V_{CE} = 600 V, I_C = 18 A
Trench IGBT

FGM633

Data Sheet

Description

The FGM633 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 °C) ---------- 18 A
- $V_{CE(sat)}$ ---------- 1.5 V typ.
- t_f (T_J = 25 °C) ---------- 120 ns typ.

Applications

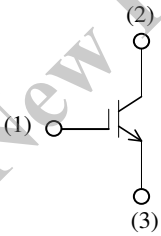
The following applications including partial switching PFC circuit:

- Air Conditioner
- Power Conditioner

Package

TO3PF-3L





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

Not to scale

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Absolute Maximum Ratings

Unless otherwise specified, T_A = 25 °C.

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

Thermal Characteristics

Unless otherwise specified, T_A = 25 °C.

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

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Electrical Characteristics

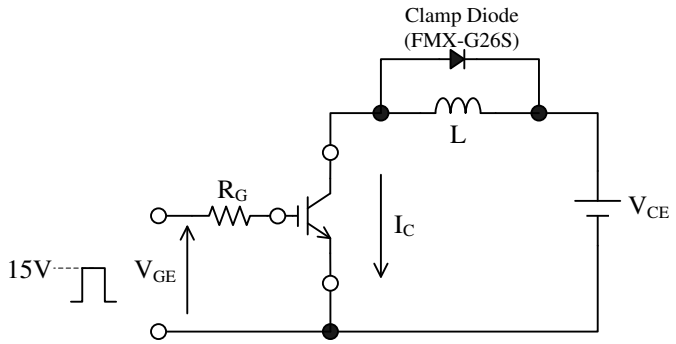
Unless otherwise specified, T_A = 25 °C.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Collector to Emitter Breakdown Voltage	$V_{(BR)CES}$	I_C = 100 µA, V_{GE} = 0 V	600	—	—	V
Collector to Emitter Leakage Current	I_{CES}	V_{CE} = 600 V, V_{GE} = 0 V	—	—	100	µA
Gate to Emitter Leakage Current	I_{GES}	V_{GE} = ±30 V	—	—	±500	nA
Gate Threshold Voltage	$V_{GE(TH)}$	V_{CE} = 10 V, I_C = 1 mA	4	—	7	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15 V, I_C = 30 A	—	1.5	1.7	V
Input Capacitance	C_{ies}	V_{CE} = 20 V, V_{GE} = 0 V, f = 1.0 MHz	—	2500	—	pF
Output Capacitance	C_{oes}		—	150	—	
Reverse Transfer Capacitance	C_{res}		—	80	—	
Gate Charge	Q_g	V_{CE} = 300 V, I_C = 30 A, V_{GE} = 15 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 °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 °C; see Figure 1	—	100	—	ns
Rise Time	t_r		—	100	—	
Turn-off Delay Time	$t_{d(off)}$		—	300	—	
Fall Time	t_f		—	200	—	

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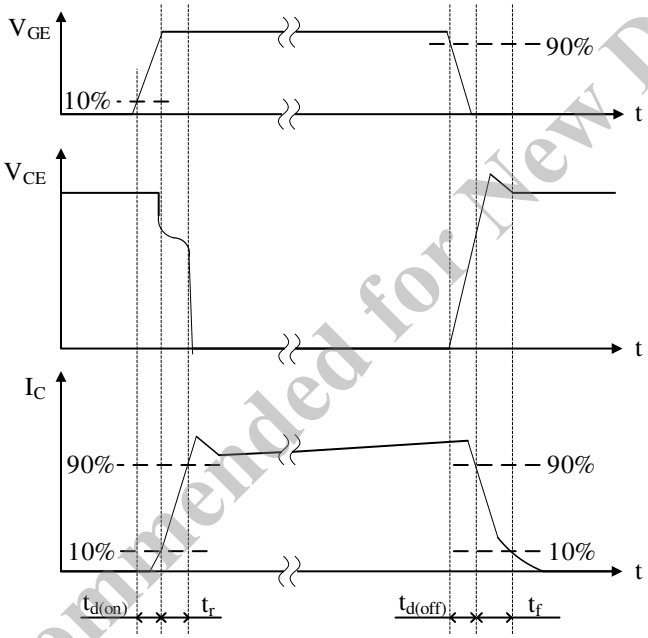
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Test Circuits and Waveforms



Test conditions
V_{CE} = 300 V
I_C = 30 A
V_{GE} = 15 V
R_G = 39 Ω
L= 100 µH

(a) Test Circuit



(b) Waveform

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

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Rating and Characteristic Curves

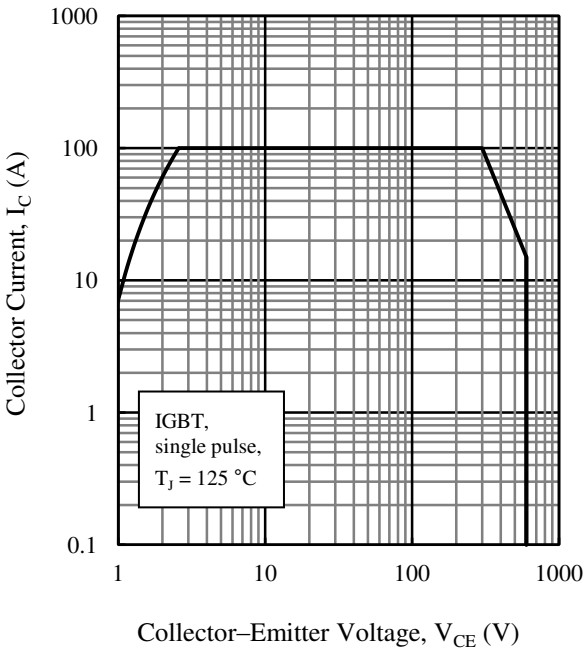


Figure 2. IGBT Reverse Bias Safe Operating Area

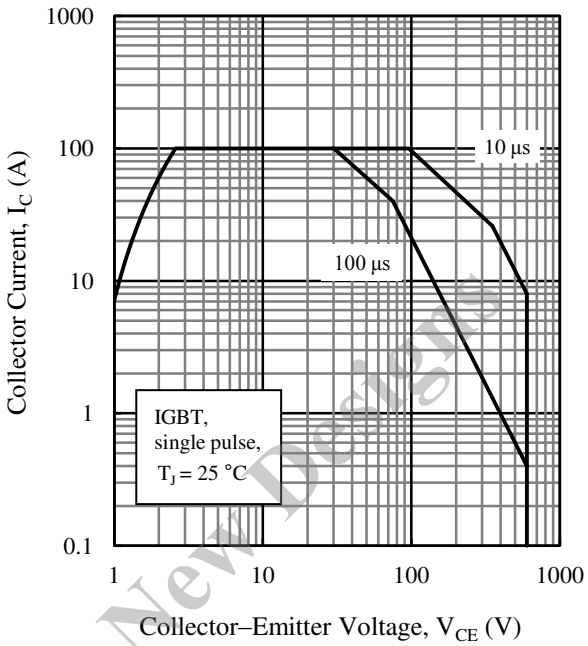


Figure 3. IGBT Safe Operating Area

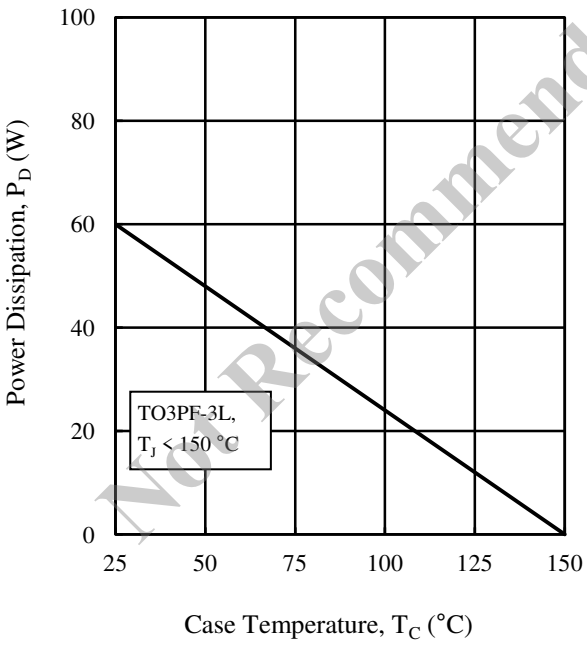


Figure 4. Power Dissipation vs. Case Temperature

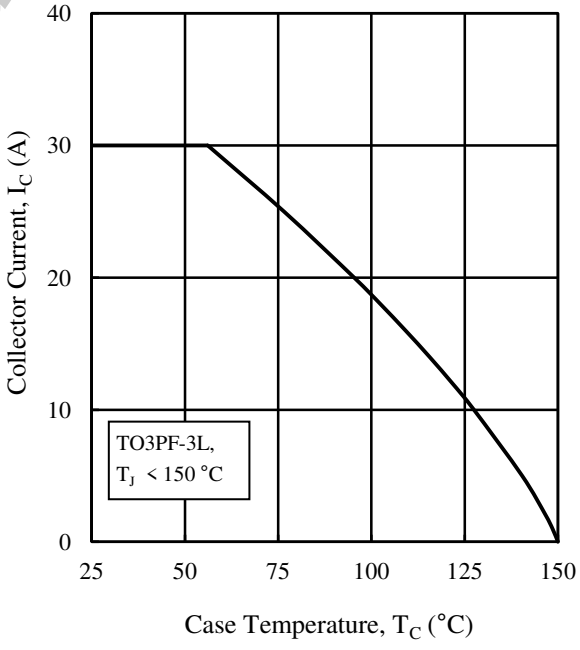


Figure 5. Collector Current vs. Case Temperature

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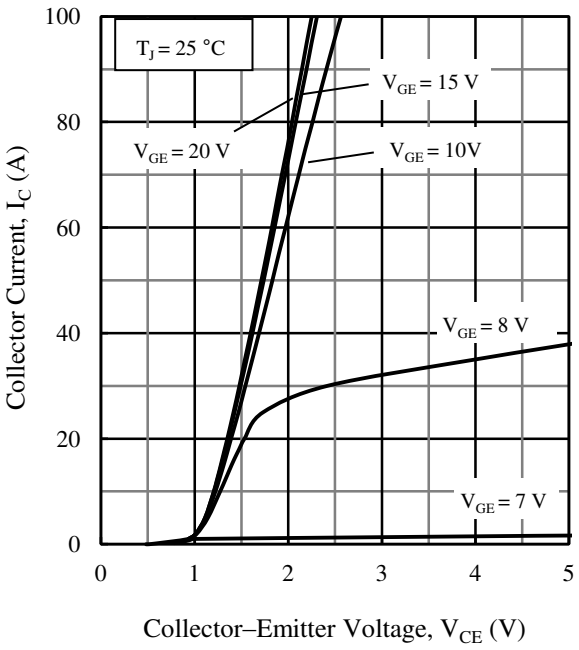


Figure 6. Output Characteristics (T_J = 25 °C)

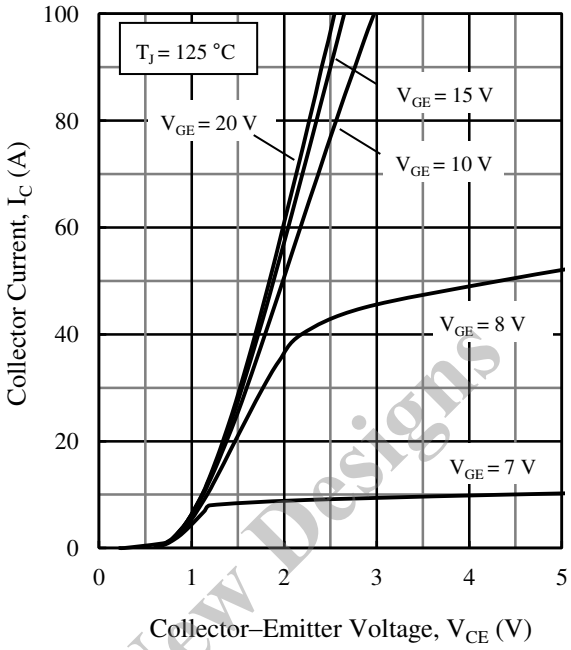


Figure 7. Output Characteristics (T_J = 175 °C)

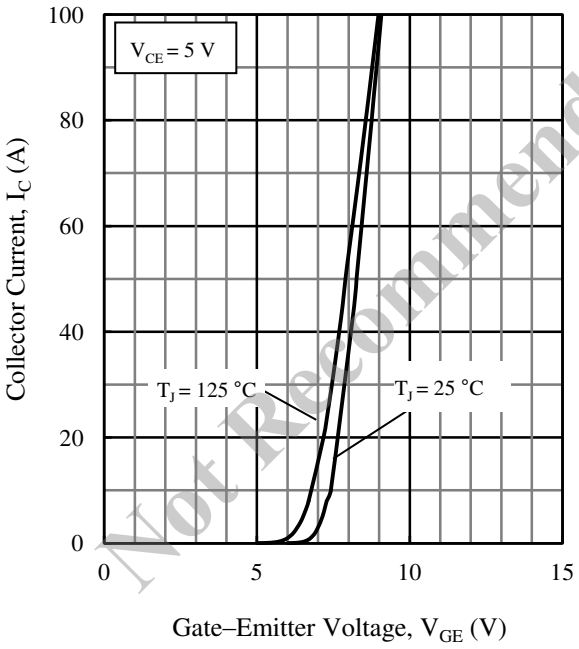


Figure 8. Transfer Characteristics

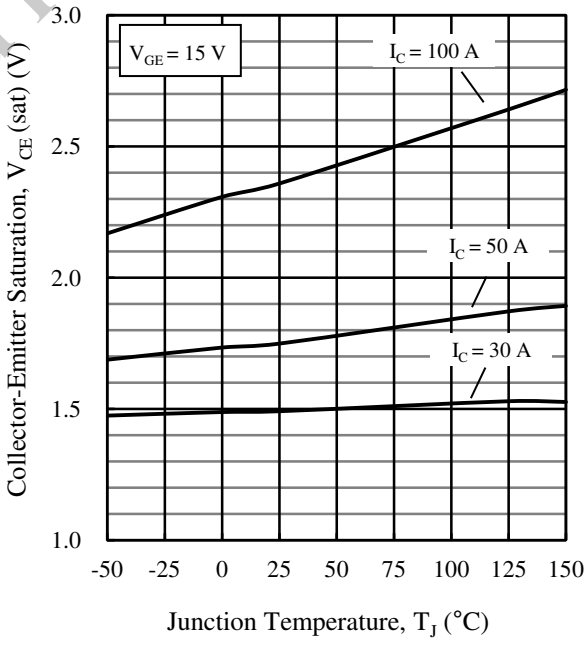


Figure 9. Saturation Voltage vs. Junction Temperature

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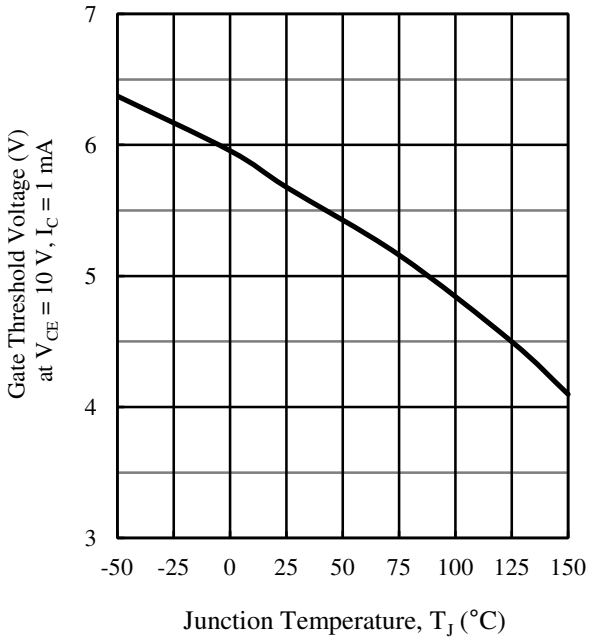


Figure 10. Gate Threshold Voltage vs. Junction Temperature

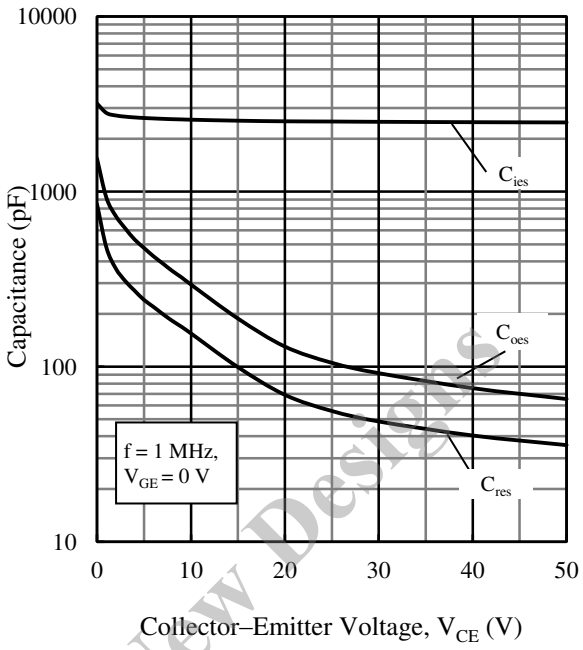


Figure 11. Capacitance Characteristics

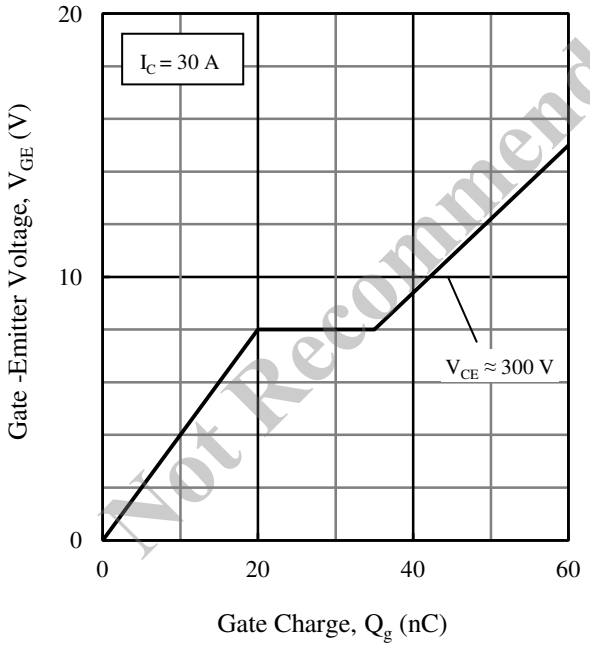


Figure 12. Typical Gate Charge

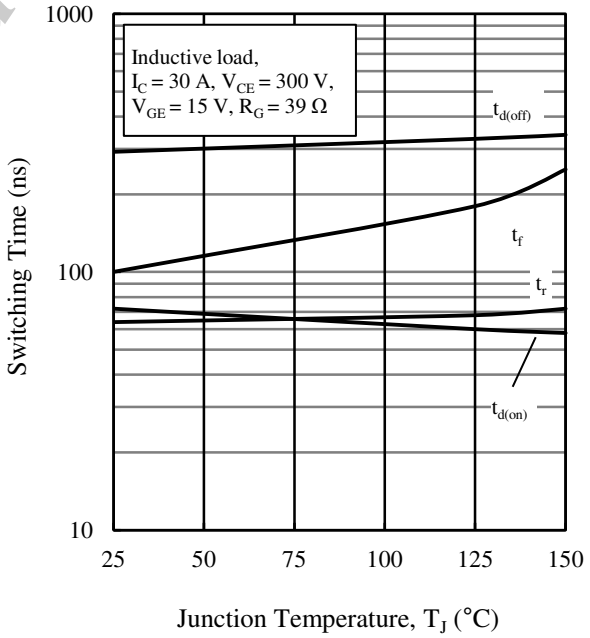


Figure 13. Switching Time vs. Junction Temperature

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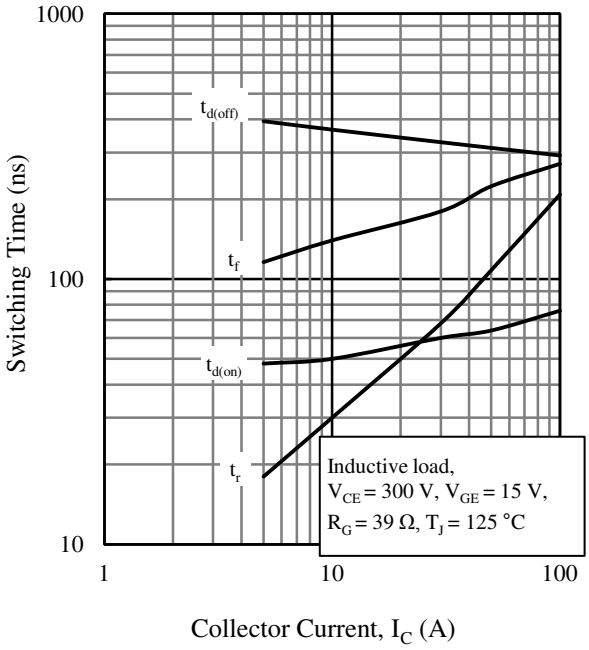


Figure 14. Switching Time vs. Collector Current

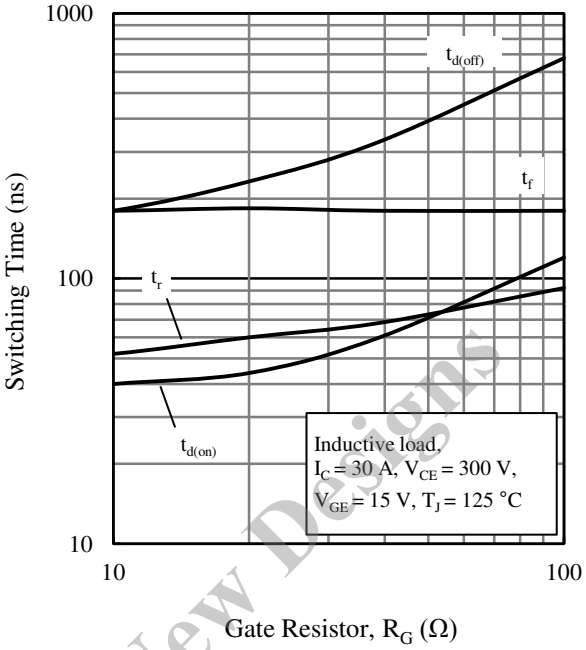


Figure 15. Switching Time vs. Gate Resistor

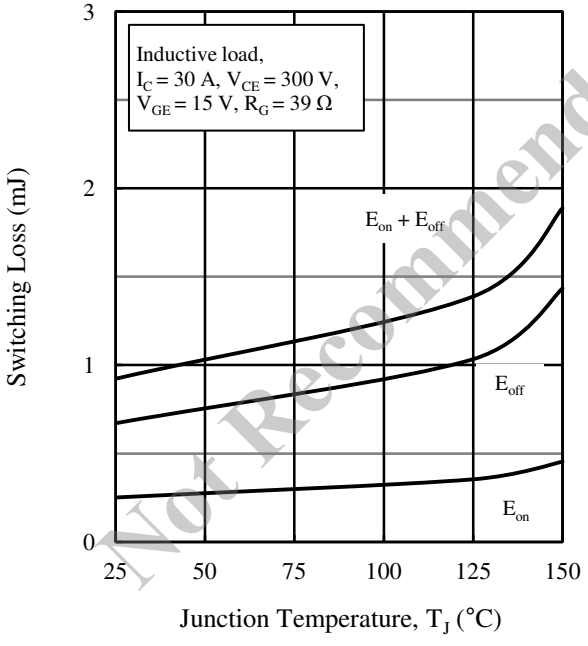


Figure 16. Switching Loss vs. Junction Temperature

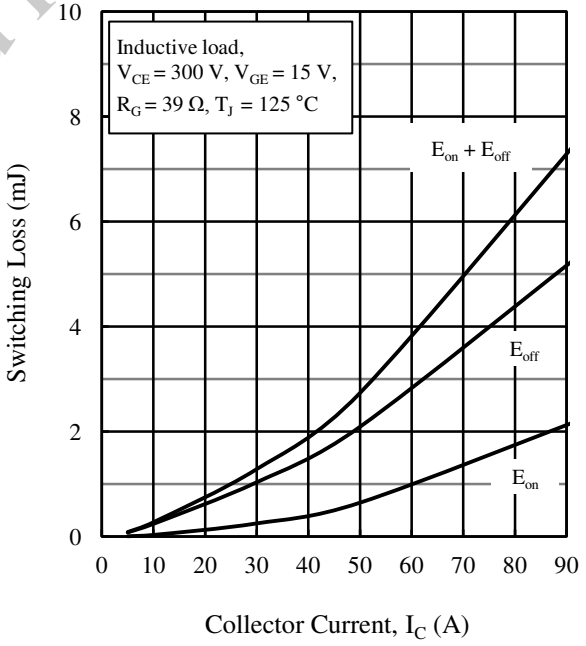


Figure 17. Switching Loss vs. Collector Current

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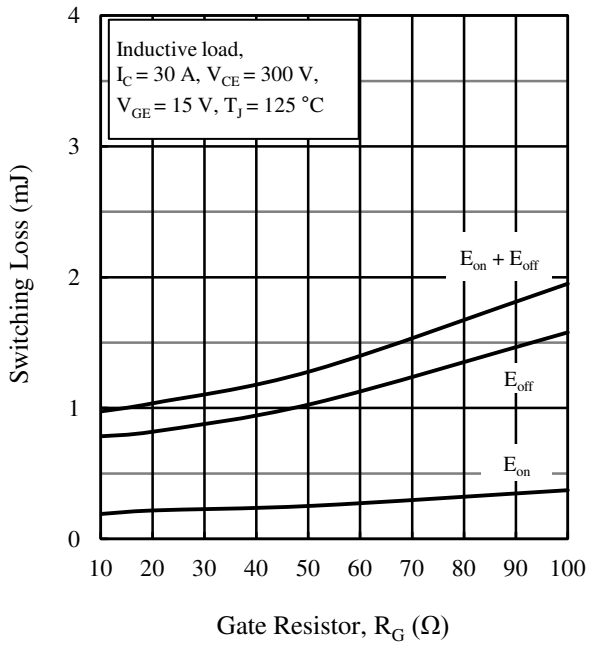


Figure 18. Switching Loss vs. Gate Resistor

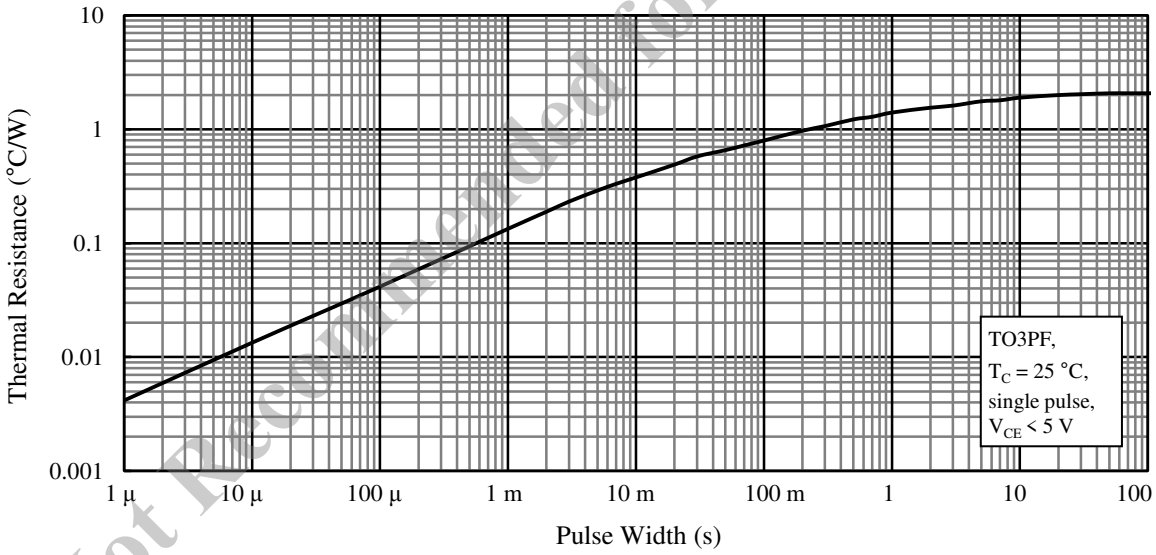


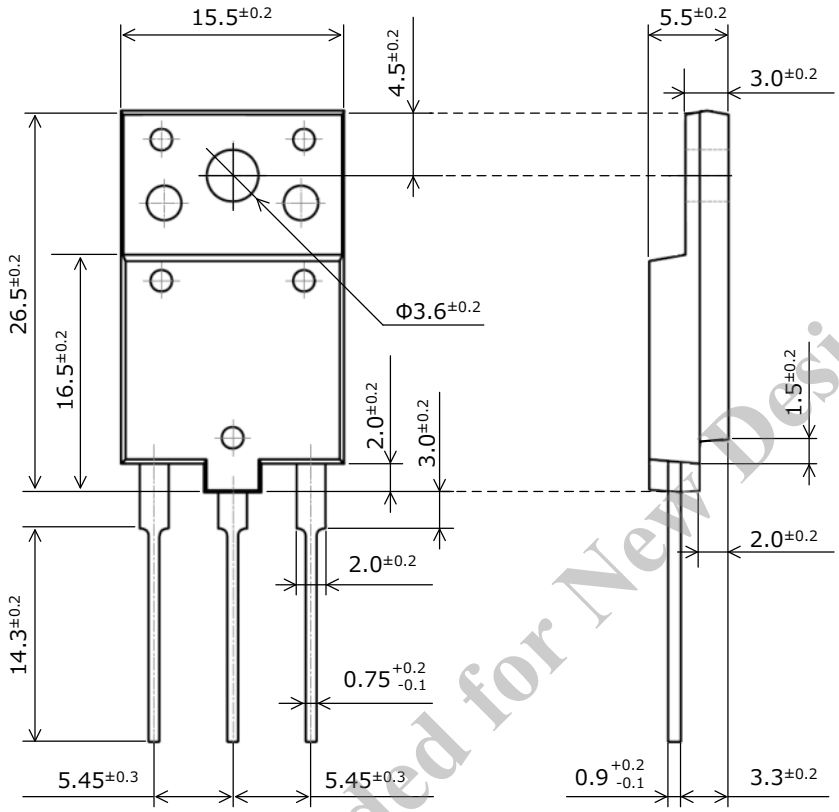
Figure 19. Transient Thermal Resistance

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Physical Dimensions

● **TO3PF-3L**



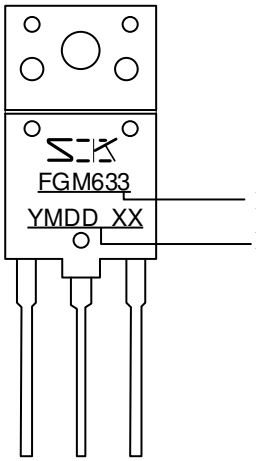
NOTES:

- 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 ± 5 °C / 10 ± 1 s, 2 times
  Soldering Iron: 380 ± 10 °C / 3.5 ± 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)

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Marking Diagram



Part Number

Lot Number:

Y is the last digit of the year of manufacture (0 to 9)
M is the month of the year (1 to 9, O, N, or D)
DD is the day of the month (01 to 31)
XX is the control number

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