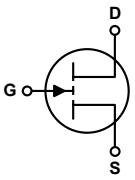
INN040LA015A

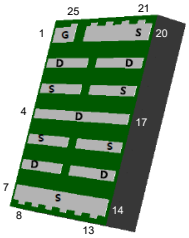
1. General description

GaN-on-Silicon enhancement mode high-electron-mobility-transistor (HEMT) in FCLGA with 5 mm x 4 mm package size.

2. Features



- GaN-on-Silicon E-mode HEMT technology
- Very low gate charge
- Ultra-low on resistance
- Zero reverse recovery charge



3. Applications

- Battery Charger
- Battery Management System
- Notebook
- Industry

4. Key performance parameters

Table 1 Key performance parameters at T_j = 25 °C

Parameter	Value	Unit
$V_{DS,max}$	40	V
$R_{DS(on),max}$ @ V_{GS} = 5 V	1.5	mΩ
$Q_{G,typ}$ @ V_{DS} = 20V	30	nC
$I_{DS,Pulse}$	200	A
Q_{OSS}@ V_{DS} = 20V	37	nC

5. Pin information

Table 2 Pin information

Pin	Pin description	Pin function
1,25	Gate	Driver Gate
3,5,7-14,16,18,20-24	Source	Source
2,4,6,15,17,19	Drain	Power Drain

Table 3 Ordering information

Type/Ordering Code	Package	Product Code
INN040LA015A	FCLGA 5mm x 4mm	D13

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6. Maximum ratings

at T_j = 25 °C unless otherwise specified.

Continuous application of maximum ratings can deteriorate transistor lifetime. For further information, contact Innoscience sales office.

Table 4 Maximum ratings

SYMBOL	PARAMETER	MAX	UNIT
V_{DS}	Drain-to-Source Voltage (Continuous)	40	V
I_D	Continuous current	50	A
	Pulsed (25˚C, T_{Pulse} = 100 μs)	200	A
V_{GS}	Gate-to-Source Voltage	6	V
	Gate-to-Source Voltage	-4	V
T_J	Operating Temperature	-40 to 150	˚C
T_{STG}	Storage Temperature	-40 to 150	˚C

7. Thermal characteristics

Table 5 Thermal characteristics

SYMBOL	PARAMETER	TYP	UNIT
$R_{\theta JC}$	Thermal Resistance, Junction to Case	14	˚C/W
$R_{\theta JB}$	Thermal Resistance, Junction to Board	1.2	˚C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient [1]	46	˚C/W

Note 1: $R_{\theta JA}$ is determined with the device mounted on one square inch of copper pad, single layer 2 oz copper on FR4 board.

8. Electric characteristics

at T_j = 25 °C, unless specified otherwise

Table 6 Static characteristics

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS
BV_{DSS}	Drain-to-Source Voltage	40			V	V_{GS} = 0 V, I_D = 1.1 mA
I_{DSS}	Drain Source Leakage		0.04	0.9	mA	V_{GS} = 0 V, V_{DS} = 32 V
I_{GSS}	Gate-to-Source Forward Leakage		0.04	0.8	mA	V_{GS} = 5 V
	Gate-to-Source Reverse Leakage		0.04	0.4	mA	V_{GS} = -4 V
$V_{GS(TH)}$	Gate Threshold Voltage	0.7	1.1	2.3	V	V_{DS} = V_{GS}, I_D = 25 mA
$R_{DS(on)}$	Drain-Source On-state Resistance		1.2	1.5	mΩ	V_{GS} = 5 V, I_D = 15 A
V_{SD}	Source-Drain Forward Voltage		0.9		V	I_S = 0.5 A, V_{GS} = 0 V

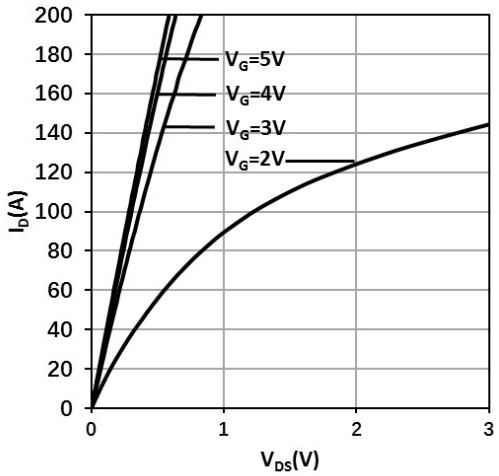
Table 7 Dynamic characteristics

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS
C_{iss}	Input Capacitance		4.2		nF	V_{GS} = 0 V, V_{DS} = 20 V
C_{oss}	Output Capacitance		1.5			V_{GS} = 0 V, V_{DS} = 20 V
C_{rss}	Reverse Transfer Capacitance		0.1			V_{GS} = 0 V, V_{DS} = 20 V
$C_{oss(er)}$	Energy Related C_{oss}		1.9			V_{DS} = 0 V to 20 V, V_{GS} = 0 V
$C_{oss(tr)}$	Time Related C_{oss}		2.4			
R_G	Gate resistance		1.6		Ω	
Q_G	Total Gate Charge		30		nC	V_{GS} = 5 V, V_{DS} = 20 V, I_D= 15 A
Q_{GS}	Gate to Source Charge		5			V_{DS} = 20 V, I_D = 15 A
Q_{GD}	Gate to Drain Charge		4			V_{DS} = 20 V, I_D = 15 A
$Q_{G(TH)}$	Gate Charge at Threshold		4.6			V_{DS} = 20 V, I_D = 15 A
Q_{OSS}	Output Charge		37			V_{GS} = 0 V, V_{DS} = 20 V

9. Electric characteristics diagrams

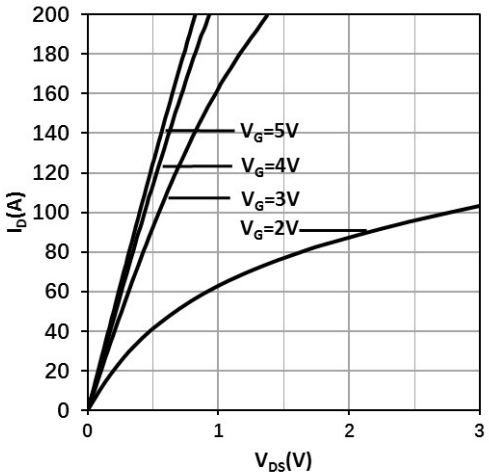
at T_j = 25 °C, unless specified otherwise

Fig. 1 Typical Output Characteristics



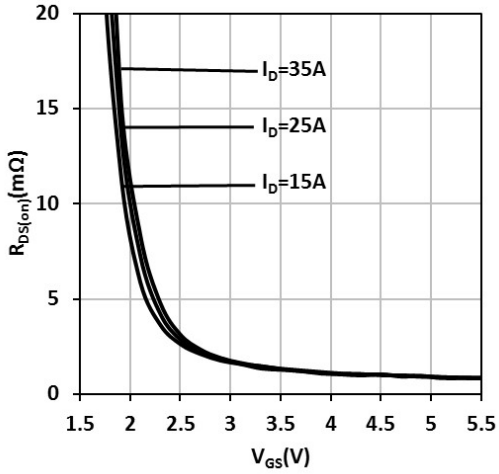
$I_D = f(V_{DS},V_{GS})$; T_J = 25 °C

Fig. 2 Typical Output Characteristics



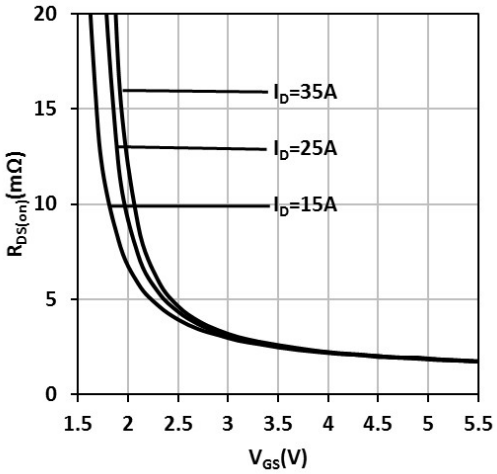
$I_D = f(V_{DS},V_{GS})$; T_J = 125 °C

Fig. 3 Typical Drain On-state Resistance



$R_{D(on)} = f(V_{GS},I_D)$; T_J = 25 °C

Fig. 4 Typical Drain On-state Resistance



$R_{D(on)} = f(V_{GS}, I_D)$; T_J = 125 °C

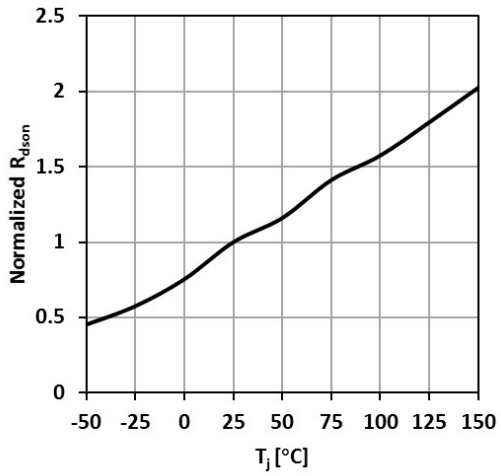
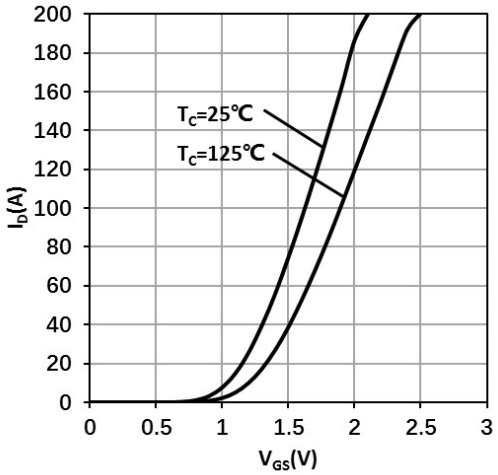
Fig. 5 Normalized On-State Resistance vs. Temp.	Fig. 6 Typical Transfer Characteristics
	
Normalized $R_{DS(on)} = f(T_J)$; I_D = 15 A	$I_D = f(V_{GS}, T_J)$; V_{DS} = 3 V

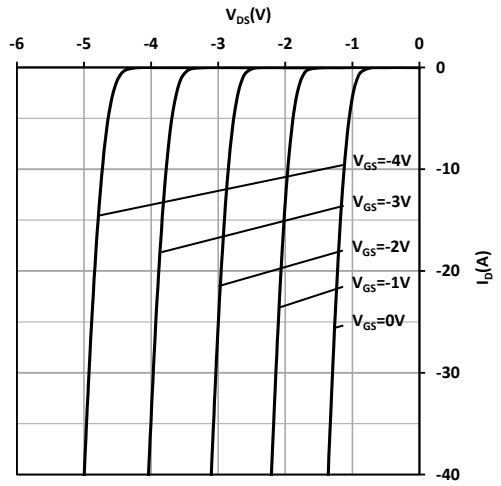
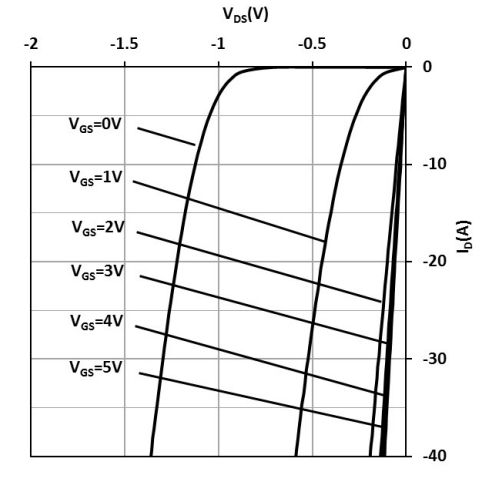
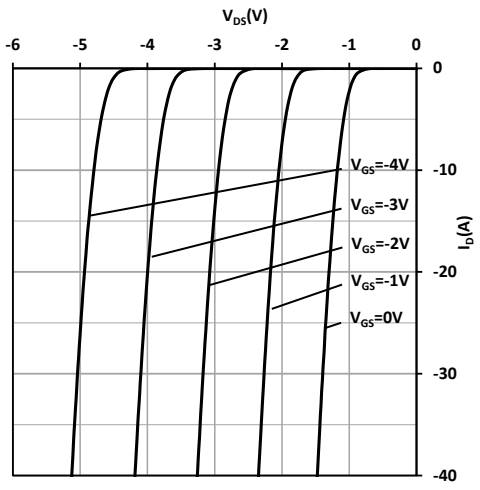
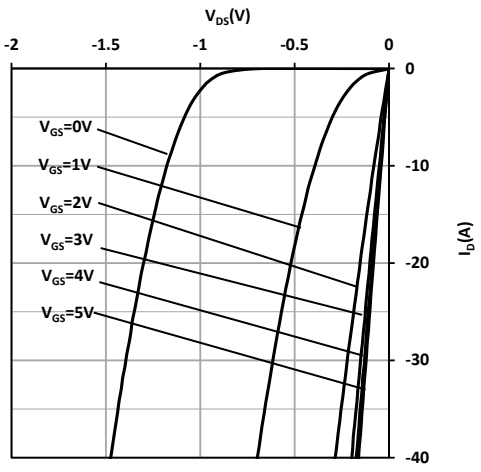
Fig. 7 Typ. Reverse Drain-Source Characteristics	Fig. 8 Typ. Reverse Drain-Source Characteristics
	
$I_D = f(V_{DS}, V_{GS})$; T_J = 25 °C	$I_D = f(V_{DS}, V_{GS})$; T_J = 25 °C

Fig. 9 Typ. Reverse Drain-Source Characteristics



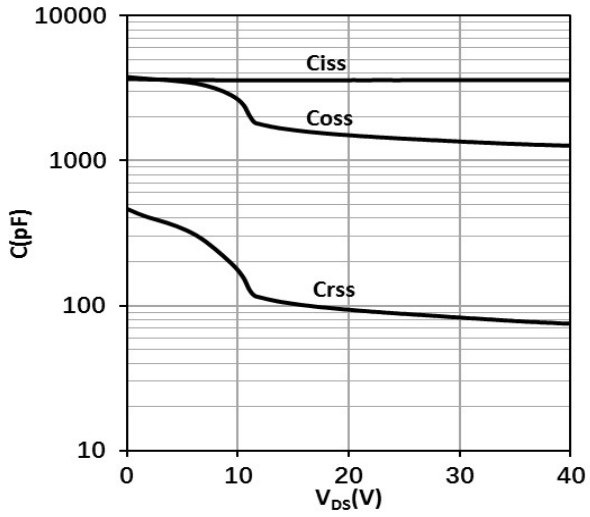
$I_D = f(V_{DS},V_{GS})$; T_J = 125 °C

Fig. 10 Typ. Reverse Drain-Source Characteristics



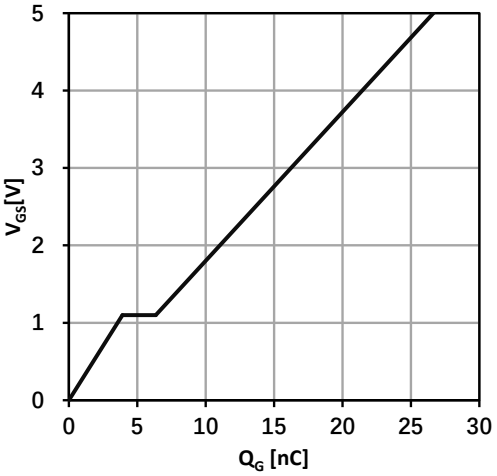
$I_D = f(V_{DS},V_{GS})$; T_J = 125 °C

Fig. 11 Typ. Capacitances Characteristics



$C_{xss} = f(V_{DS})$; T_J = 25 °C

Fig. 12 Typ. Gate Charge



$V_{GS} = f(Q_G)$; V_{DS} = 20 V; I_D = 15 A

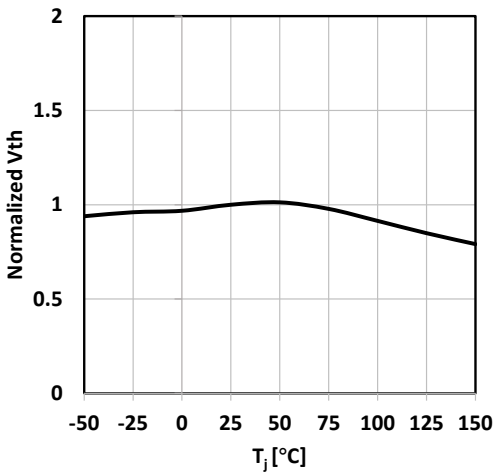
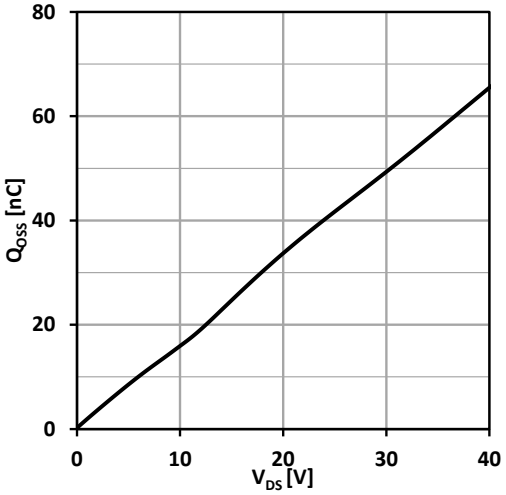
Fig. 13 Normalized Threshold Voltage vs. Temp.	Fig. 14 Output Charge
	
Normalized V_{TH} = f(T_J); V_{GS} = V_{DS}; I_D = 25 mA	Q_{oss} = f(V_{DS})

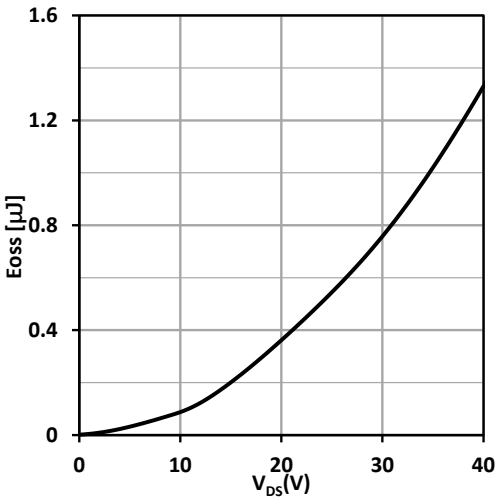
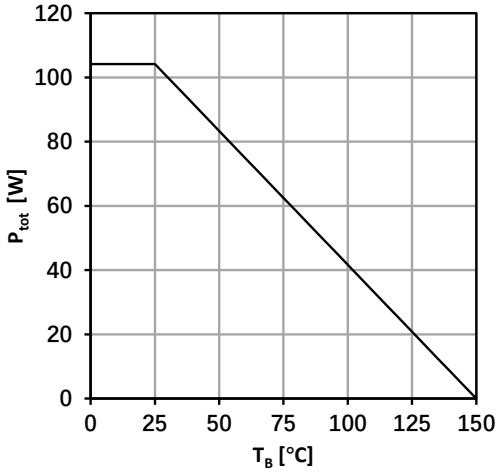
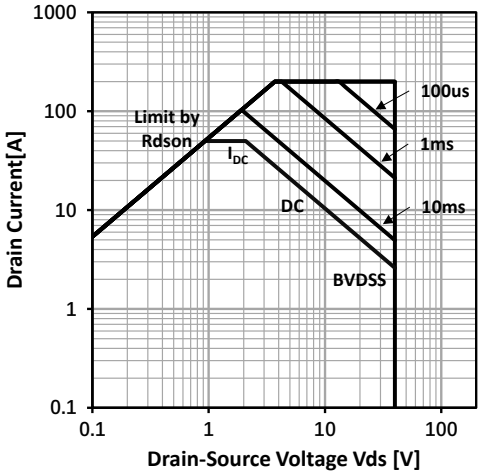
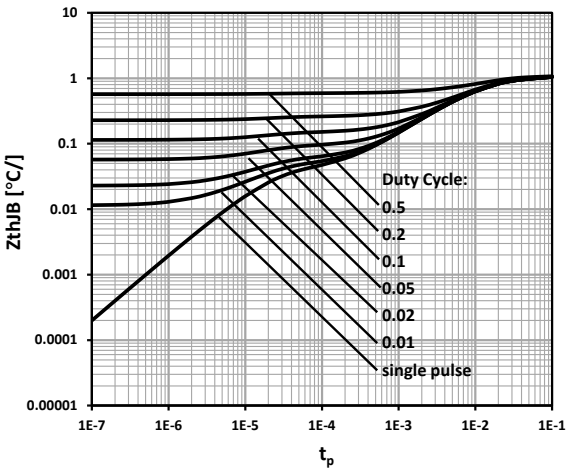
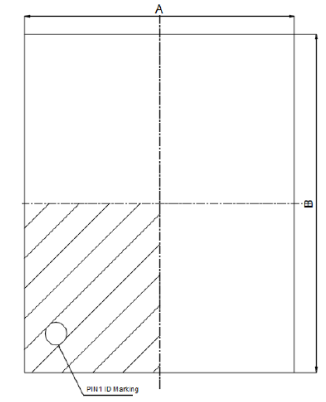
Fig. 15 Output Capacitance Stored Energy	Fig. 16 Power Dissipation
	
E_{oss} = f(V_{DS})	P_{tot} = f(T_B)

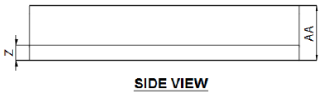
Fig. 17 Safe Operating Area	Fig. 18 Max. Transient Thermal Impedance
	
$I_D = f(V_{DS})$; T_C = 25 ˚C; Single Pulse	$Z_{\theta JB} = f(t_p)$; parameter: D = t_p / T

10. Package outlines

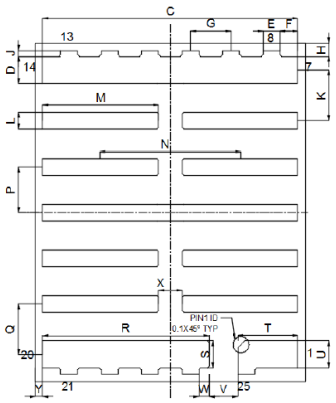
Package Reference



TOP VIEW



SIDE VIEW

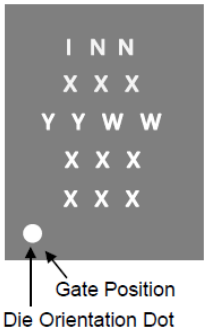


BOTTOM VIEW

NOTE:
1)ALL DIMENSION ARE IN MILLIMETERS.
2)BOTTOM VIEW IS FT TESTER SIDE VIEW.
3)LEAD COPLANARITY SHALL BE 0.10 MILLIMETERS MAX.
4)COMPLIES WITH JEDEC MO-303.
5)DRAWING IS NOT TO SCALE.

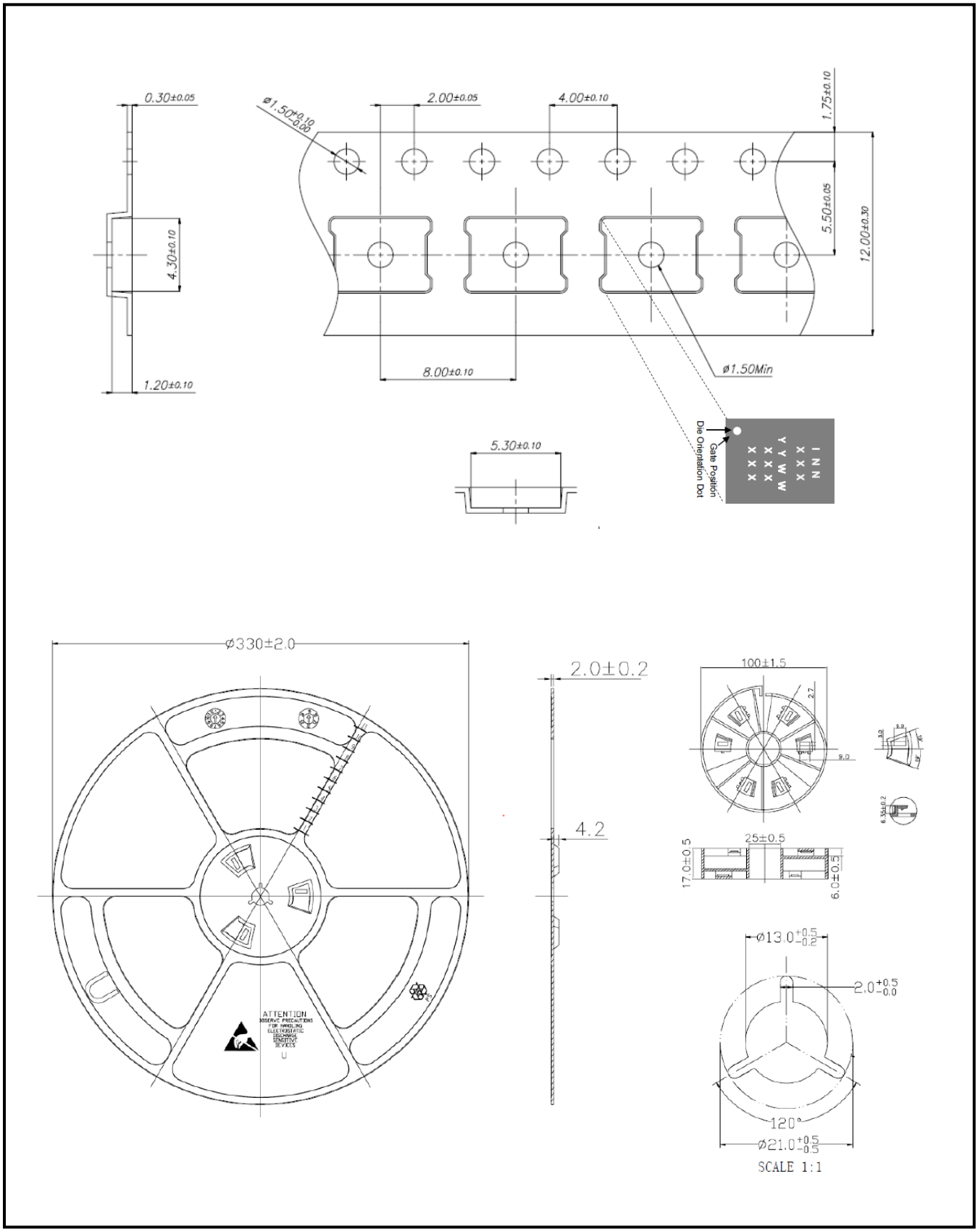
SYMBOL	MILLIMETER			NOTE
	MIN	NOM	MAX	
A	3.9	4.0	4.1	
B	4.9	5.0	5.1	
C	3.73	3.78	3.83	
D	0.35	0.40	0.45	
E	0.20	0.25	0.30	11X
F	0.265 REF			2X
G	0.6 BASIC			8X
H	0.2 REF			
J	0.04	0.09	0.14	11X
K	0.75 BASIC			
L	0.20	0.25	0.30	10X
M	1.665	1.715	1.765	8X
N	2.09 BASIC			
P	0.675 BASIC			
Q	0.75 BASIC			
R	2.417	2.467	2.517	
S	0.35	0.40	0.45	
T	0.849	0.889	0.939	
U	0.35	0.40	0.45	
V	0.375	0.425	0.475	
W	0.152 REF			
X	0.3	0.35	0.4	
Y	0.11 REF			
Z	0.202	0.252	0.302	
AA	0.732	0.832	0.932	

Marking Reference:



Row	Description	Example
Row 1	Company name	INN
Row 2	Product code	XXX
Row 3	Date code	YYWW
Row 4	Lot code	XXX
Row 5		XXX

11. Reel information



12. Revision history

Major changes since the last revision

Revision	Date	Description of changes
1.0	2022-03-10	1.0 version setup

Important Notice

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