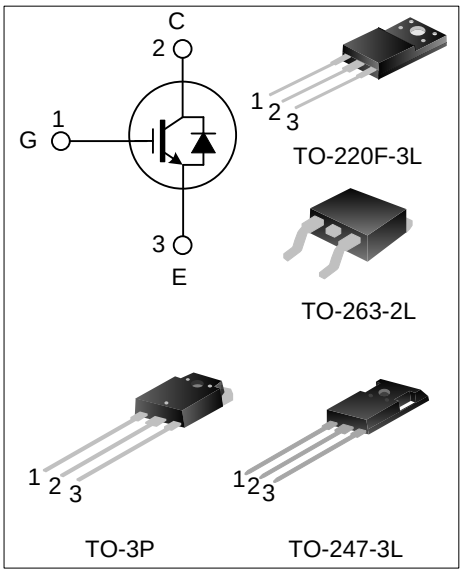
20A, 600V FIELD STOP IGBT

DESCRIPTION

SGT20N60FD1PN/P7/F/S using Field Stop IGBT technology, offers the optimum performance for induction Heating, UPS, SMPS and PFC application.



FEATURES

- 20A, 600V, $V_{CE(sat)(typ.)}$=2.0V@I_C=20A
- Low conduction loss
- Fast switching
- High input impedance

NOMENCLATURE

SGT 20 N 60 □□□ □

- IGBT series
- Current: 60 denotes 60A
- N : N Channel
  NE: N-channel planar gate with ESD
  T: N-channel trench gate
- Voltage: 60 denotes 600V
- L : Low saturation voltage
  S : Standard
  Q : Quick
  F : High speed
  UF : Ultra high speed
- D : Package with fast recovery diode
  R : integrated with freewheeling diode
- 1,2,3··· : Version No.
- Package, PN denotes TO-3P;
  P7 denotes TO-247-3L,
  F denotes TO-220F;
  S denotes TO-263

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing
SGT20N60FD1PN	TO-3P	20N60FD1	Pb free	Tube
SGT20N60FD1P7	TO-247-3L	20N60FD	Pb free	Tube
SGT20N60FD1F	TO-220F-3L	20N60FD1F	Pb free	Tube
SGT20N60FD1S	TO-263-2L	20N60FD1S	Pb free	Tube

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

Parameter		Symbol	Ratings				Units
			SGT20N60 FD1PN	SGT20N60 FD1P7	SGT20N60 FD1F	SGT20N60 FD1S	
Collector to Emitter Voltage		V_{CE}	600				V
Gate to Emitter Voltage		V_{GE}	±20				V
Collector Current	T_C=25°C	I_C	40				A
	T_C=100°C		20				
Pulsed Collector Current		I_{CM}	60				A
Power Dissipation(T_C=25°C)		P_D	155	167	38	195	W
-Derate above 25°C			1.24	1.33	0.25	1.56	W/°C
Operating Junction Temperature Range		T_J	-55～+150				°C
Storage Temperature Range		T_{stg}	-55～+150				°C

THERMAL CHARACTERISTICS

Parameter	Symbol	Ratings				Units
		SGT20N60 FD1PN	SGT20N60 FD1P7	SGT20N60 FD1F	SGT20N60 FD1S	
Thermal Resistance, Junction to Case (IGBT)	$R_{\theta JC}$	0.79	0.75	3.95	0.64	°C/W
Thermal Resistance, Junction to Case (FRD)	$R_{\theta JC}$	2.7	2.24	5.2	3.07	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	40	40	62.5	30	°C/W

ELECTRICAL CHARACTERISTICS OF IGBT (T_C = 25°C unless otherwise noted)

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Units
Collector to Emitter Breakdown Voltage	BV_{CE}	V_{GE}=0V,I_C=100μA	600	--	--	V
C-E Leakage Current	I_{CES}	V_{CE}=600V,V_{GE}=0V	--	--	200	μA
G-E Leakage Current	I_{GES}	V_{GE}=20V,V_{CE}=0V	--	--	±400	nA
G-E Threshold Voltage	$V_{GE(th)}$	I_C=250μA,V_{CE}=V_{GE}	4.0	5.0	6.5	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=20A,V_{GE}=15V	--	2.0	2.7	V
		I_C=20A, V_{GE}=15V,T_C=125°C	--	2.3	--	V
Input Capacitance	C_{ies}	V_{CE}=30V	--	916	--	pF
Output Capacitance	C_{oes}	V_{GE}=0V	--	108	--	
Reverse Transfer Capacitance	C_{res}	f=1MHz	--	26	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=400V	--	15	--	ns

Rise Time	T_r	I_C=20A	--	45	--	
Turn-Off Delay Time	$T_{d(off)}$	R_g=10Ω	--	67	--	
Fall Time	T_f	V_{GE}=15V	--	129	--	
Turn-On Switching Loss	E_{on}	Inductive Load	--	0.898	--	mJ
Turn-Off Switching Loss	E_{off}		--	0.336	--	
Total Switching Loss	E_{st}		--	1.234	--	
Total Gate Charge	Q_g	V_{CE} = 300V, I_C=20A, V_{GE} = 15V	--	57	--	nC
Gate to Emitter Charge	Q_{ge}		--	11	--	
Gate to Collector Charge	Q_{gc}		--	26	--	

ELECTRICAL CHARACTERISTICS OF FRD (T_C = 25°C unless otherwise noted)

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Units
Diode Forward Voltage	V_{FM}	I_F = 12A T_C=25°C	--	1.9	2.6	V
		I_F = 12A T_C=125°C	--	1.5	--	
Diode Reverse Recovery Time	T_{rr}	I_{ES} =12A, dI_{ES}/dt = 200A/μs	--	32	--	ns
Diode Reverse Recovery Charge	Q_{rr}	I_{ES} =12A, dI_{ES}/dt = 200A/μs	--	74	--	nC

TYPICAL CHARACTERISTIC CURVES

Figure 1. Typical Output Characteristics (25°C)

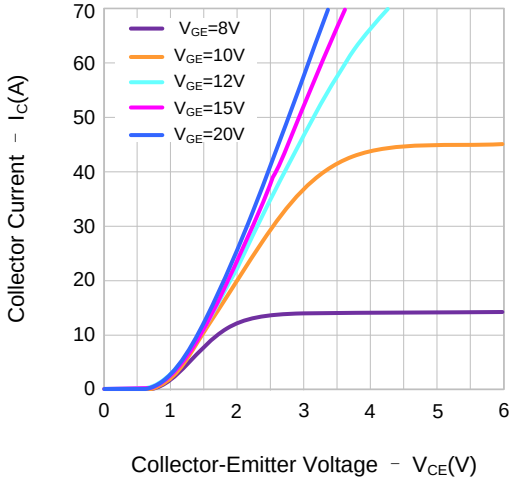


Figure 2. Typical Output Characteristics (125°C)

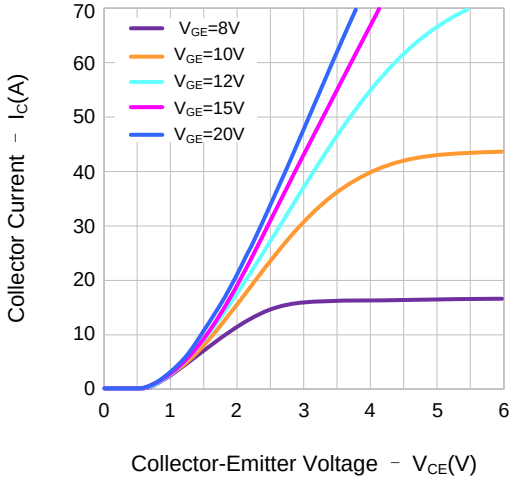


Figure 3. Typical Saturation Voltage Characteristics

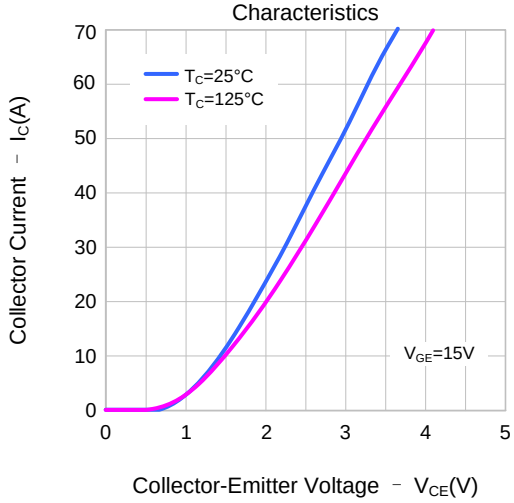
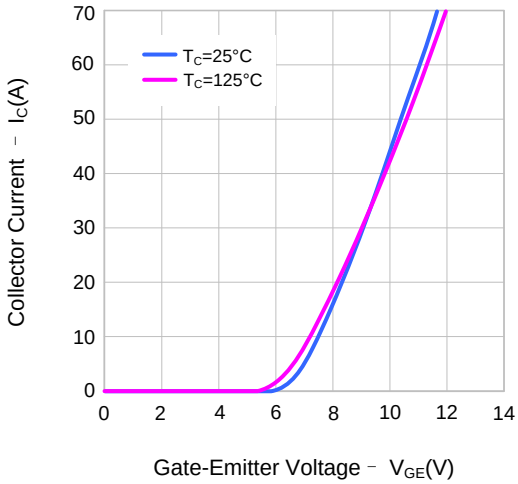


Figure 4. Transmission Characteristics



TYPICAL CHARACTERISTIC CURVES(continued)

Figure 5. Capacitance Characteristics

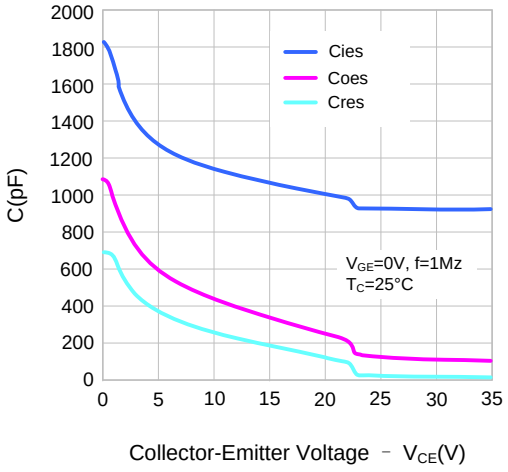


Figure 6. Gate Charge Characteristics

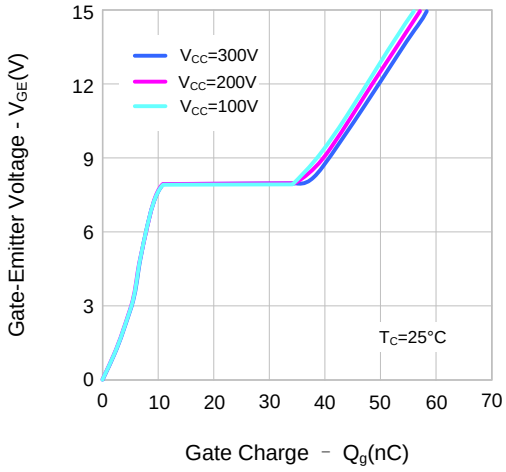


Figure 7. Turn-on Characteristics vs. Gate Resistance

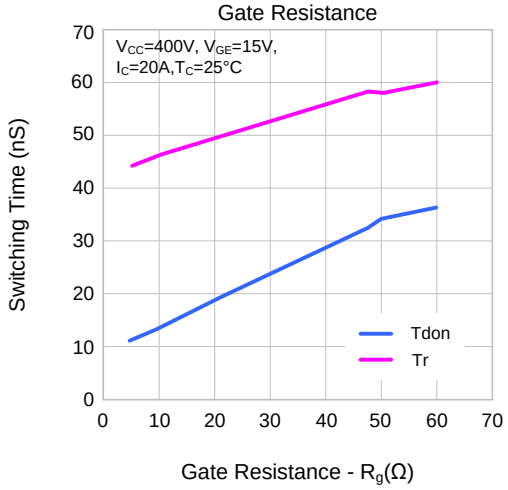


Figure 8. Turn-off Characteristics vs. Gate Resistance

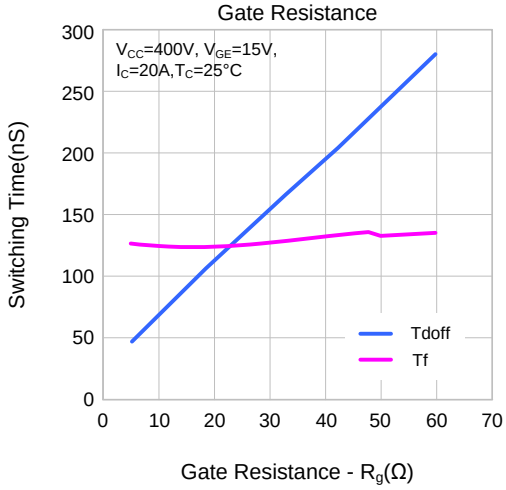


Figure 9. Switching Loss vs. Gate Resistance

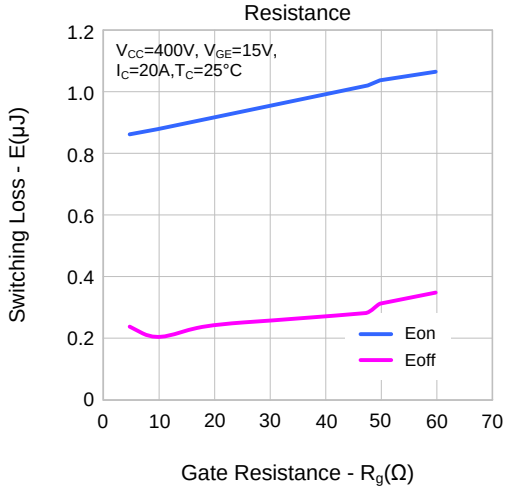
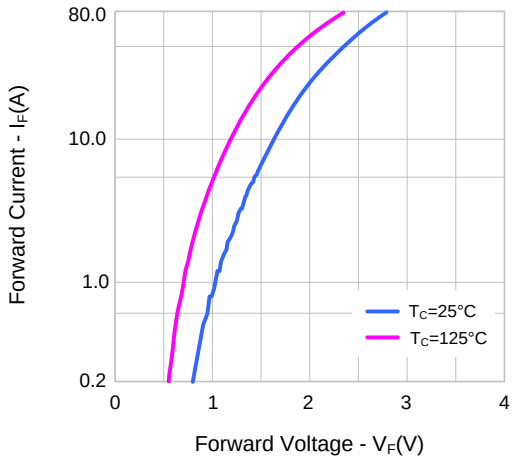


Figure 10. Forward Characteristics



TYPICAL CHARACTERISTIC CURVES(continued)

Figure 11-1. Max. Safe Operating Area(SGT20N60FD1PN)

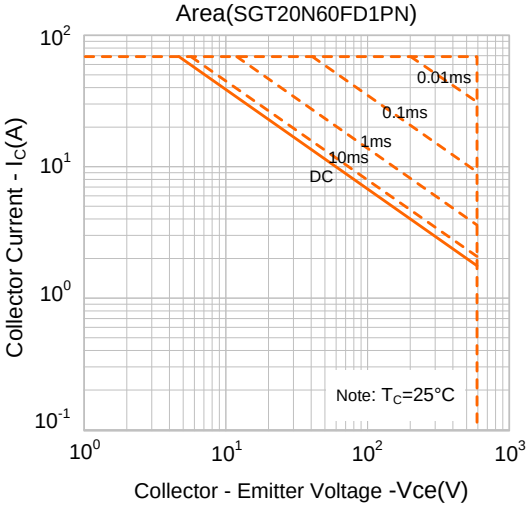


Figure 11-2. Max. Safe Operating Area(SGT20N60FD1P7)

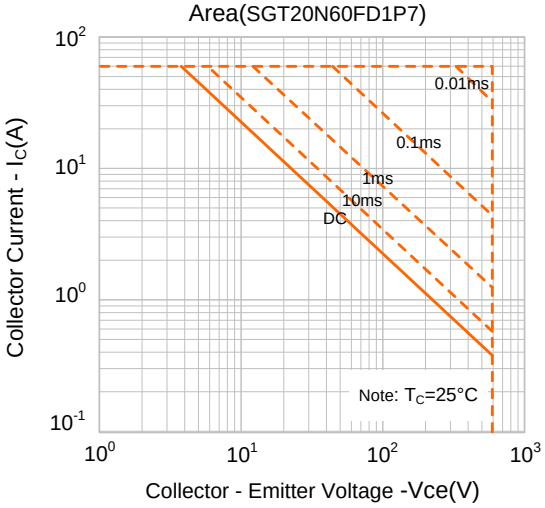


Figure 11-3. Max. Safe Operating Area(SGT20N60FD1F)

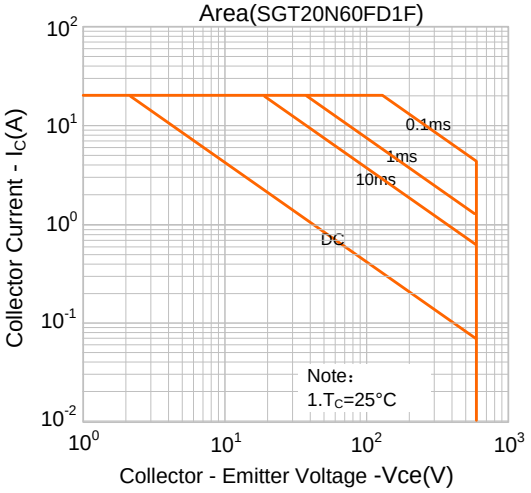
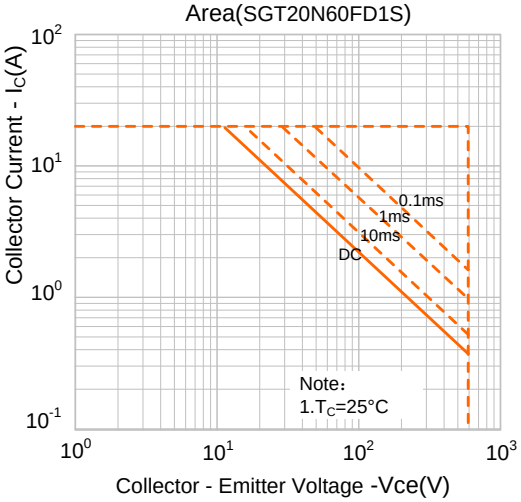
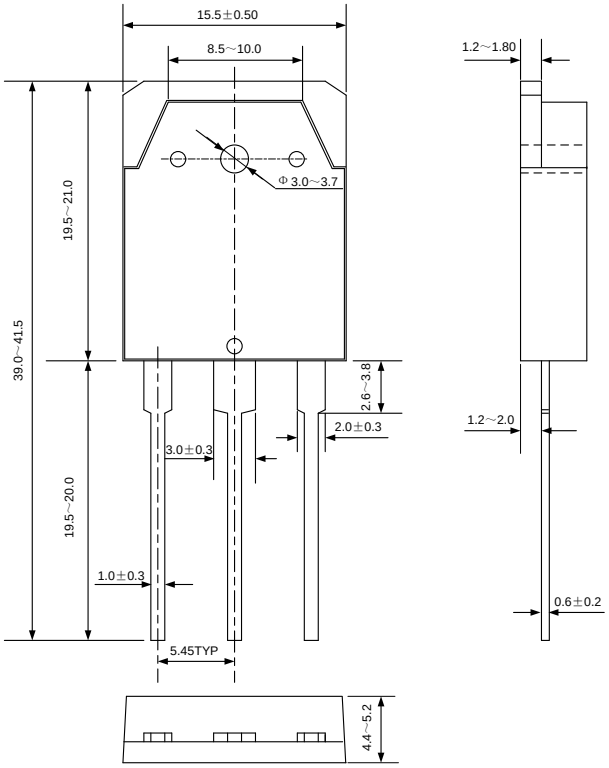


Figure11-4. Safe Operating Area(SGT20N60FD1S)

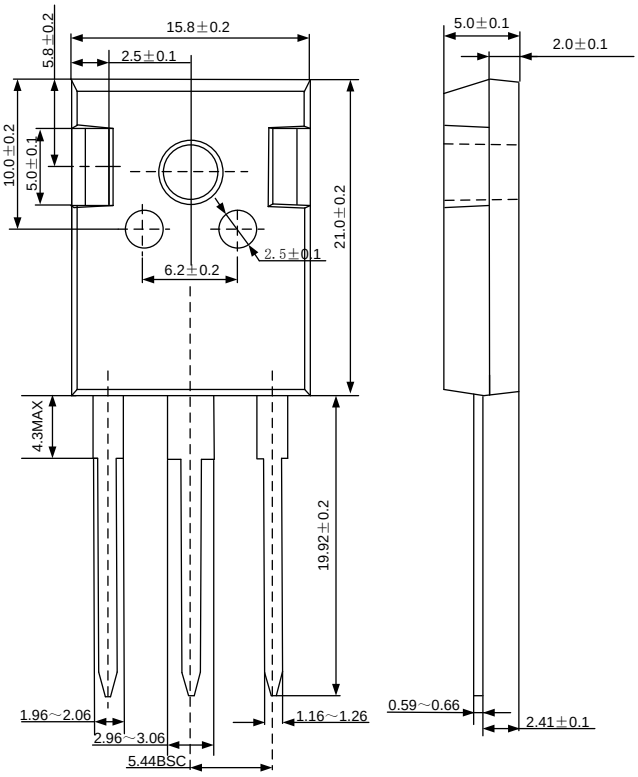


PACKAGE OUTLINE

TO-3P UNIT: mm



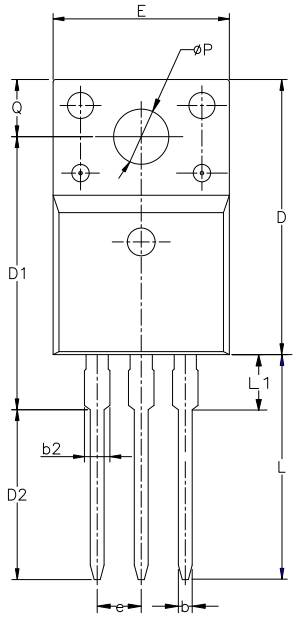
TO-247-3L UNIT: mm

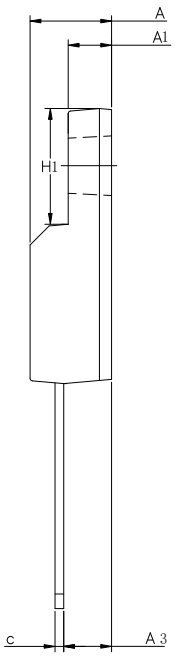


PACKAGE OUTLINE(continued)

TO-220F-3L

单位：mm

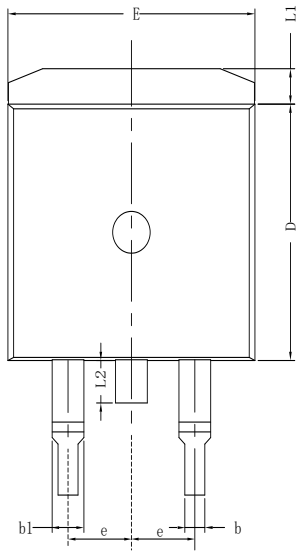


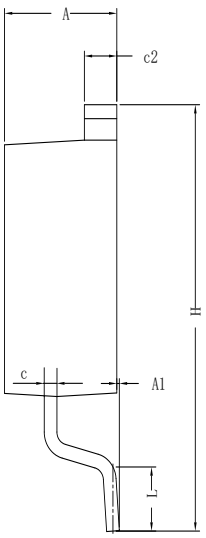


SYMBOL	MIN	NOM	MAX
A	4.42	4.70	5.02
A1	2.30	2.54	2.80
A3	2.50	2.76	3.10
b	0.70	0.80	0.90
b2	—	—	1.47
c	0.35	0.50	0.65
D	15.25	15.87	16.25
D1	15.30	15.75	16.30
D2	9.30	9.80	10.30
E	9.73	10.16	10.36
e	2.54BCS		
H1	6.40	6.68	7.00
L	12.48	12.98	13.48
L1	/	/	3.50
øP	3.00	3.18	3.40
Q	3.05	3.30	3.55

TO-263-2L

单位：mm





SYMBOL	MIN	NOM	MAX
A	4.30	4.57	4.72
A1	0	0.10	0.25
b	0.71	0.81	0.91
c	0.30	---	0.60
c2	1.17	1.27	1.37
D	8.50	---	9.35
E	9.80	---	10.45
e	2.54BSC		
H	14.70	---	15.75
L	2.00	2.30	2.74
L1	1.12	1.27	1.42
L2	---	---	1.75

Disclaimer :

- **Silan reserves the right to make changes to the information herein for the improvement of the design and performance without prior notice! Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current.**
- **All semiconductor products malfunction or fail with some probability under special conditions. When using Silan products in system design or complete machine manufacturing, it is the responsibility of the buyer to comply with the safety standards strictly and take essential measures to avoid situations in which a malfunction or failure of such Silan products could cause loss of body injury or damage to property.**
- **Silan will supply the best possible product for customers!**

Part No.:	SGT20N60FD1PN/P7/F/S	Document Type:	Datasheet
Copyright:	HANGZHOU SILAN MICROELECTRONICS CO.,LTD	Website:	http: //www.silan.com.cn

Rev.: 1.3

Revision History:

1. Add the package information of TO-263-2L

Rev.: 1.2

Revision History:

1. Add the package information of TO-220F-3L

Rev.: 1.1

Revision History:

1. Add the package information of TO-247-3L

Rev.: 1.0

Revision History:

1. First release