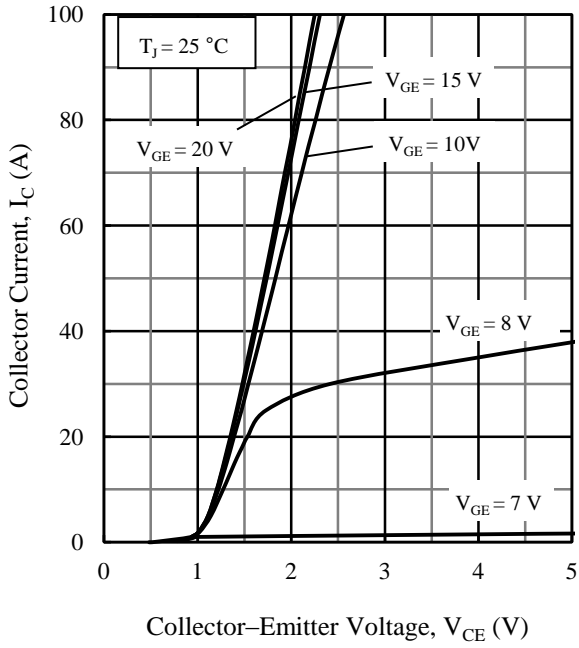


Figure 6. Output Characteristics ( $T_J = 25\text{ }^\circ\text{C}$ )

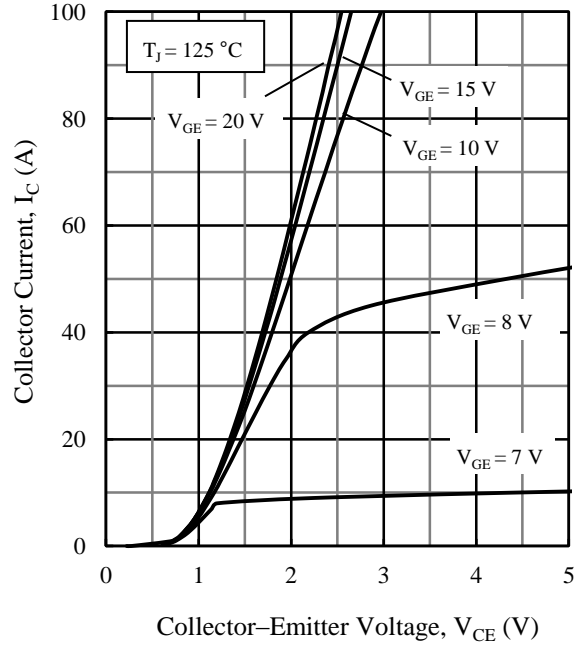


Figure 7. Output Characteristics ( $T_J = 175\text{ }^\circ\text{C}$ )

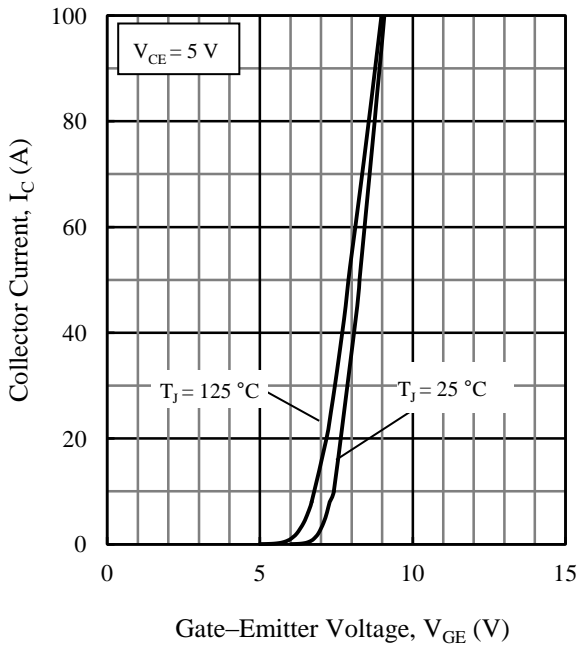


Figure 8. Transfer Characteristics

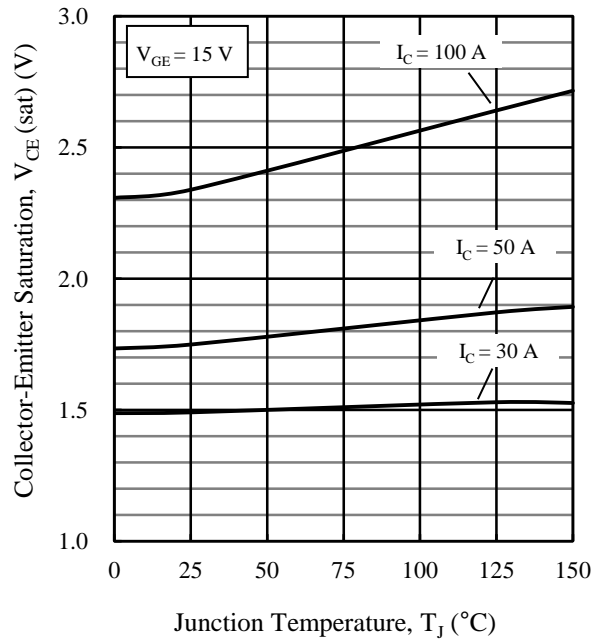


Figure 9. Saturation Voltage vs. Junction Temperature

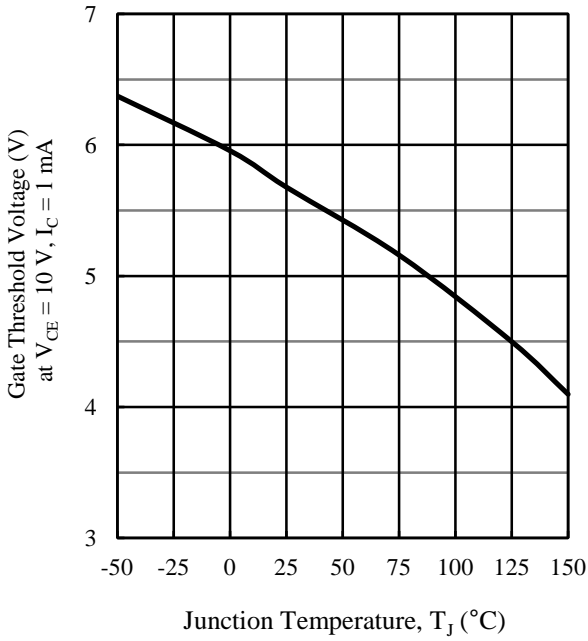


Figure 10. Gate Threshold Voltage vs. Junction Temperature

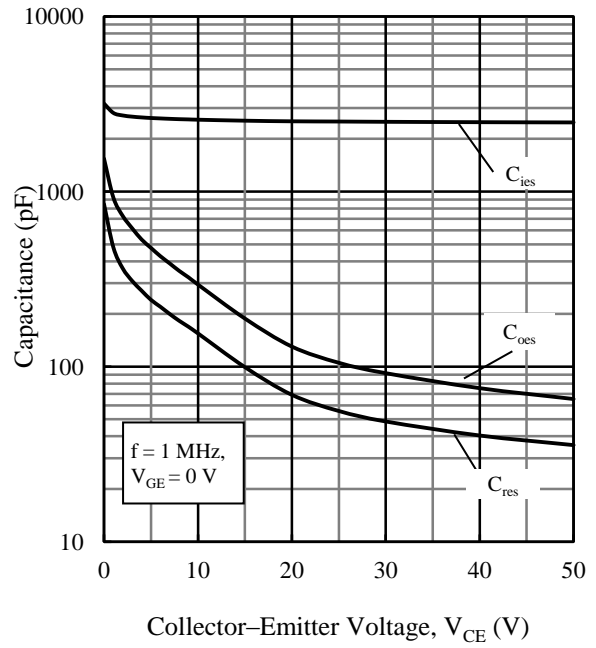


Figure 11. Capacitance Characteristics

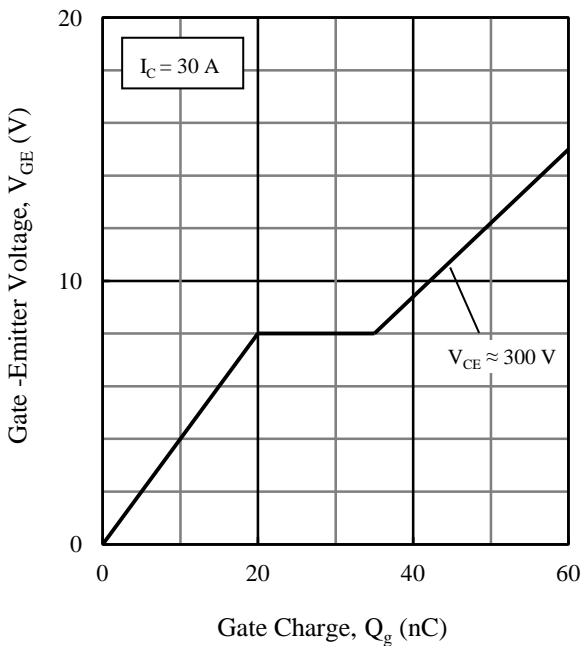


Figure 12. Typical Gate Charge

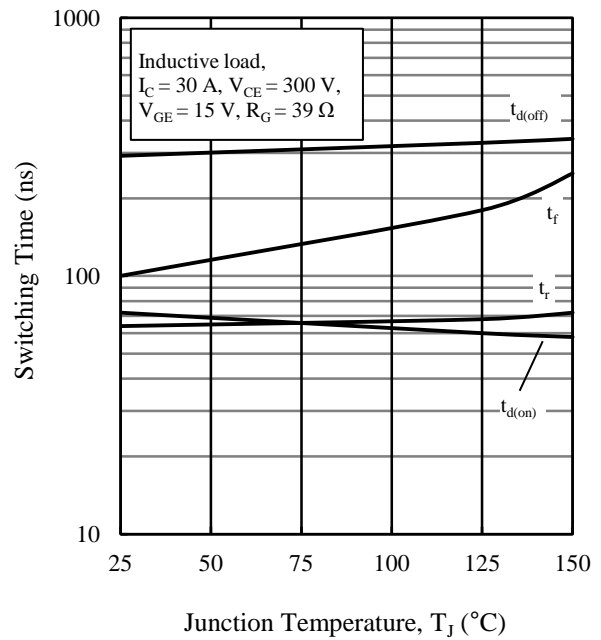


Figure 13. Switching Time vs. Junction Temperature

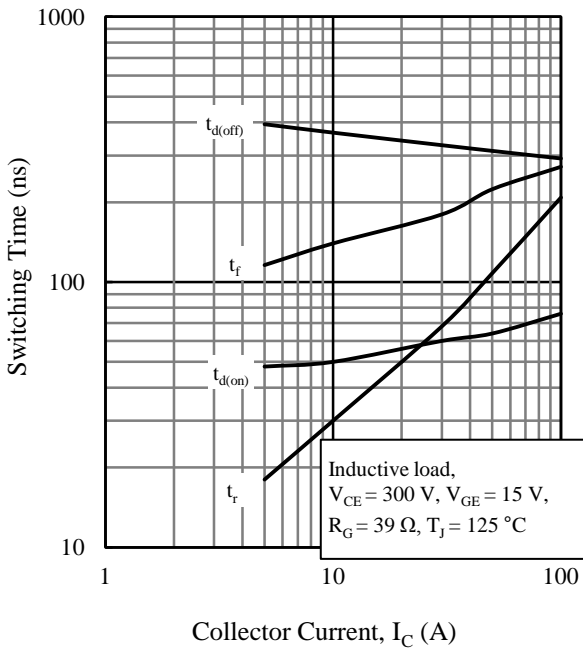


Figure 14. Switching Time vs. Collector Current

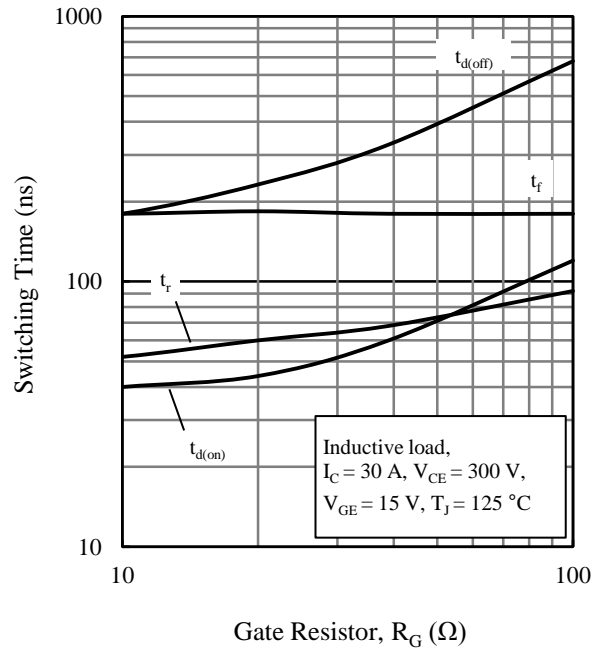


Figure 15. Switching Time vs. Gate Resistor

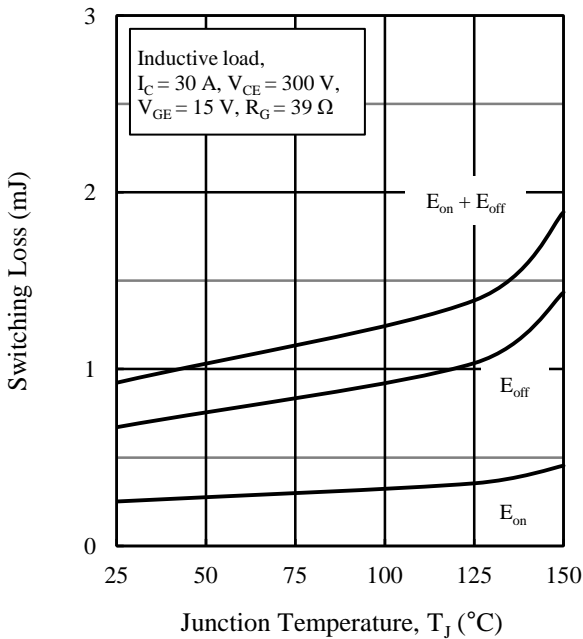


Figure 16. Switching Loss vs. Junction Temperature

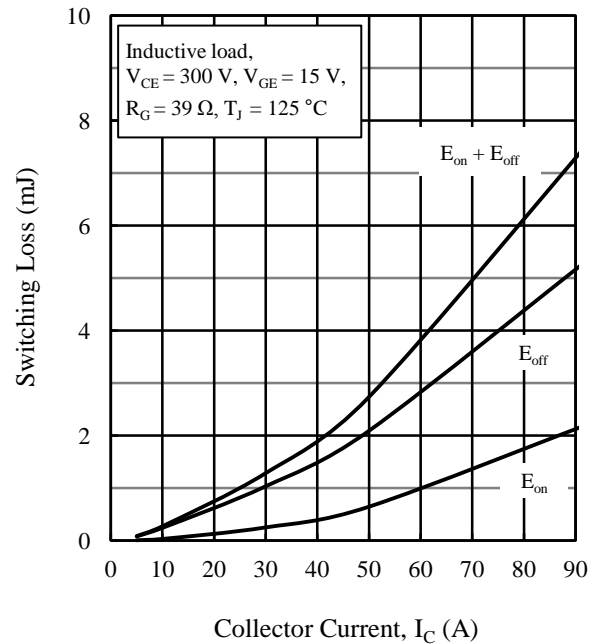


Figure 17. Switching Loss vs. Collector Current



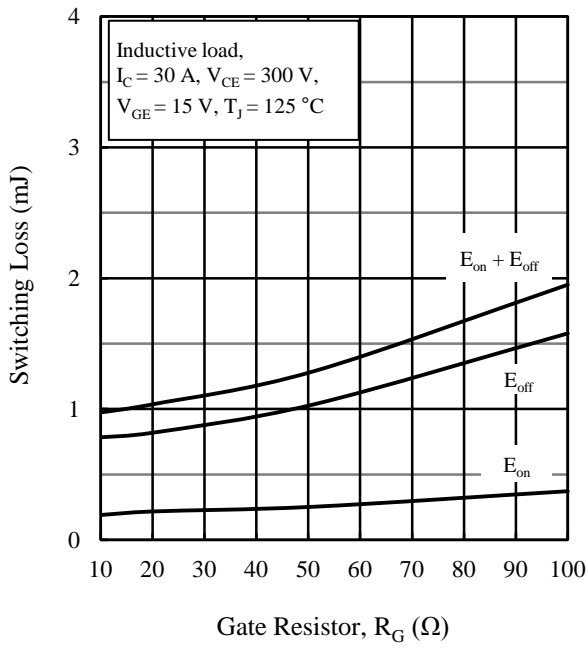


Figure 18. Switching Loss vs. Gate Resistor

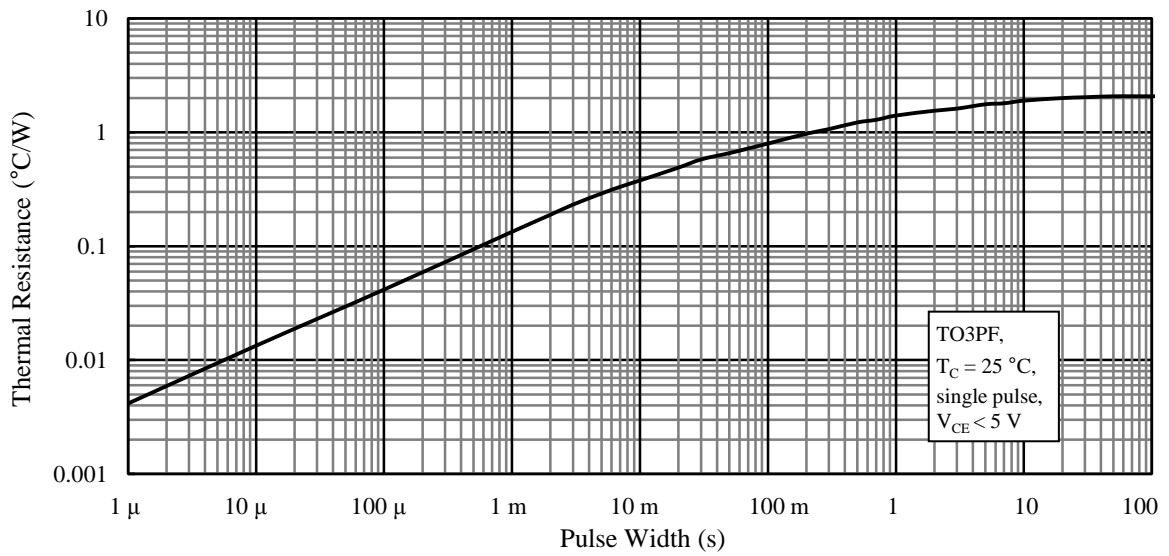
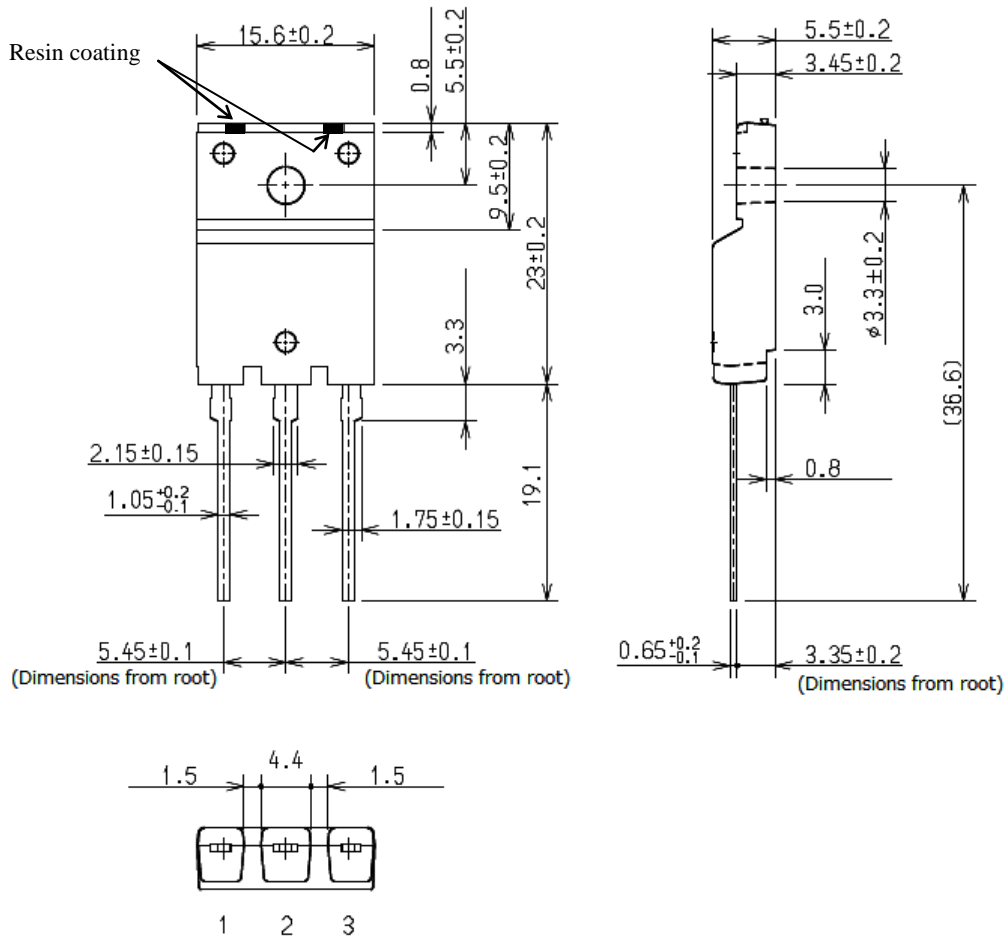


Figure 19. Transient Thermal Resistance

# FGM623S

## Physical Dimensions

### ● TO3PF-3L



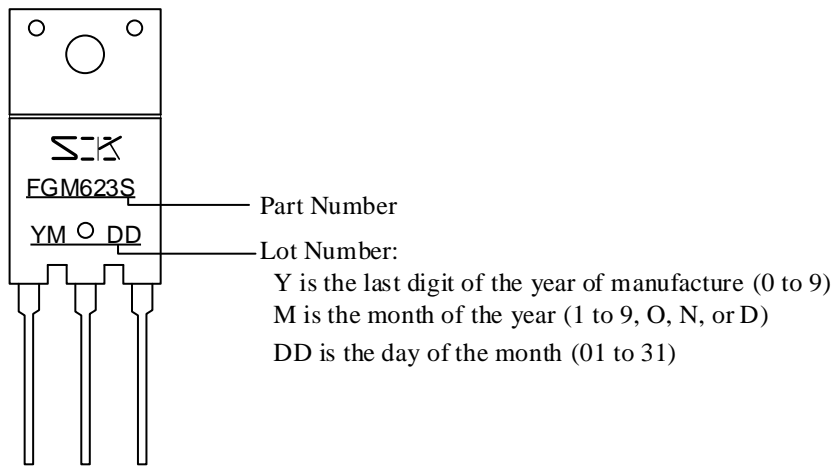
### NOTES:

- Dimensions in millimeters
- Bare lead frame: Pb-free (RoHS compliant)
- When soldering the products, it is required to minimize the working time, within the following limits:
  - Flow:  $260 \pm 5$  °C /  $10 \pm 1$  s, 2 times
  - Soldering Iron:  $380 \pm 10$  °C /  $3.5 \pm 0.5$  s, 1 time (Soldering should be at a distance of at least 1.5 mm from the body of the products.)
- Recommended screw torque for TO3PF: 0.686 N·m to 0.882 N·m (7 kgf·cm to 9 kgf·cm)

# FGM623S

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## Marking Diagram



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