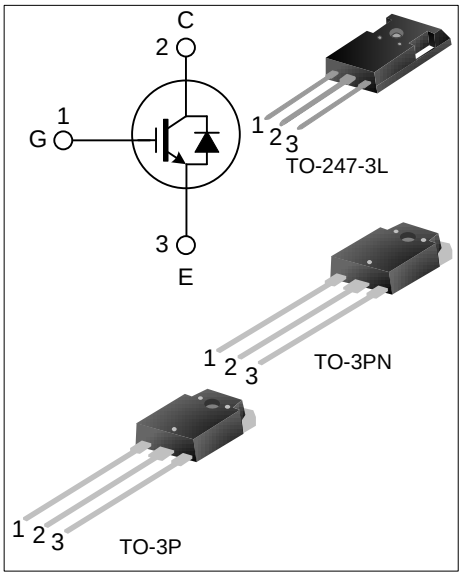
40A, 600V FIELD STOP IGBT

DESCRIPTION

SGT40N60FD2PN(P7)(PT) using Field Stop III IGBT technology, offers the optimum performance for induction Heating, UPS, SMPS and PFC application.



FEATURES

- 40A, 600V, $V_{CE(sat)(typ.)}$=1.8V@I_C=40A
- Low conduction loss
- Fast switching
- High input impedance

NOMENCLATURE

SGT 40 N 60 S D M 1 P7

- IGBT series
- Current, 40: 40A
- N : N Channel
  NE : N-channel planar gate with ESD
  T : Field Stop 3/4
  U : Field Stop 4+
  V : Field Stop 5
  W: Field Stop 6
  X : Field Stop 7
- Voltage, 65: 650V
  120: 1200V
- Package
  P7 : TO-247-3L
- 1,2,3··· : Version No.
- Blank: Standard diode
  M : Standard Diode, full range
  R : Rapid Diode
  B : Rapid Diode, full range
  S : Soft Diode, full range
- D : Packaged with fast recovery diode
  R : RC IGBT
- L : Ultra low switching，recommended frequency ~2KHz
  Q : Low switching，recommended frequency2~20K
  S : Standard frequency，recommended frequency5~40K
  F : Fast switching，recommended frequency10~60K
  UF : Ultra fast switching，recommended frequency 40K~

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SGT40N60FD2PN	TO-3P	40N60FD2	Pb free	Tube
SGT40N60FD2P7	TO-247-3L	40N60FD2	Pb free	Tube
SGT40N60FD2PT	TO-3PN	40N60FD2	Pb free	Tube

ABSOLUTE MAXIMUM RATINGS (T_C=25°C UNLESS OTHERWISE NOTED)

Parameter		Symbol	Ratings	Units
Collector to Emitter Voltage		V_{CE}	600	V
Gate to Emitter Voltage		V_{GE}	±20	V
Collector Current	T_C=25°C	I_C	80	A
	T_C=100°C		40	
Pulsed Collector Current		I_{CM}	120	A
Power Dissipation(T_C=25°C)		P_D	380	W
-Derate above 25°C			3.04	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
Thermal Resistance, Junction to Case (IGBT)	$R_{\theta JC}$	0.33	°C/W
Thermal Resistance, Junction to Case (FRD)	$R_{\theta JC}$	1.9	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	40	°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	--	--	±500	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=40A, V_{GE}=15V	--	1.8	2.7	V
		I_C=40A, V_{GE}=15V, T_C=125°C	--	2.5	--	V
Input Capacitance	C_{ies}	V_{CE}=30V V_{GE}=0V f=1MHz	--	1850	--	pF
Output Capacitance	C_{oes}		--	190	--	
Reverse Transfer Capacitance	C_{res}		--	50	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=400V I_C=40A R_g=10Ω V_{GE}=15V Inductive Load	--	16	--	ns
Rise Time	T_r		--	88	--	
Turn-Off Delay Time	$T_{d(off)}$		--	110	--	
Fall Time	T_f		--	96	--	
Turn-On Switching Loss	E_{on}		--	1.8	--	mJ
Turn-Off Switching Loss	E_{off}		--	0.8	--	
Total Switching Loss	E_{st}		--	2.6	--	
Total Gate Charge	Q_g	V_{CE} = 300V, I_C=40A, V_{GE} = 15V	--	100	--	nC
Gate to Emitter Charge	Q_{ge}		--	11	--	
Gate to Collector Charge	Q_{gc}		--	52	--	

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 = 20A, T_C=25°C	--	1.9	2.6	V
		I_F = 20A, T_C=125°C	--	1.5	--	
Diode Reverse Recovery Time	T_{rr}	I_{ES}=20A, dI_{ES}/dt=200A/μs	--	32	--	ns
Diode Reverse Recovery Charge	Q_{rr}	I_{ES}=20A, dI_{ES}/dt=200A/μs	--	74	--	nC

TYPICAL CHARACTERISTIC CURVES

Figure 1. Typical Output Characteristics

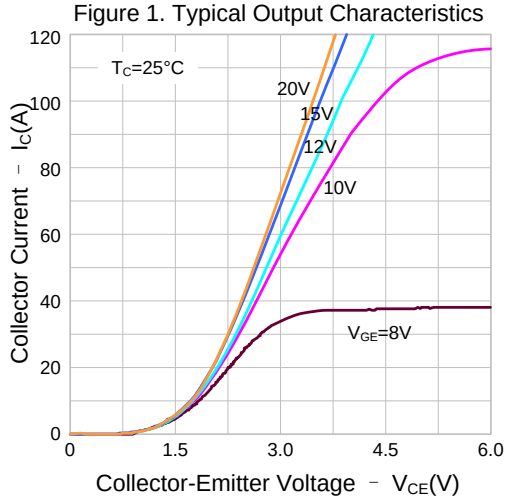


Figure 2. Typical Output Characteristics

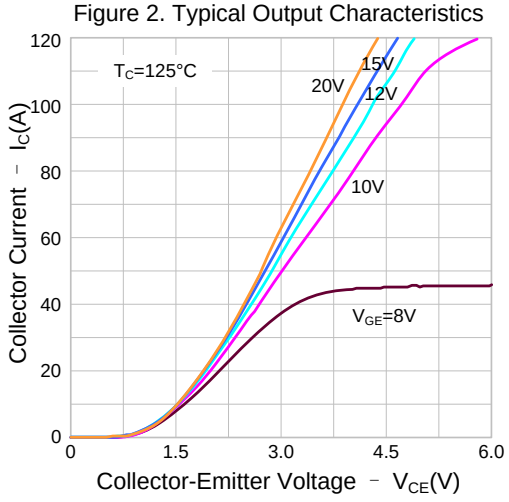


Figure 3. Typical Saturation Voltage Characteristics

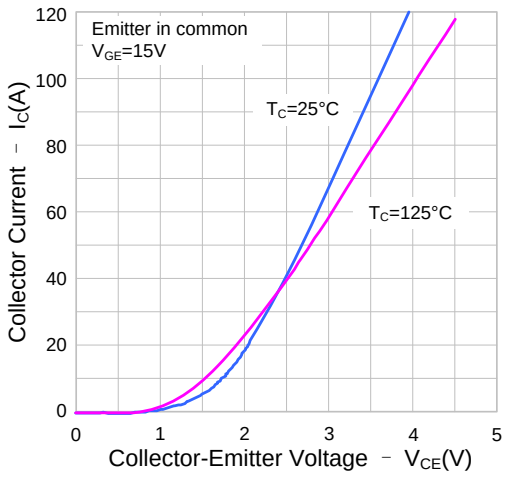


Figure 4. Transmission Characteristics

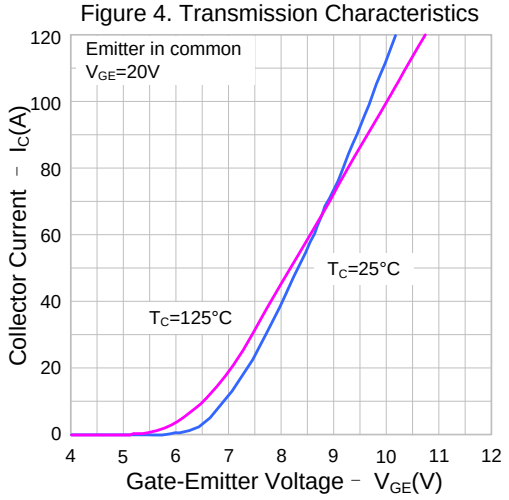


Figure 5. Saturation Voltage vs. V_{GE}

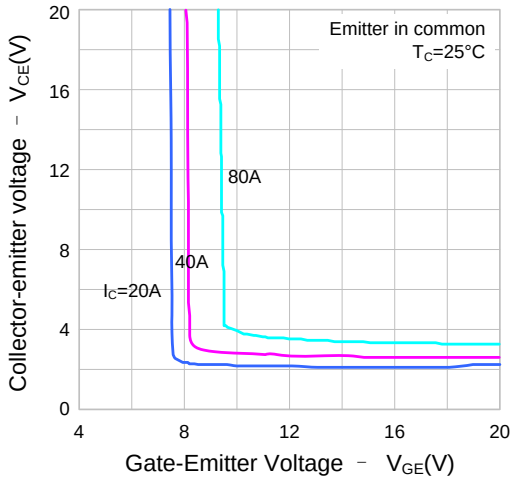
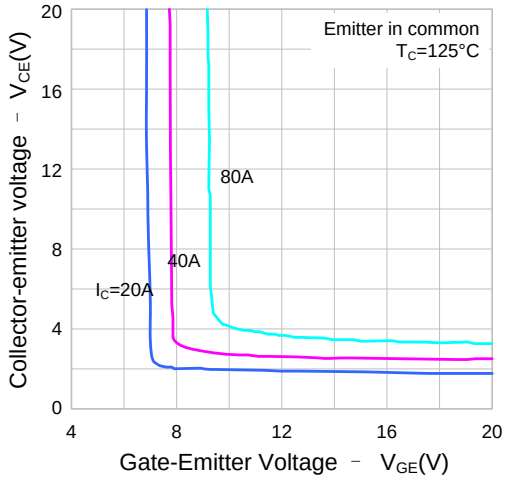


Figure 6. Saturation Voltage vs. V_{GE}



TYPICAL CHARACTERISTIC CURVES(CONTINUED)

Figure 7. Capacitance Characteristics

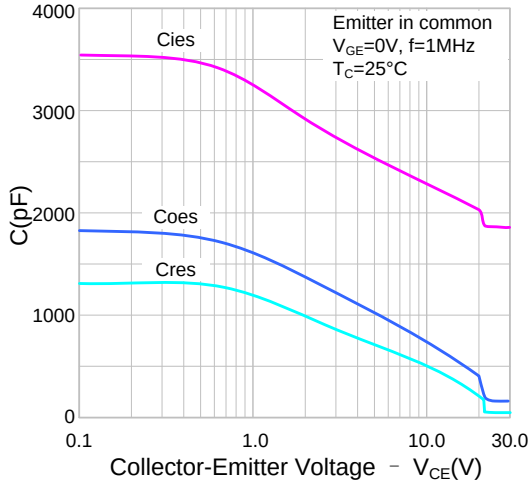


Figure 8. Gate Charge Characteristics

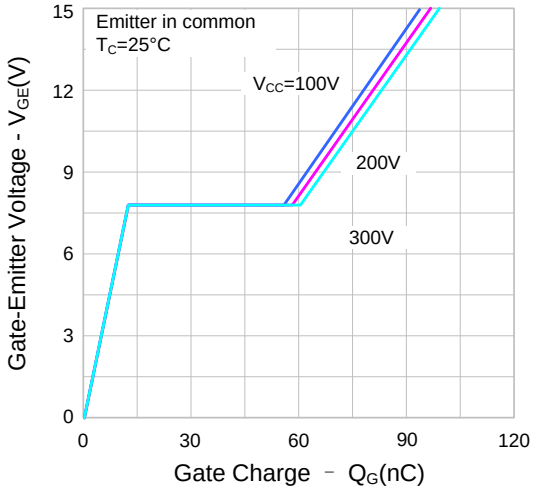


Figure 9. Turn-on Characteristics vs. Gate Resistance

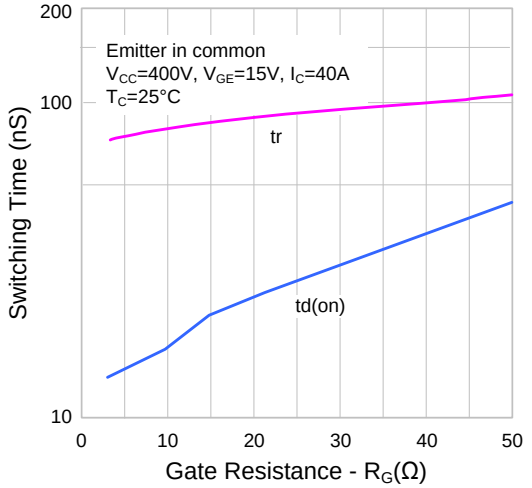


Figure 10. Turn-off Characteristics vs. Gate Resistance

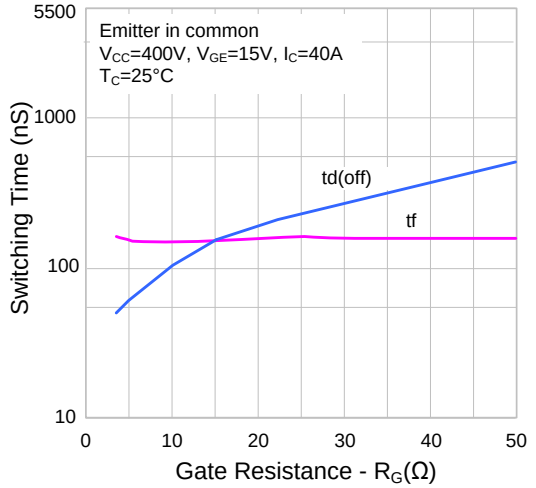


Figure 11. Switching Loss vs. Gate Resistance

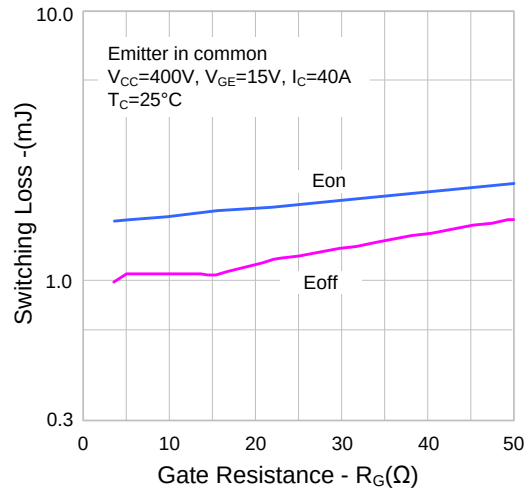
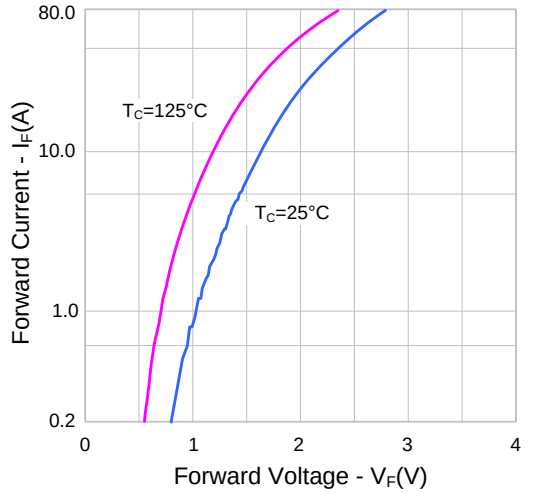


Figure 12. Forward Characteristics



TYPICAL CHARACTERISTIC CURVES(CONTINUED)

Figure 13. Max. Safe Operating Area

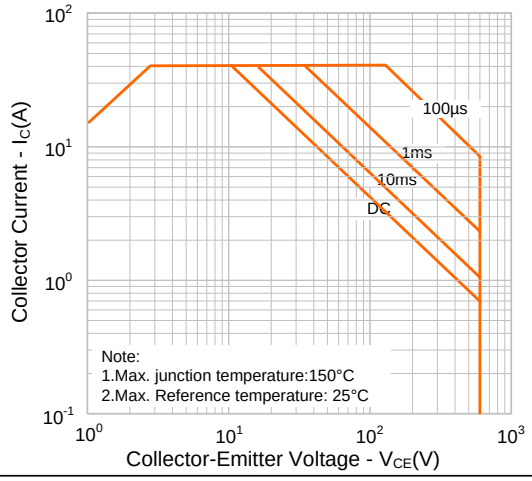
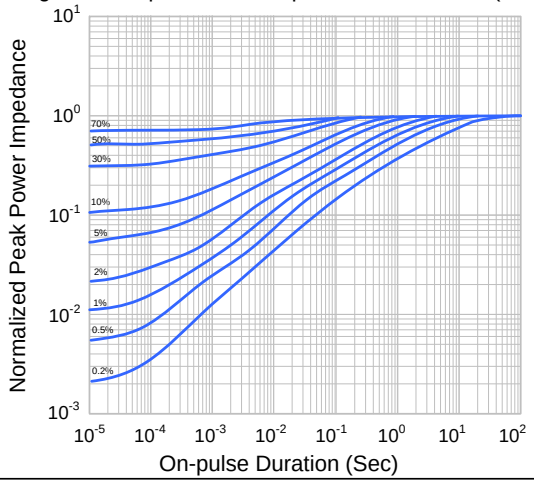


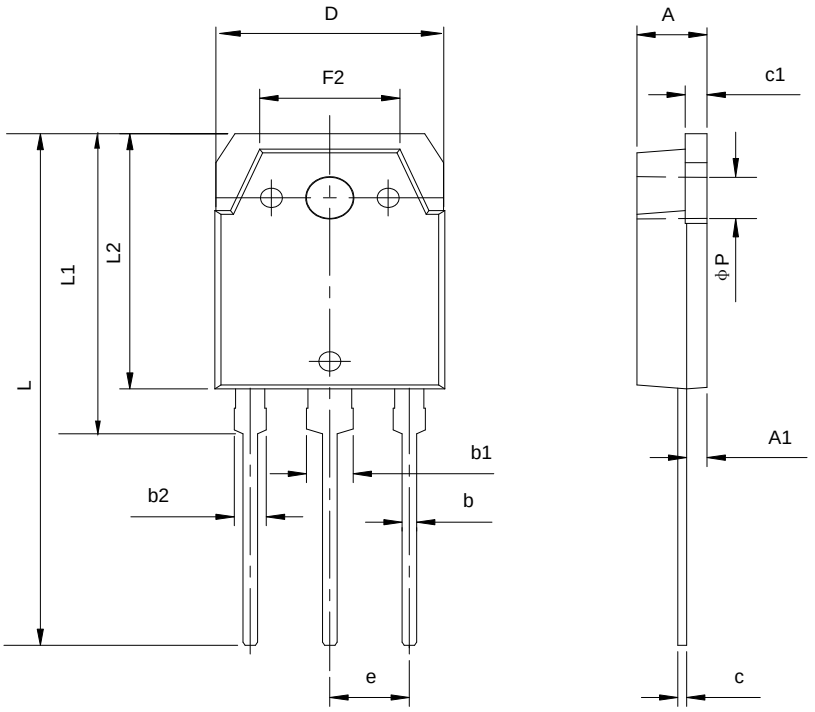
Figure 14. Square Wave Impedance Simulation (IGBT)



PACKAGE OUTLINE

TO-3P

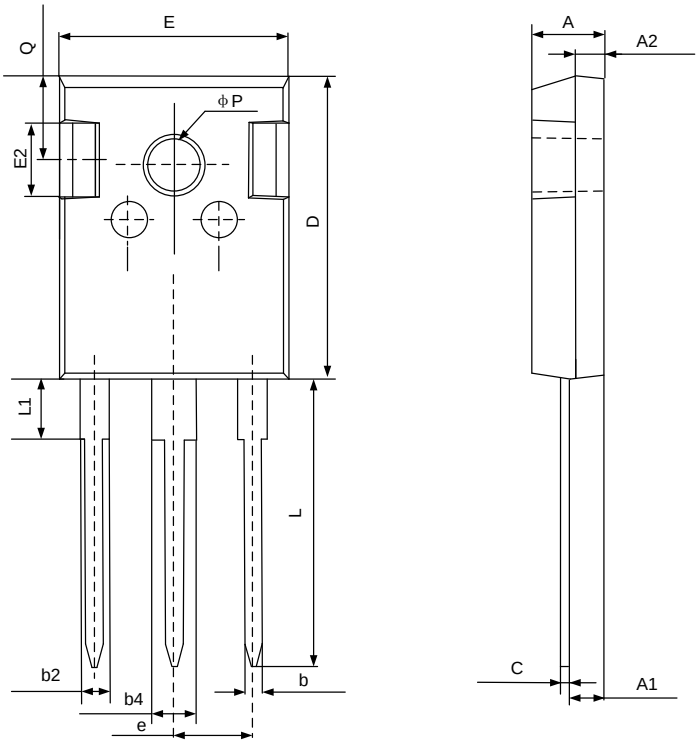
UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.4	—	5.2
c1	1.2	—	1.8
A1	1.2	—	2.0
b	0.7	1.0	1.3
b1	2.7	3.0	3.3
b2	1.7	2.0	2.3
D	15.0	15.5	16.0
c	0.4	0.6	0.8
F2	8.5	—	10.0
e	5.45 TYP		
L1	22.6	—	23.6
L	39.0	—	41.5
L2	19.5	—	21.0
P	3.0	—	3.4

TO-247-3L

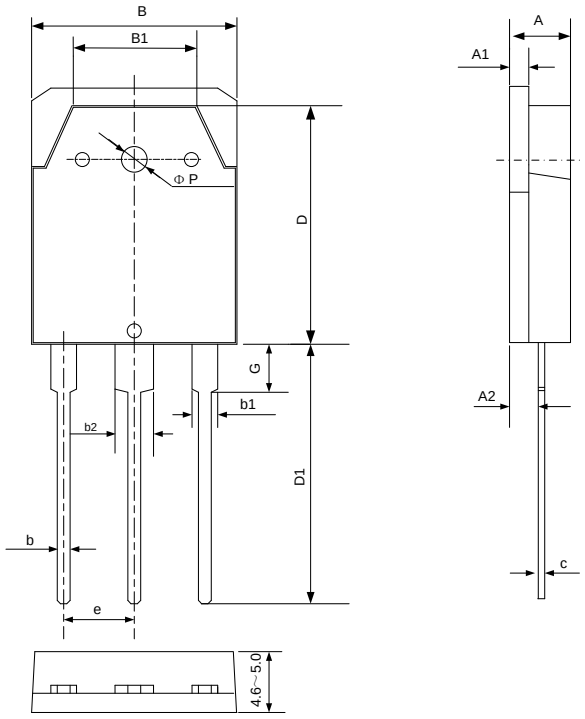
UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	–	1.36
b2	1.91	–	2.25
b4	2.91	–	3.25
c	0.51	–	0.75
D	20.80	21.00	21.30
E	15.50	15.80	16.10
E2	4.40	5.00	5.20
e	5.44 BSC		
L	19.72	19.92	20.22
L1	–	–	4.30
Q	5.60	5.80	6.00
P	3.40	—	3.80

PACKAGE OUTLINE(CONTINUED)

TO-3PN **UNIT: mm**



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.60	4.80	5.00
A1	1.30	1.50	1.70
A2	2.20	2.40	2.60
b	0.80	1.00	1.20
b1	1.80	2.00	2.20
b2	2.90	3.10	3.30
B	15.20	15.60	16.00
B1	9.10	9.30	9.50
c	0.50	0.60	0.70
D	18.30	18.50	18.70
D1	19.00	19.50	20.00
e	5.25	5.45	5.65
G	2.80	3.00	3.20
ΦP	3.00	3.20	3.40

Important notice :

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2. **Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current. Please read the instructions carefully before using our products, including the circuit operation precautions.**
3. **Our products are consumer electronic products or the other civil electronic products.**
4. **When using our products, please do not exceed the maximum rating of the products, otherwise the reliability of the whole machine will be affected. There is a certain possibility of failure or malfunction of any semiconductor product under specific conditions. The buyer is responsible for complying with safety standards and taking safety measures when using our products for system design, sample and whole machine manufacturing, so as to avoid potential failure risk that may cause personal injury or property loss.**
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Rev.: 1.2

Revision History:

1. Add the package outline of TO-3PN
2. Update the template of datasheet

Rev.: 1.1

Revision History:

1. Update NOMENCLATURE
2. Update Marking
3. Update package outline

Rev.: 1.0

Revision History:

1. First release