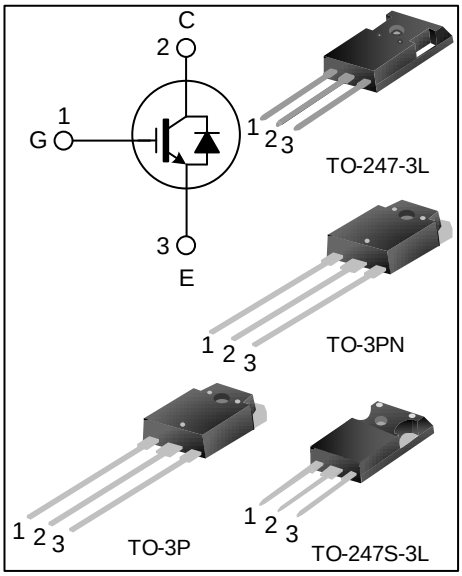
40A, 600V FIELD STOP IGBT

DESCRIPTION

SGT40N60FD2PN(P7)(PT)(PS) 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 F D 2 P7

IGBT series

Current, 40: 40A

N : N-channel
NE : N-channel planner gate with ESD
T : Field Stop 3/4
U : Field Stop 4+
V : Field Stop 5
W: Field Stop 5+
Y : Field Stop5++
A : Field Stop 6

Voltage, 60: 600V
120: 1200V

L : Ultra low switching，recommended frequency ~2KHz
Q : Low switching，recommended frequency 2~20KHz
S : Standard frequency，recommended frequency 5~40KHz
F : Fast switching，recommended frequency 10~60KHz
UF : Ultra fast switching，recommended frequency 40KHz~
I: Igniter

D : packaged with fast recovery diode
R : RC IGBT
Blank: single IGBT
C : Sic

Blank: Standard diode
M : Standard Diode, full range
R : Rapid Diode
B : Rapid Diode, full range
S : Soft Diode, full range

1,2,3⋯ : Version No.

Package
P7 : TO-247-3L

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
SGT40N60FD2PS	TO-247S-3L	40N60FD2	Pb free	Tube

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

Parameter		Symbol	Ratings	Units
Collector - Emitter Voltage		V_{CE}	600	V
Gate - Emitter Voltage		V_{GE}	±20	V
Transient Gate - Emitter Voltage (t_p≤10μs, D<0.010)		V_{GE}	±30	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_{tot}	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)	$R_{th(j-C)}$	0.33	°C/W
Thermal Resistance, Junction to Case (FRD)	$R_{th(j-C)}$	1.9	°C/W
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	40	°C/W

ELECTRICAL CHARACTERISTICS OF IGBT (T_J = 25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Units
Collector - Emitter Breakdown Voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=250μA	600	--	--	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE}=600V, V_{GE}=0V	--	--	200	μA
Gate-emitter Leakage Current	I_{GES}	V_{GE}=20V, V_{CE}=0V	--	--	±500	nA
Gate-emitter Threshold Voltage	$V_{GE(th)}$	I_C=250μA, V_{CE}=V_{GE}	4.0	5.0	6.5	V
Collector-emitter Saturation Voltage	V_{CEsat}	I_C=40A, V_{GE}=15V	--	1.8	2.7	V
		I_C=40A, V_{GE}=15V, T_J=125°C	--	2.5	--	V
Input Capacitance	C_{ies}	V_{CE}=30V	--	1850	--	pF
Output Capacitance	C_{oes}	V_{GE}=0V	--	190	--	
Reverse Transfer Capacitance	C_{res}	f=1MHz	--	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 Energy	E_{on}		--	1.8	--	mJ
Turn-Off Energy	E_{off}		--	0.8	--	
Total Switching Energy	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_J=25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Units
Diode Forward Voltage	V_F	I_F = 20A, T_J=25°C	--	1.9	2.6	V
		I_F = 20A, T_J=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

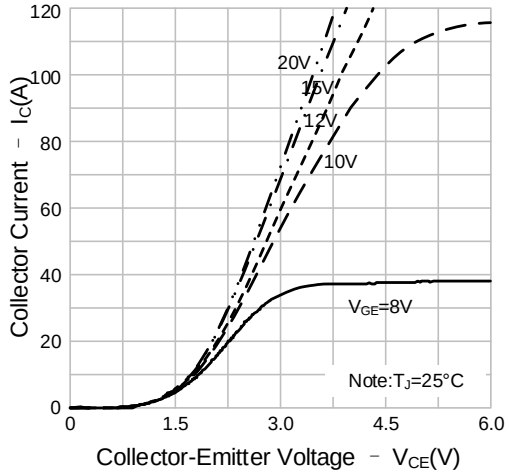


Figure 2. Typical Output Characteristics

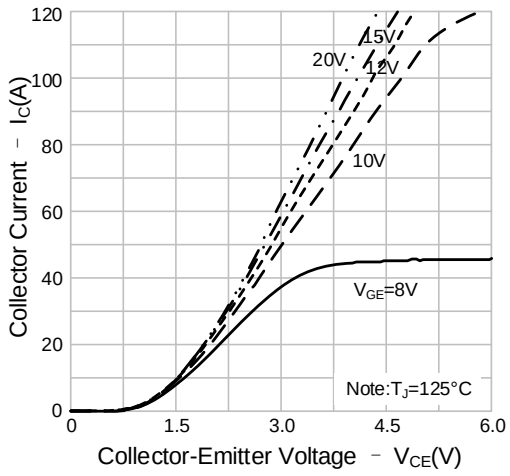


Figure 3. Typical Saturation Voltage Characteristics

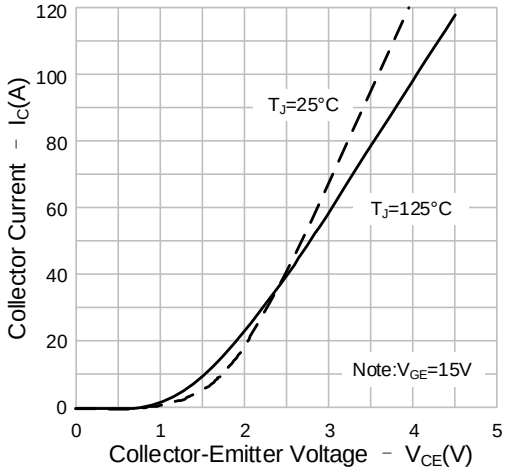


Figure 4. Transmission Characteristics

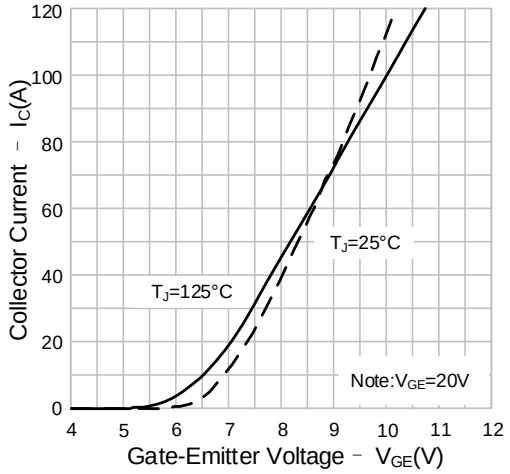


Figure 5. Saturation Voltage vs. V_{GE}

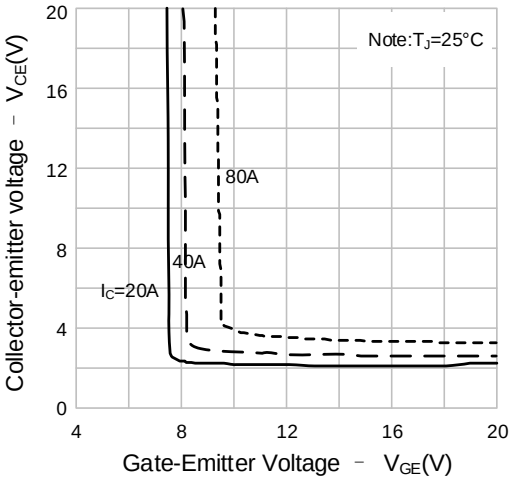
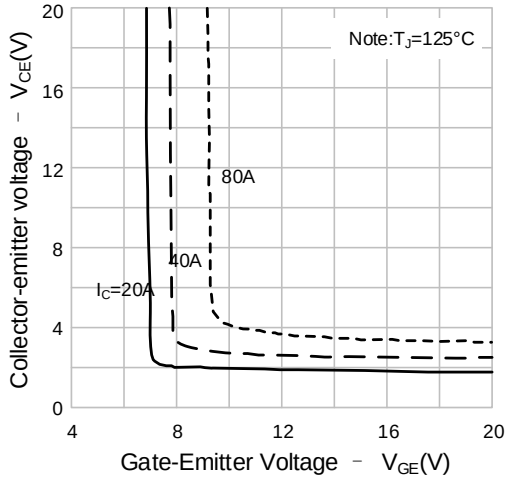


Figure 6. Saturation Voltage vs. V_{GE}



TYPICAL CHARACTERISTIC CURVES(CONTINUED)

Figure 7. Capacitance Characteristics

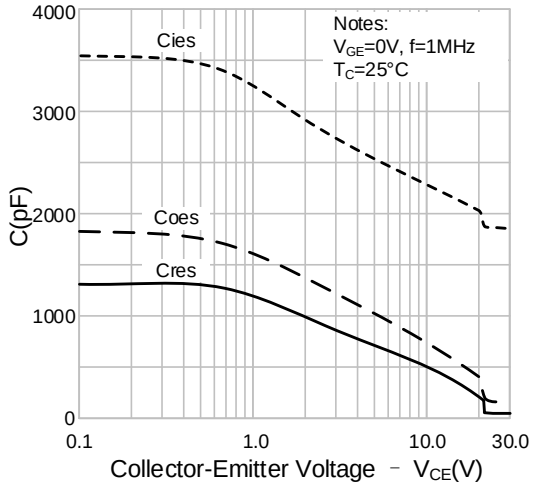


Figure 8. Gate Charge Characteristics

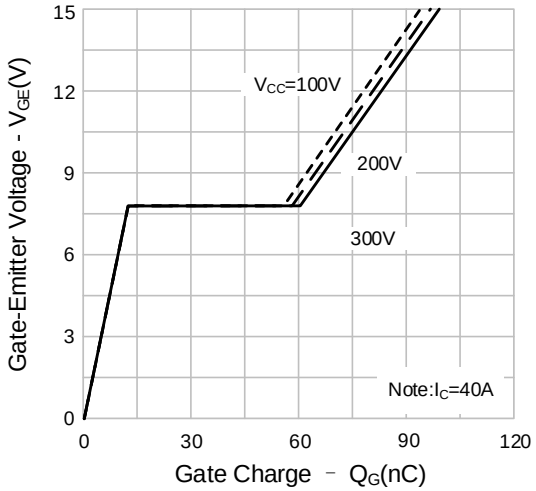


Figure 9. Turn-on Characteristics vs. Gate Resistance

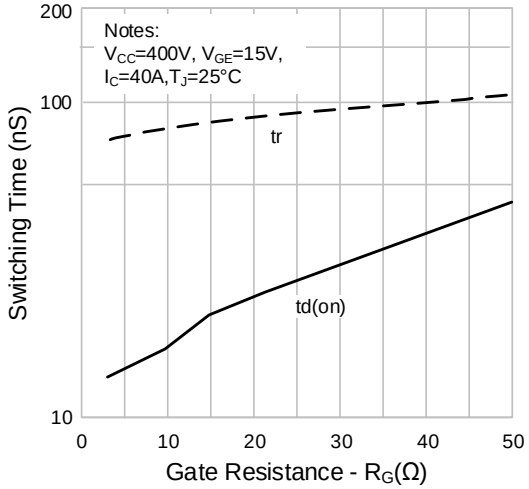


Figure 10. Turn-off Characteristics vs. Gate Resistance

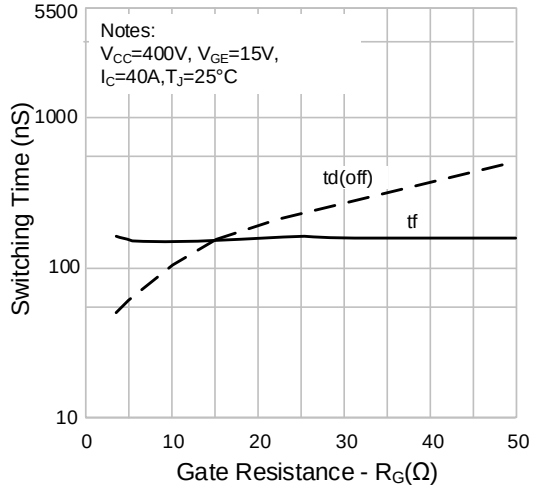


Figure 11. Switching Loss vs. Gate Resistance

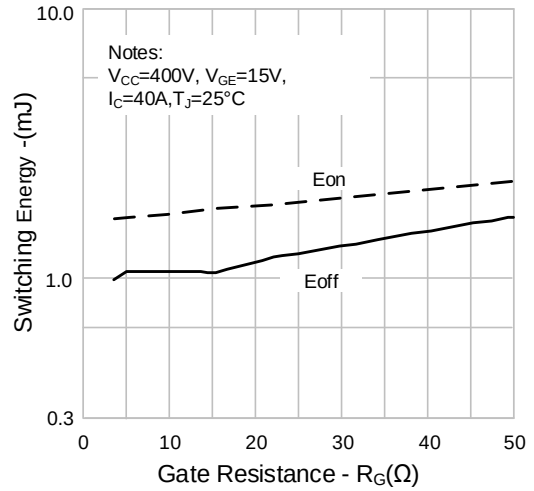
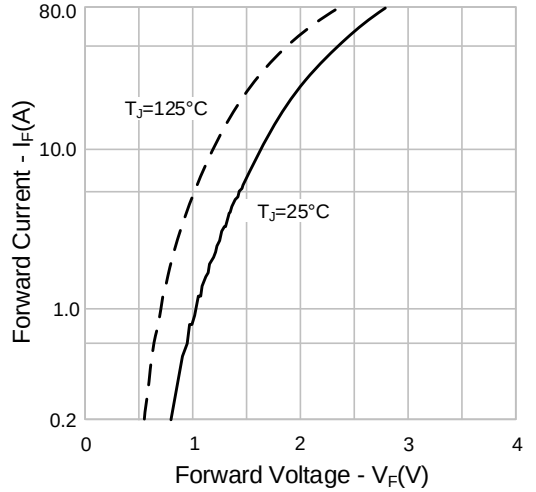


Figure 12. Forward Characteristics



TYPICAL CHARACTERISTIC CURVES(CONTINUED)

Figure 13. Max. Safe Operating Area

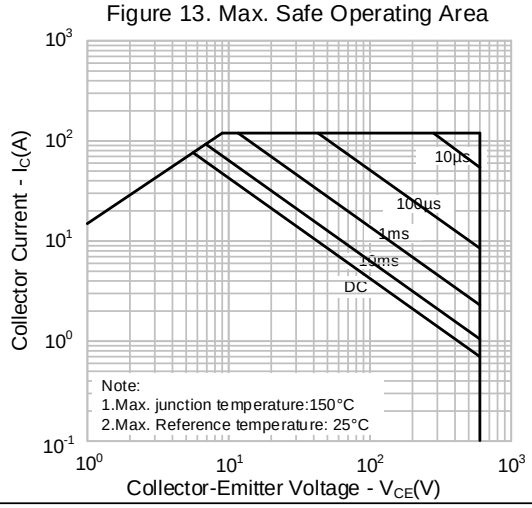
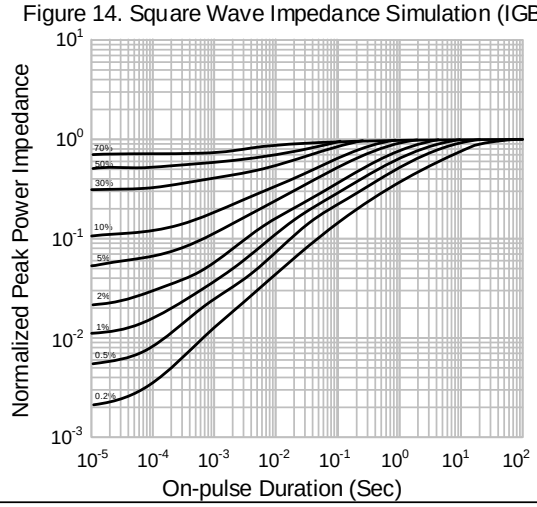
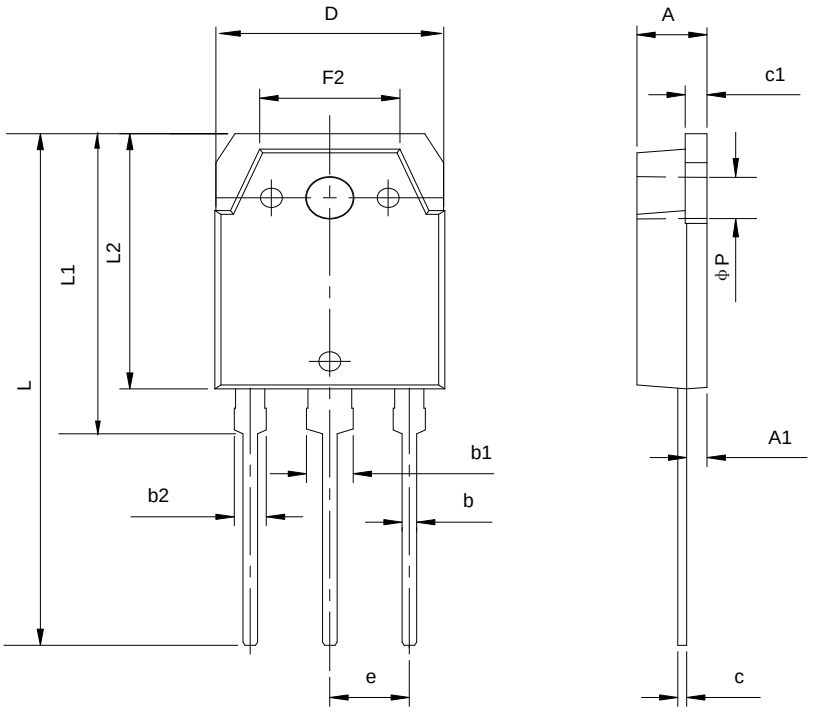


Figure 14. Square Wave Impedance Simulation (IGBT)



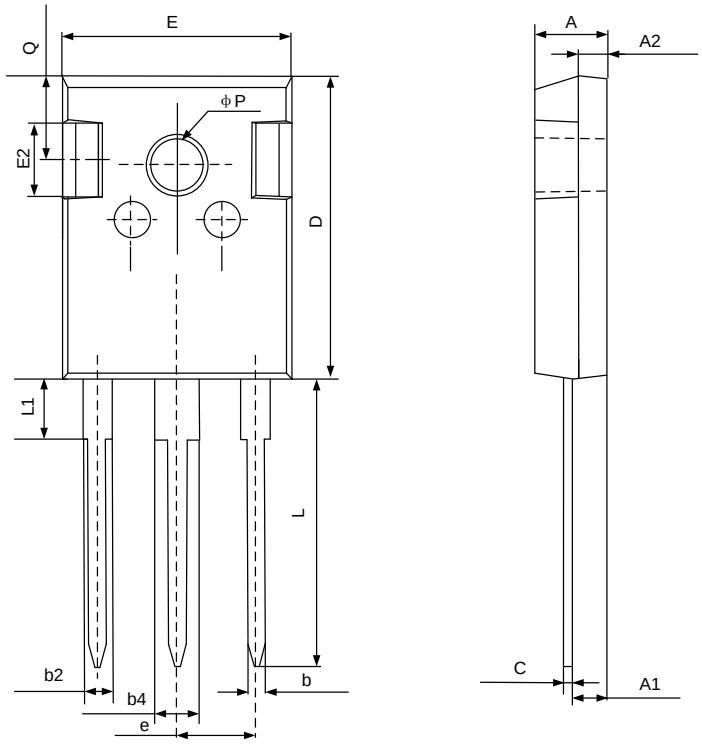
PACKAGE OUTLINE

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

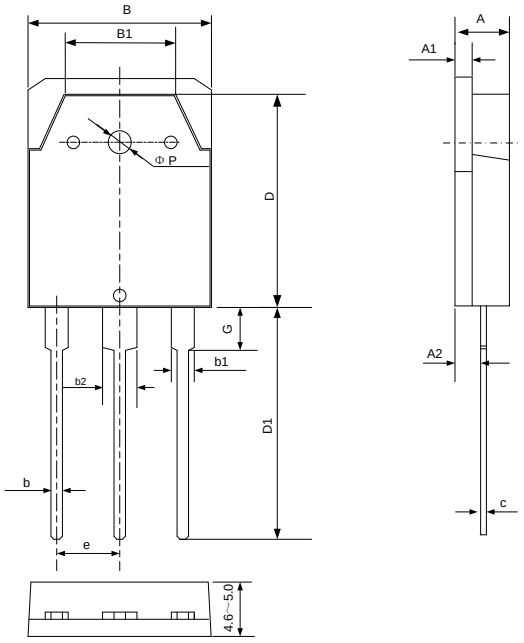


SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	–	1.36
b2	1.91	–	2.25
b4	2.91	–	3.25
c	0.51	–	0.75
D	20.80	21.00	21.30
E	15.50	15.80	16.10
E2	4.40	5.00	5.20
e	5.44 BSC		
L	19.72	19.92	20.22
L1	–	–	4.30
Q	5.60	5.80	6.00
P	3.40	—	3.80

PACKAGE OUTLINE(CONTINUED)

TO-3PN

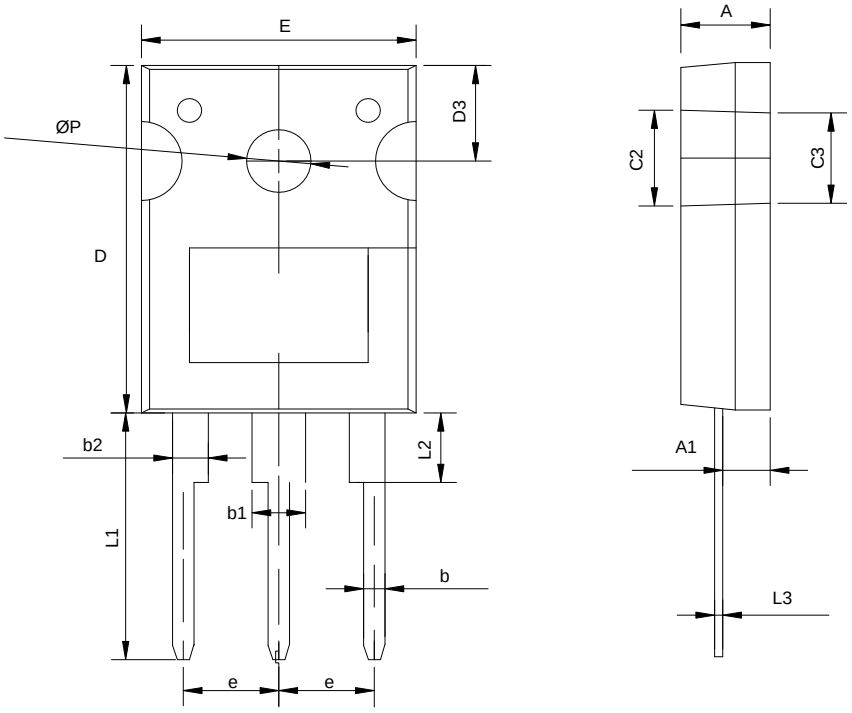
UNIT: mm



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
ØP	3.00	3.20	3.40

TO-247S-3L

UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.30	2.50	2.70
b	1.10	1.20	1.30
b1	2.90	3.10	3.30
b2	1.90	2.10	2.30
c2	5.50	6.00	6.50
c3	4.95	5.10	5.25
D	19.00	20.00	21.00
D3	5.30	5.50	5.70
e	5.34	5.44	5.54
E	15.40	15.60	15.80
L1	14.40	14.60	14.80
L2	3.85	4.00	4.15
L3	0.35	0.50	0.65
ØP	3.40	3.60	3.80

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Rev.: 1.5

Revision History:

1. Add TO-247S-3L package outline

Rev.: 1.4

Revision History:

1. Update nomenclature and parameter names

Rev.: 1.3

Revision History:

1. Update the curve
2. Update important notice

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