V_{CE} = 600 V, I_C = 37 A
Trench IGBT with Fast Recovery Diode

MGD623S

Data Sheet

Description

The MGD623S 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
- With Integrated Low V_F Fast Recovery Diode
- Bare Lead Frame: Pb-free (RoHS Compliant)

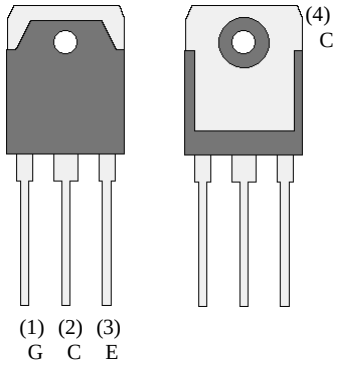
- V_{CE} ---------- 600 V
- I_C (T_C = 100 °C)---------- 37 A
- $V_{CE(sat)}$----------1.8 V typ.
- t_f (T_J = 25 °C)---------- 120 ns typ.
- V_F----------1.2 V typ.

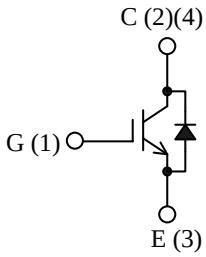
Applications

- Microwave Oven
- IH Cooker
- Inverter Circuit

Package

TO3P-3L





Not to scale

Absolute Maximum Ratings

Unless otherwise specified, T_A = 25 °C.

Parameter	Symbol	Conditions	Rating	Unit	Remarks
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	50	A	
		T_C = 100 °C	37	A	
Pulsed Collector Current	$I_{C(PULSE)}$	$P_W \leq 1$ ms, duty cycle ≤ 1%	100	A	
Diode Continuous Forward Current	I_F	T_C = 25 °C	30	A	
Diode Pulsed Forward Current	$I_{F(PULSE)}$	$P_W \leq 1$ ms, duty cycle ≤ 1%	60	A	
Maximum Collector to Emitter dv/dt	dv/dt	$T_C \leq 125$ °C, see Figure 1	5	V/ns	
Power Dissipation	P_D	T_C = 25 °C	150	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.

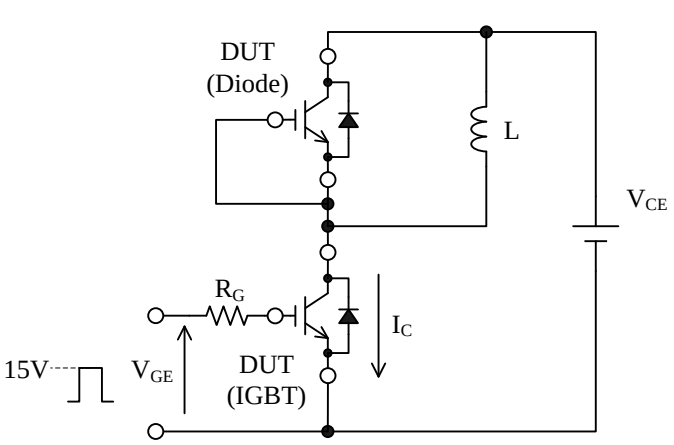
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Remarks
Thermal Resistance of IGBT (Junction to Case)	$R_{\theta JC(IGBT)}$		—	—	0.833	°C/W	
Thermal Resistance of Diode (Junction to Case)	$R_{\theta JC(Di)}$		—	—	1.67	°C/W	

Electrical Characteristics

Unless otherwise specified, T_A = 25 °C.

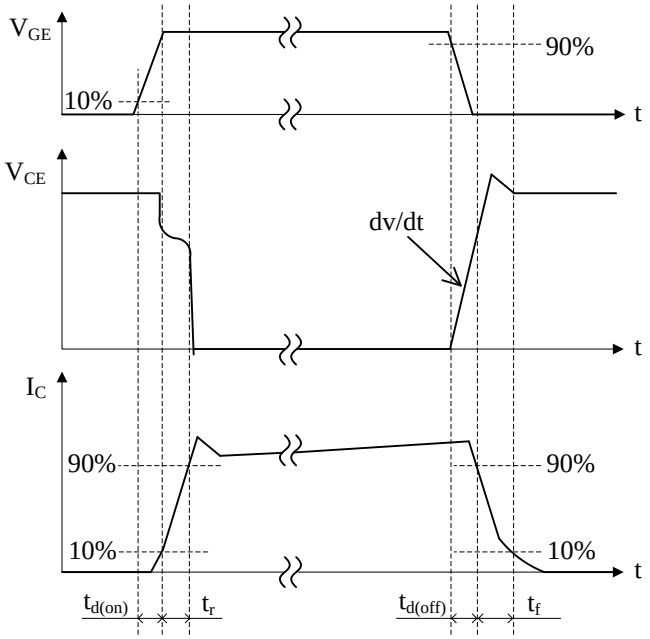
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Collector to Emitter Breakdown Voltage	$V_{(BR)CES}$	I_C = 100 µA, V_{GE} = 0 V	600	—	—	V
Collector to Emitter Leakage Current	I_{CES}	V_{CE} = 600 V, V_{GE} = 0 V	—	—	100	µA
Gate to Emitter Leakage Current	I_{GES}	V_{GE} = ±30 V	—	—	±500	nA
Gate Threshold Voltage	$V_{GE(TH)}$	V_{CE} = 10 V, I_C = 1 mA	3	4.5	6	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15 V, I_C = 50 A	—	1.8	2.4	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	—	
Total Gate Charge	Q_G	V_{CE} = 300 V, I_C = 50 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	—	75	—	ns
Rise Time	t_r		—	100	—	
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	—	75	—	ns
Rise Time	t_r		—	100	—	
Turn-off Delay Time	$t_{d(off)}$		—	300	—	
Fall Time	t_f		—	200	—	
Emitter to Collector Diode Forward Voltage	V_F	I_F = 30 A	—	1.2	1.6	V
Emitter to Collector Diode Reverse Recovery Time	t_{rr}	I_F = 30 A, di/dt = 100 A/µs	—	300	—	ns

Test Circuits and Waveforms



Conditions:
V_{CE} = 300 V
I_C = 50 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

Rating and Characteristic Curves

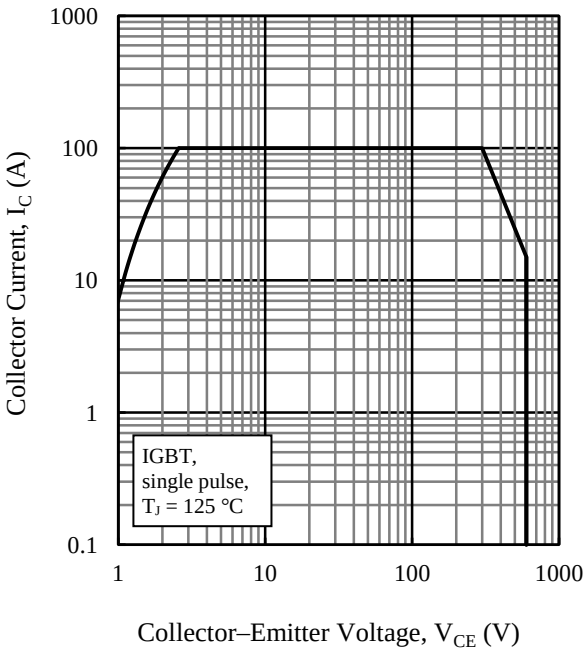


Figure 2. IGBT Reverse Bias Safe Operating Area

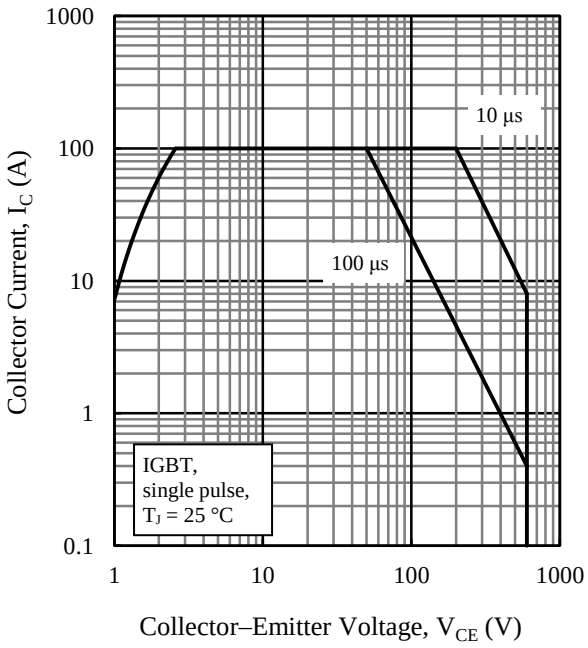


Figure 3. IGBT Safe Operating Area

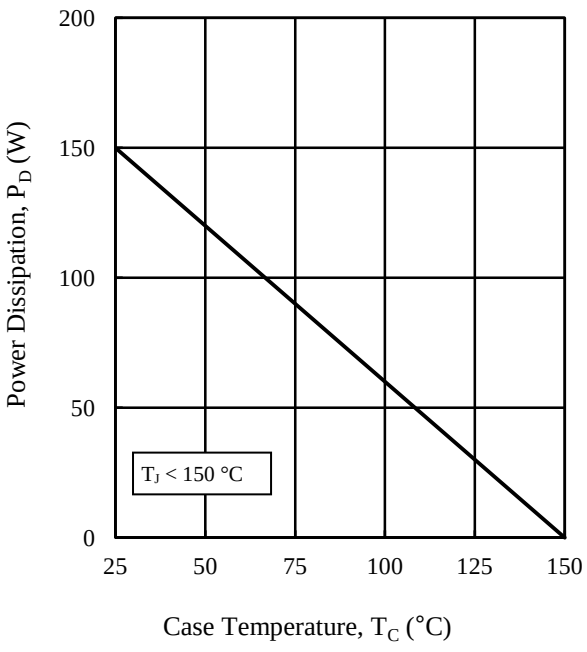


Figure 4. Power Dissipation vs. Case Temperature

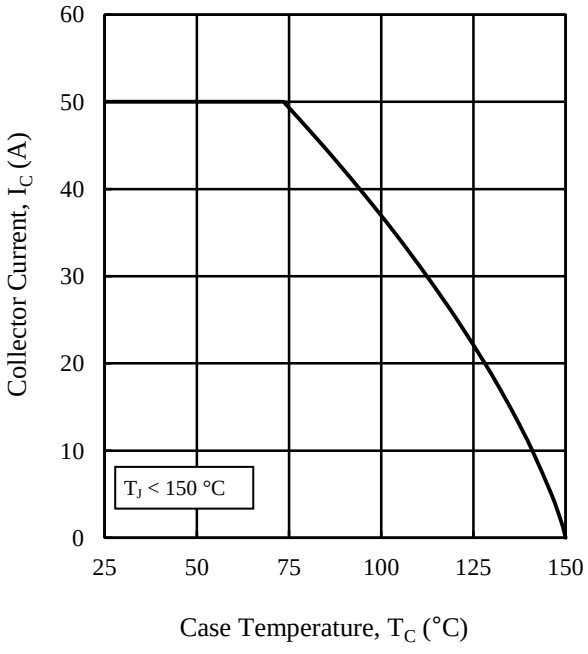


Figure 5. Collector Current vs. Case Temperature

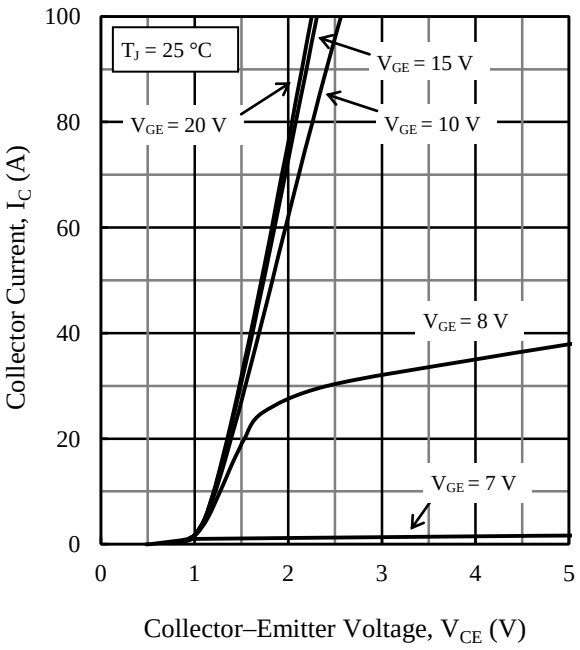


Figure 6. Output Characteristics (T_J = 25 °C)

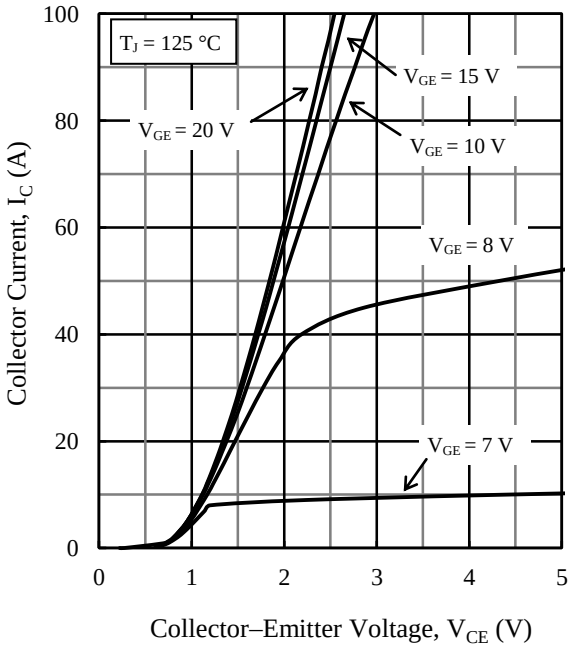


Figure 7. Output Characteristics (T_J = 125 °C)

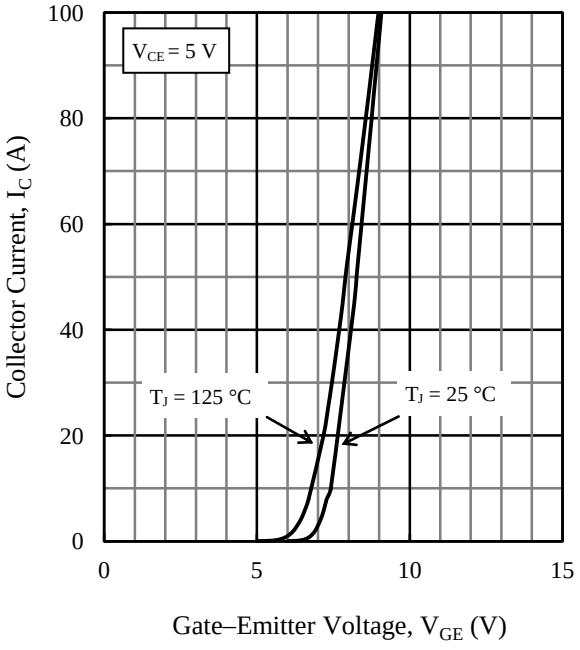


Figure 8. Transfer Characteristics

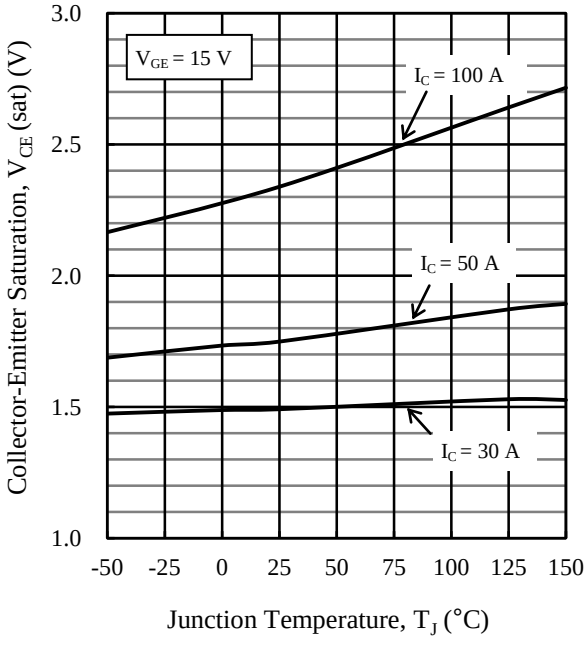


Figure 9. Saturation Voltage vs. Junction Temperature

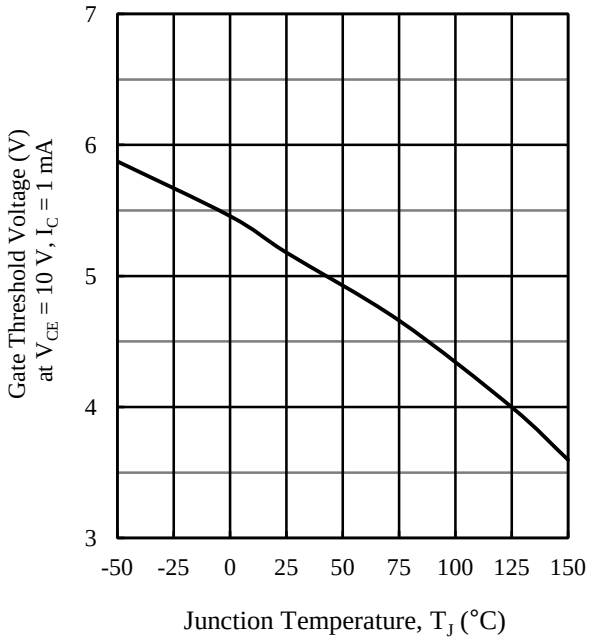


Figure 10. Gate Threshold Voltage vs. Junction Temperature

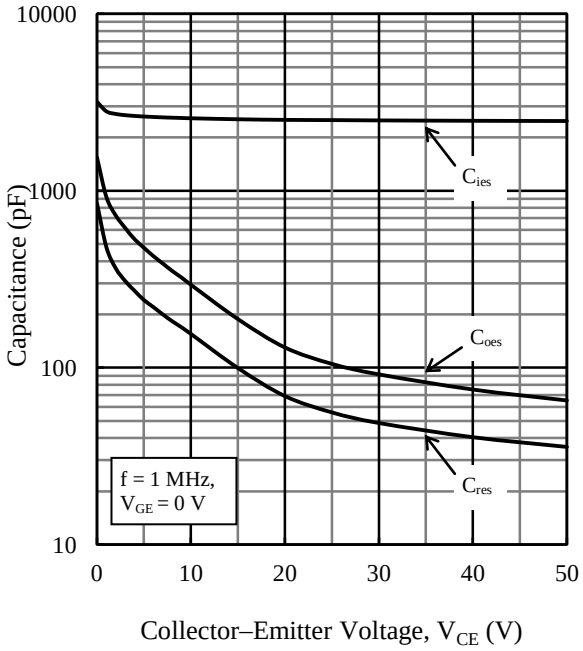


Figure 11. Capacitance Characteristics

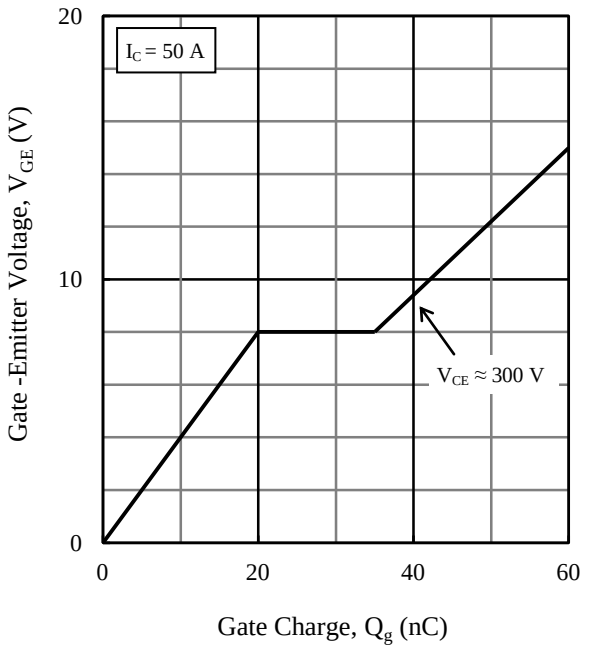


Figure 12. Typical Gate Charge

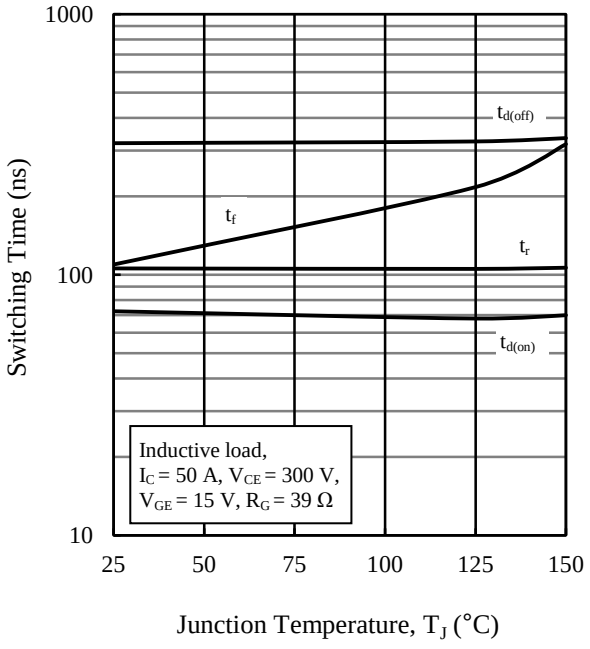


Figure 13. Switching Time vs. Junction Temperature

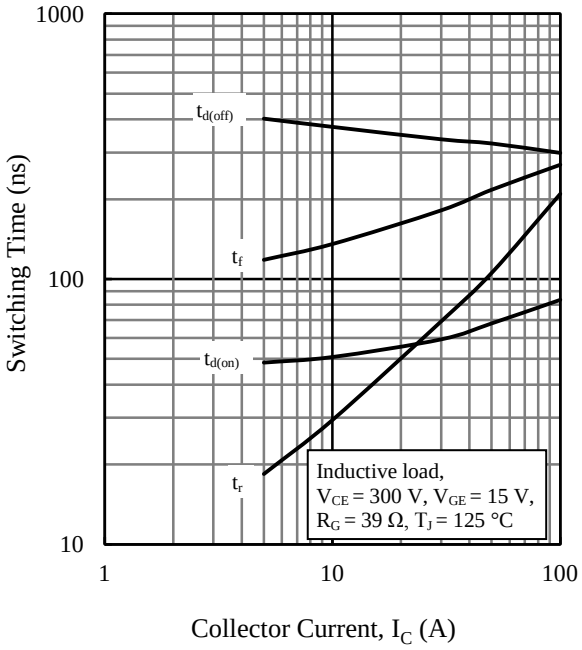


Figure 14. Switching Time vs. Collector Current

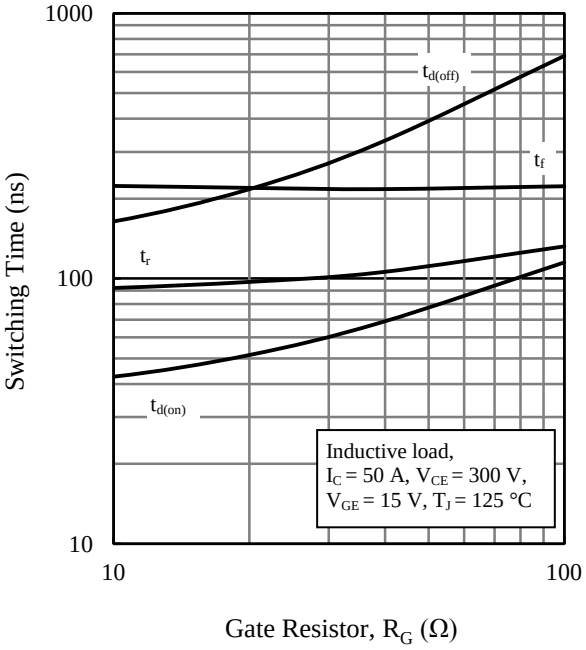


Figure 15. Switching Time vs. Gate Resistor

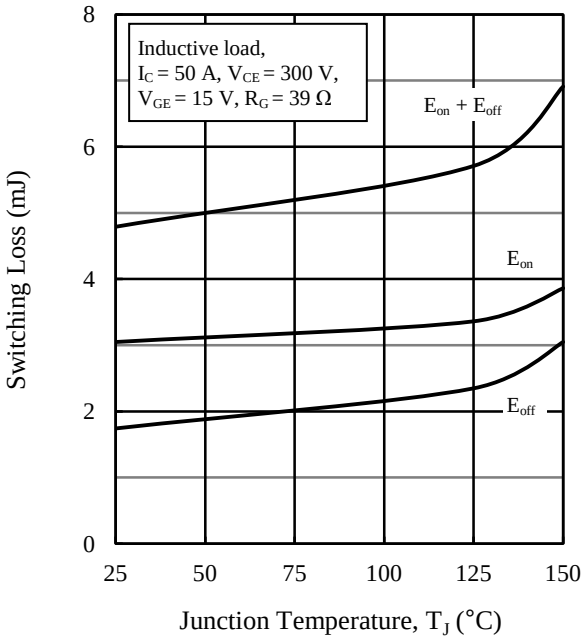


Figure 16. Switching Loss vs. Junction Temperature

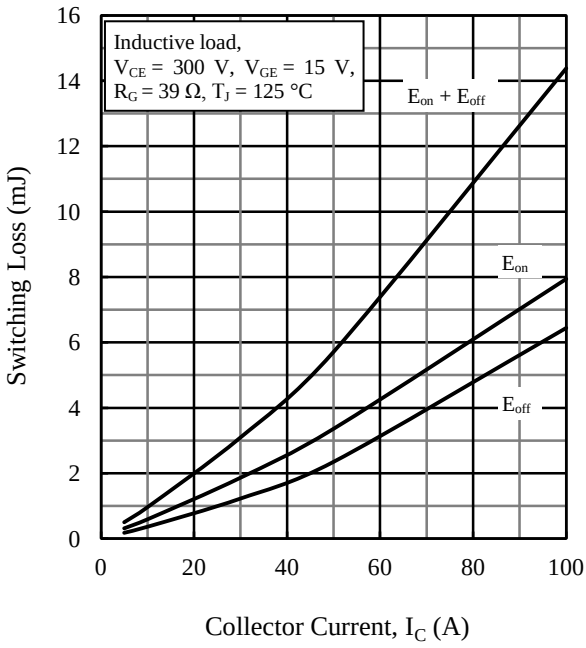


Figure 17. Switching Loss vs. Collector Current

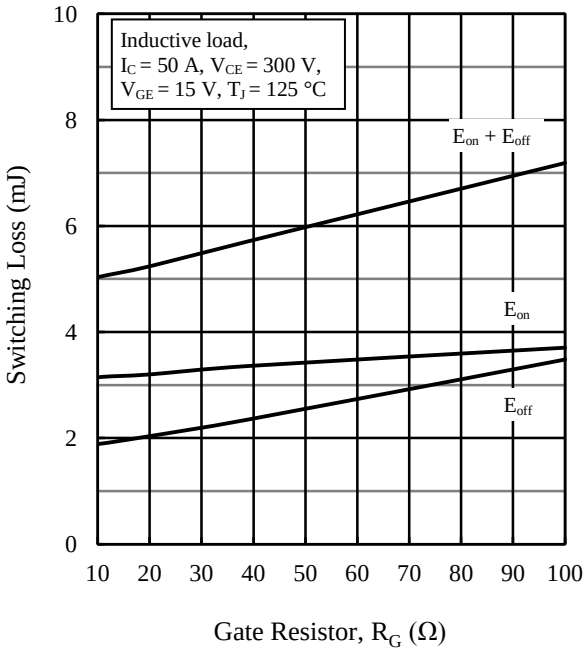


Figure 18. Switching Loss vs. Gate Resistor

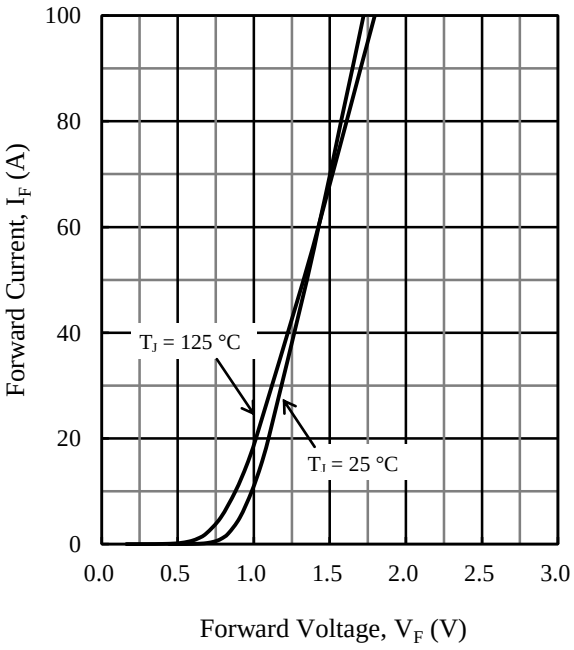


Figure 19. Diode Forward Characteristics

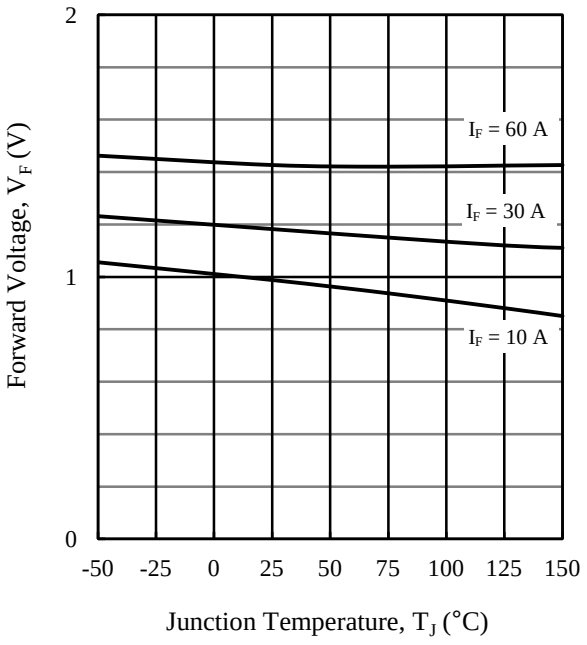


Figure 20. Diode Forward Voltage vs. Junction Temperature

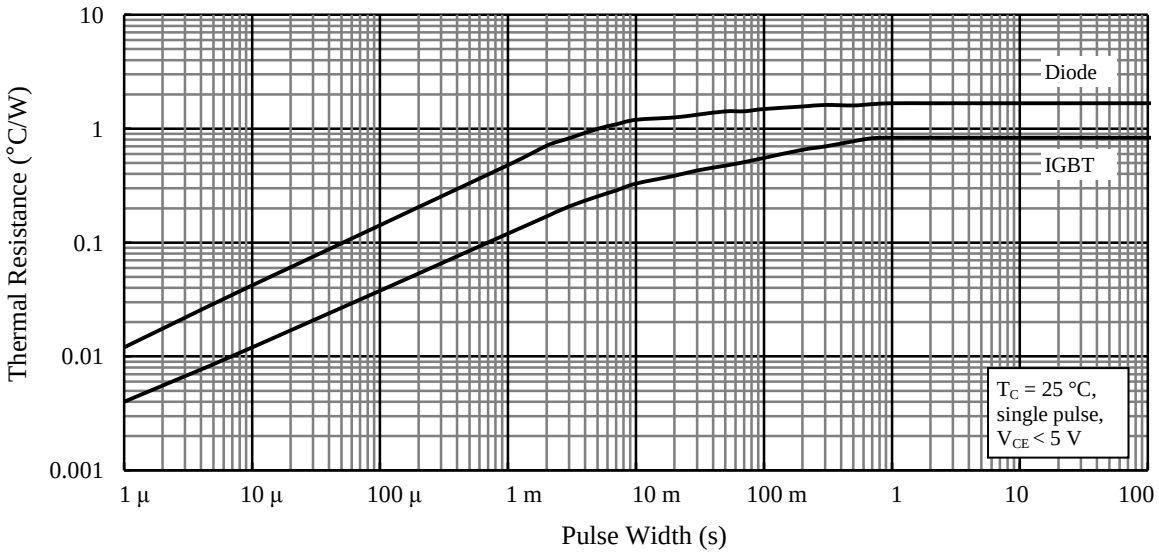
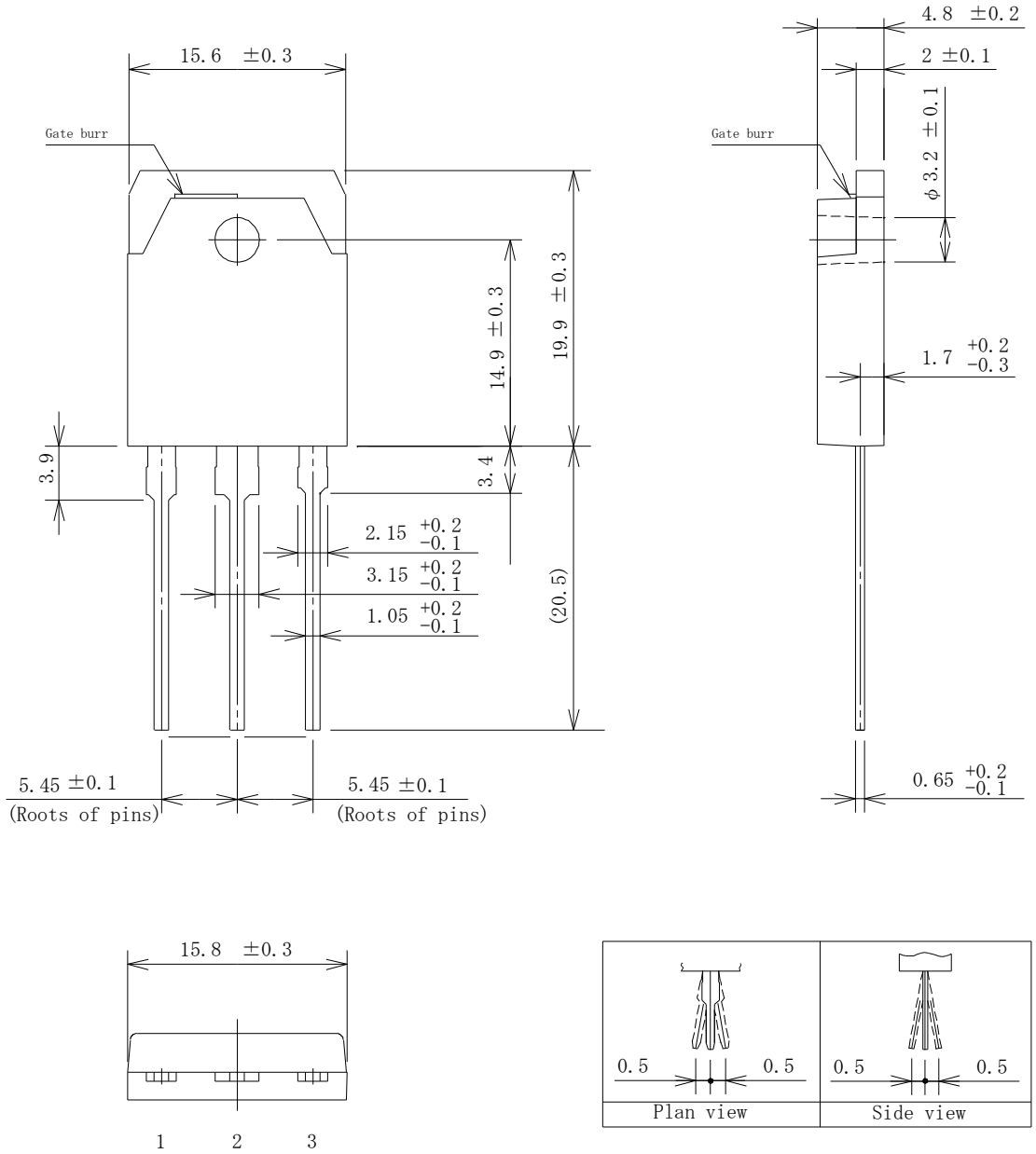


Figure 21. Transient Thermal Resistance

Physical Dimension

● **TO3P-3L**



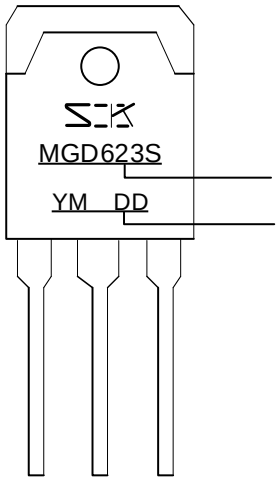
NOTES:

- Dimensions in millimeters
- Maximum gate burr height is 0.3 mm
- Bare lead frame: Pb-free (RoHS compliant)
- When soldering the products, be sure 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 product.)

- Recommended screw torque: 0.686 N·m to 0.882 N·m (7 kgf·cm to 9 kgf·cm)

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 date of the month (01 to 31)

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