

## INN100W135A-Q

### 1. General description

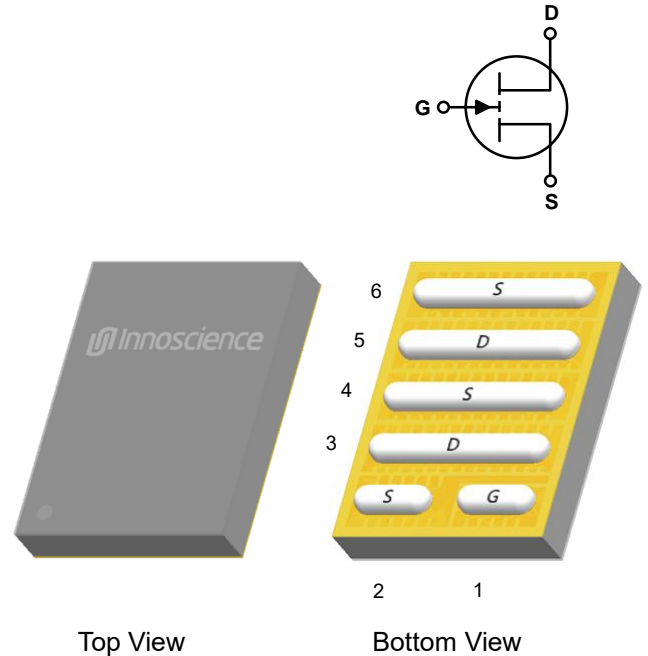
GaN-on-Silicon enhancement mode high-electron-mobility-transistor (HEMT) in WLCSP with 2.13 mm x 1.63 mm package size.

### 2. Features

- AEC-Q101 Qualified
- GaN-on-Silicon E-mode HEMT technology
- Very low gate charge
- Very small package size
- Zero reverse recovery charge

### 3. Applications

- LiDAR Application
- High Power Density DC-DC Converters
- Class-D Audio
- High Intensity Headlamps



### 4. Key performance parameters

Table 1 Key performance parameters at  $T_J = 25\text{ }^\circ\text{C}$

Parameter	Value	Unit
$V_{DS,max}$	100	V
$R_{DS(on),max}$ @ $V_{GS} = 5\text{ V}$	13.5	m $\Omega$
$Q_{G,typ}$ @ $V_{DS} = 50\text{ V}$	3.2	nC
$I_{DS,Pulse}$	75	A
$Q_{OSS}$ @ $V_{DS} = 50\text{ V}$	20	nC

### 5. Pin information

Table 2 Pin information

PIN	Pin Description	Pin Function
1	Gate	Driver Gate
3,5	Drain	Power Drain
2,4,6	Source	Power Source

Table 3 Ordering information

Type/Ordering Code	Package	Product Code
INN100W135A-Q	WLCSP 2.13x1.63	J24

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## 6. Maximum ratings

at  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise specified.

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

**Table 4** Maximum ratings

SYMBOL	PARAMETER	MAX	UNIT
$V_{DS}$	Drain-to-Source Voltage (Continuous)	100	V
$I_D$	Continuous current	18	A
	Pulsed ( $25\text{ }^\circ\text{C}$ , $T_{PULSE} = 300\text{ }\mu\text{s}$ )	75	A
$V_{GS}$	Gate-to-Source Voltage	6	V
	Gate-to-Source Voltage	-4	V
$T_J$	Operating Temperature	-40 to 150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature	-55 to 150	$^\circ\text{C}$

## 7. Thermal characteristics

**Table 5 Thermal characteristics**

SYMBOL	PARAMETER	TYP	UNIT	Note/Test Condition
$R_{\theta JC}$	Thermal Resistance, Junction to Case	15.62	°C/W	-
$R_{\theta JB}$	Thermal Resistance, Junction to Board	2.80	°C/W	-
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient <sup>1</sup>	66.29	°C/W	-
$T_{sold}$	Maximum reflow soldering temperature	260	°C	MSL1

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  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise specified.

**Table 6** Static characteristics

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS
$BV_{DSS}$	Drain-to-Source Voltage	100	-	-	V	$V_{GS} = 0\text{ V}$ , $I_D = 550\text{ }\mu\text{A}$
$I_{DSS}$	Drain Source Leakage	-	1	100	$\mu\text{A}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 100\text{ V}$
$I_{GSS}$	Gate-to-Source Forward Leakage (25°C)	-	3	100	$\mu\text{A}$	$V_{GS} = 6\text{ V}$ , $V_{DS} = 0\text{ V}$
	Gate-to-Source Reverse Leakage	-	0.1	10	$\mu\text{A}$	$V_{GS} = -4\text{ V}$ , $V_{DS} = 0\text{ V}$
$V_{GS(TH)}$	Gate Threshold Voltage	0.7	1.1	2.5	V	$V_{DS} = V_{GS}$ , $I_D = 3\text{ mA}$
$R_{DS(on)}$	Drain-Source On-state Resistance	-	10	13.5	m $\Omega$	$V_{GS} = 5\text{ V}$ , $I_D = 11\text{ A}$
$V_{SD}$	Source-Drain Forward Voltage	-	1.6	-	V	$I_{SD} = 0.5\text{ A}$ , $V_{GS} = 0\text{ V}$

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Automotive 100V Enhancement-mode GaN Power Transistor

**Table 7 Dynamic characteristics**

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS
C <sub>ISS</sub>	Input Capacitance	-	380	-	pF	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 50 V
C <sub>OSS</sub>	Output Capacitance	-	200	-		V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 50 V
C <sub>RSS</sub>	Reverse Transfer Capacitance	-	2.1	-		V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 50 V
C <sub>OSS(ER)</sub>	Energy Related C <sub>OSS</sub>	-	292	-		V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 0 V to 50 V
C <sub>OSS(TR)</sub>	Time Related C <sub>OSS</sub>	-	400	-		V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 0 V to 50 V
R <sub>G</sub>	Gate resistance	-	1.5	-	Ω	f = 5MHz, open drain
Q <sub>G</sub>	Total Gate Charge	-	3.2	-	nC	V <sub>GS</sub> = 5 V, V <sub>DS</sub> = 50 V, I <sub>D</sub> = 11 A
Q <sub>GS</sub>	Gate to Source Charge	-	0.7	-		V <sub>DS</sub> = 50 V, I <sub>D</sub> = 11 A
Q <sub>GD</sub>	Gate to Drain Charge	-	0.5	-		V <sub>DS</sub> = 50 V, I <sub>D</sub> = 11 A
Q <sub>G(TH)</sub>	Gate Charge at Threshold	-	0.5	-		V <sub>DS</sub> = 50 V, I <sub>D</sub> = 11 A
Q <sub>OSS</sub>	Output Charge	-	20	-		V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 50 V

## 9. Electric characteristics diagrams

at  $T_J = 25^\circ\text{C}$  unless otherwise specified.

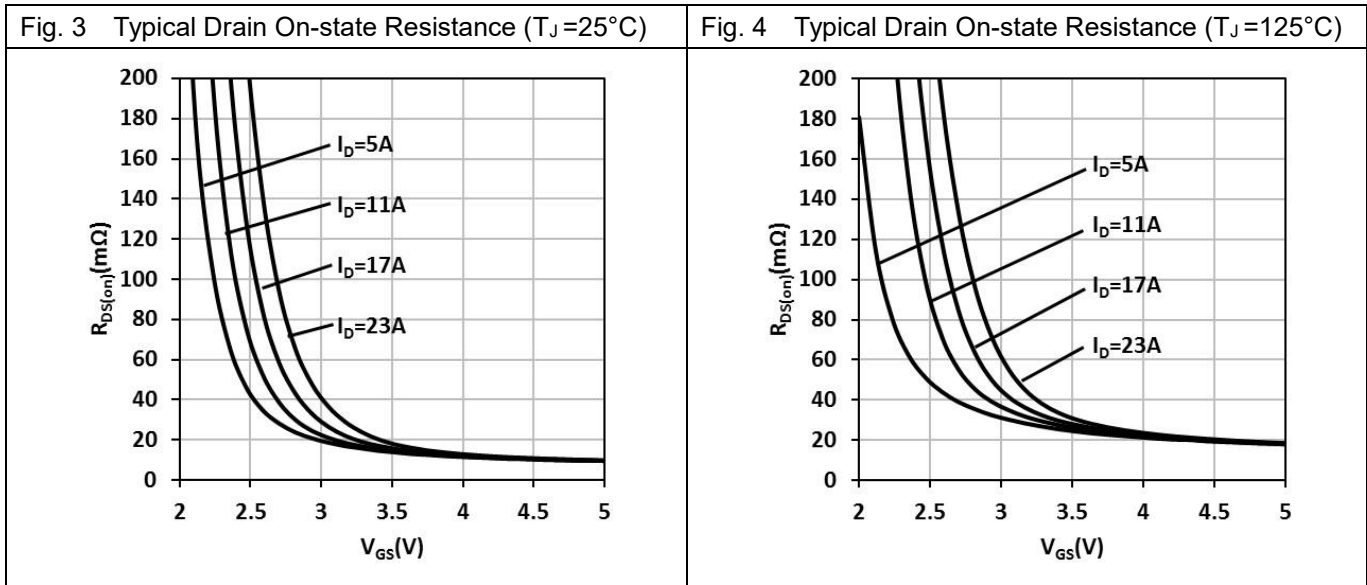
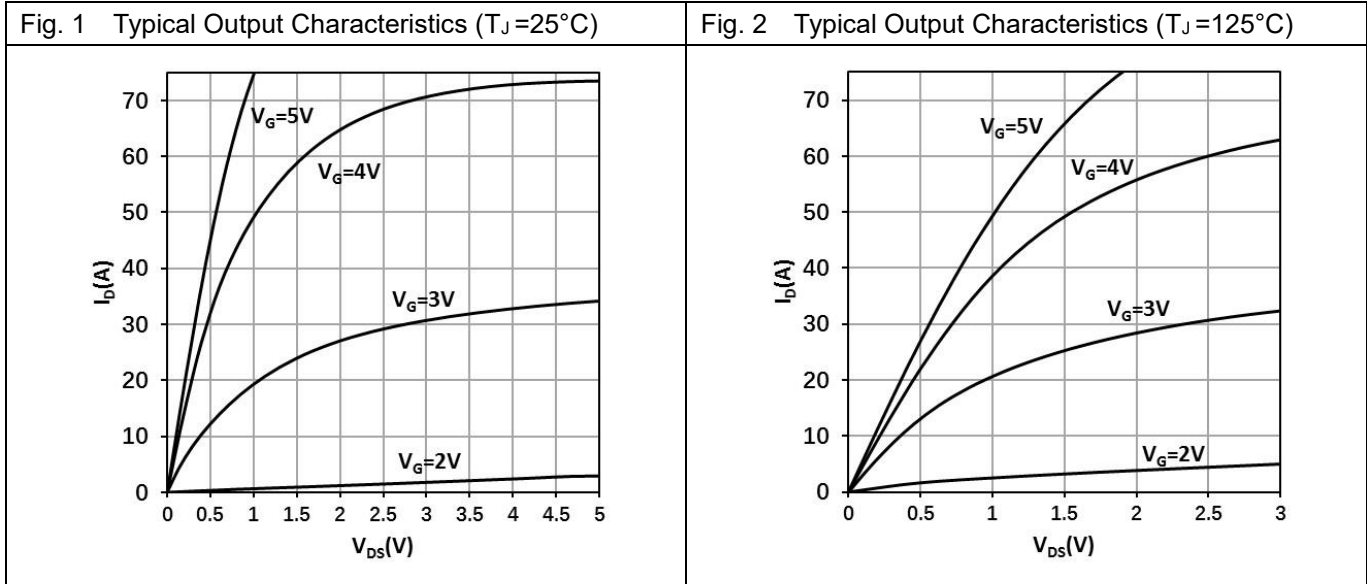


Fig. 5 Normalized On-State Resistance vs. Temp.

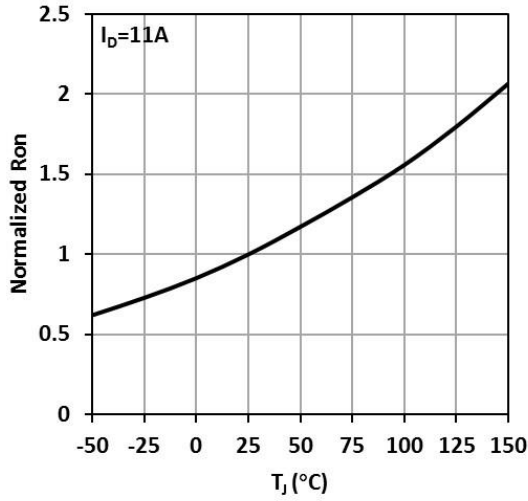


Fig. 6 Typical Transfer Characteristics

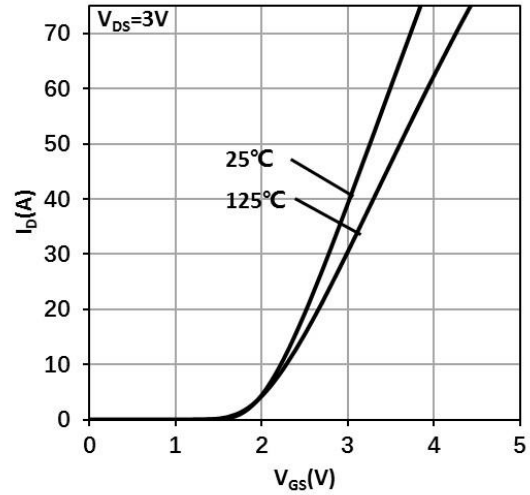


Fig. 7 Typ. Reverse Drain-Source Characteristics (VGS ≤ 0, Tj = 25°C)

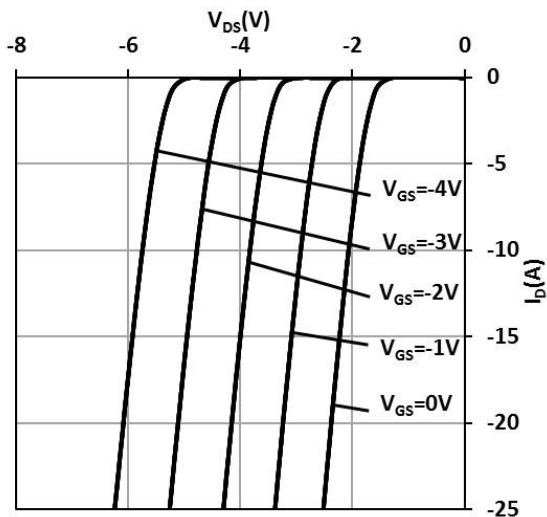


Fig. 8 Typ. Reverse Drain-Source Characteristics (VGS ≥ 0, Tj = 25°C)

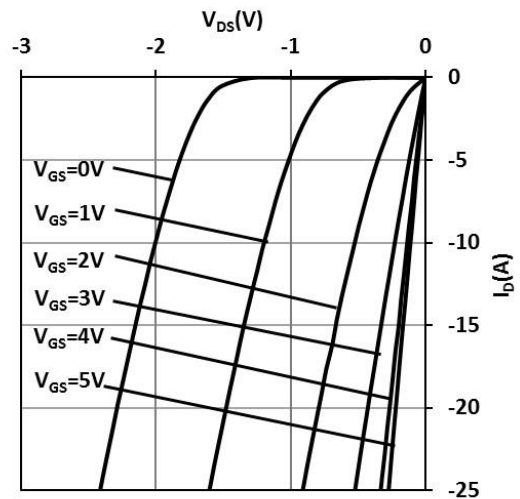




Fig. 9 Typ. Reverse Drain-Source Characteristics ( $V_{GS} \leq 0$ ,  $T_J = 125^\circ\text{C}$ )

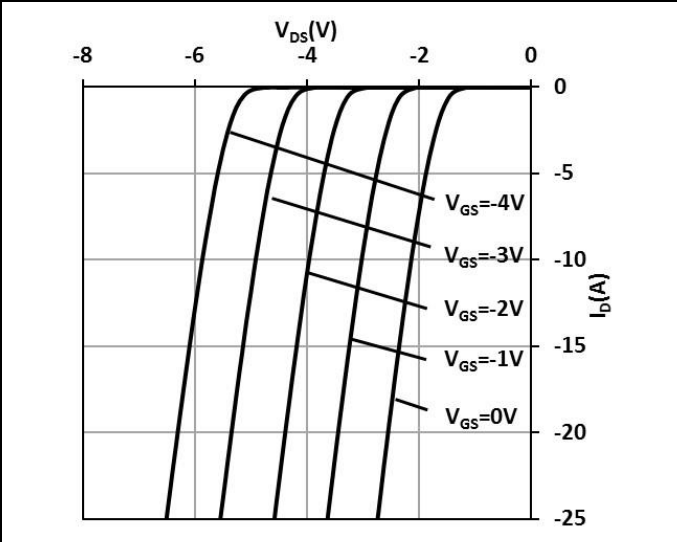


Fig. 10 Typ. Reverse Drain-Source Characteristics ( $V_{GS} \geq 0$ ,  $T_J = 125^\circ\text{C}$ )

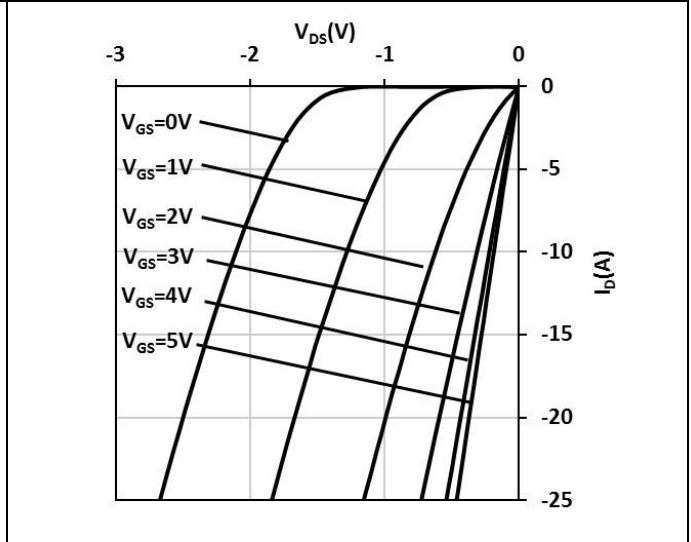


Fig. 11 Typ. Capacitances Characteristics

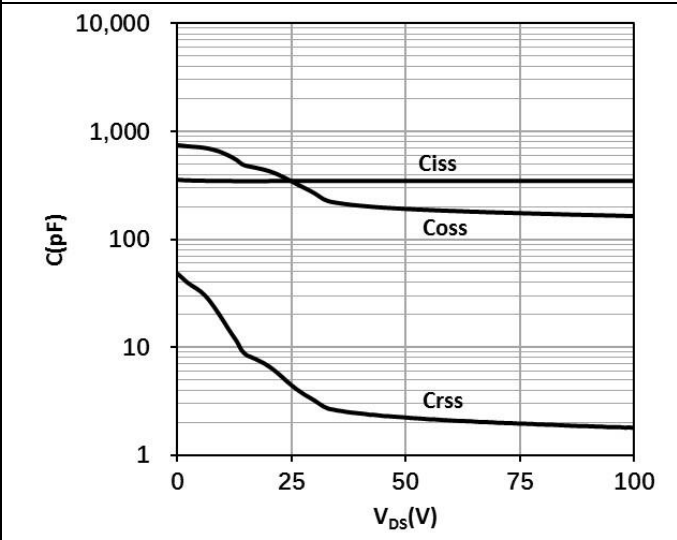


Fig. 12 Typ. Gate Charge

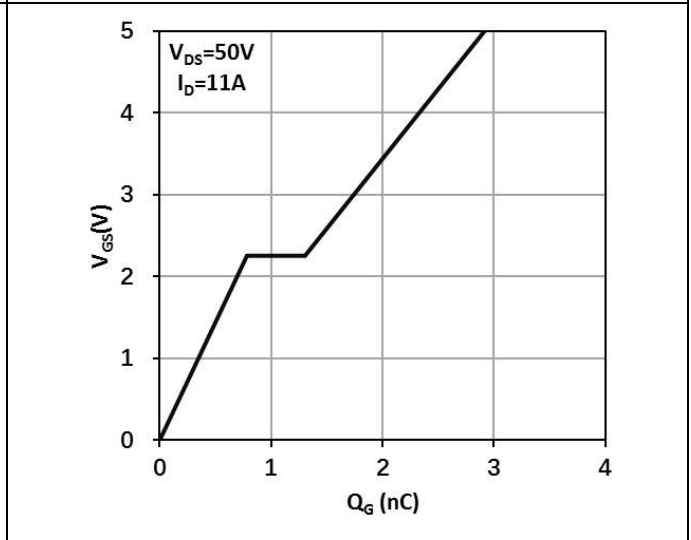


Fig. 13 Normalized Threshold Voltage vs. Temp.

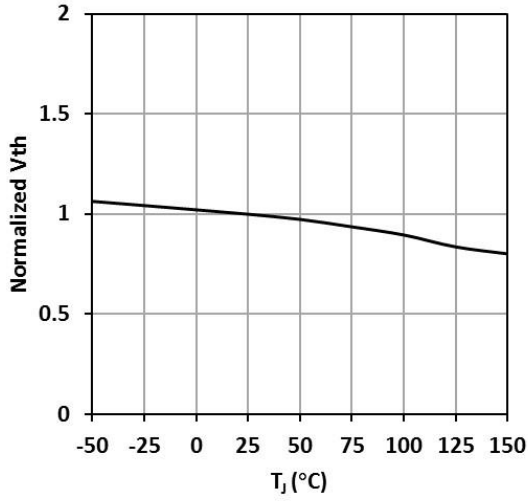


Fig. 14 Output Charge

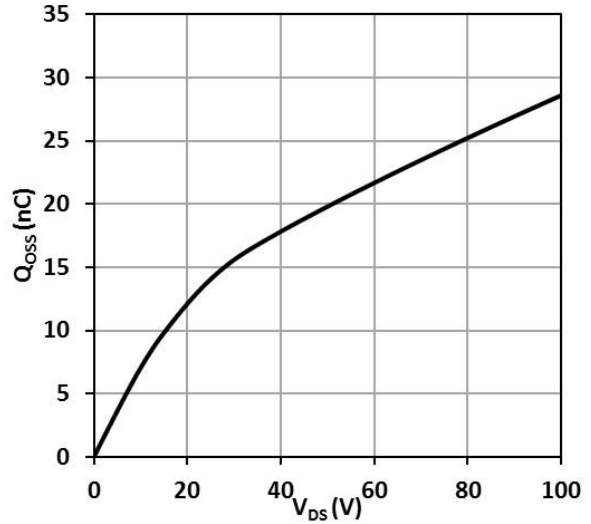


Fig. 15 Output Capacitance Stored Energy

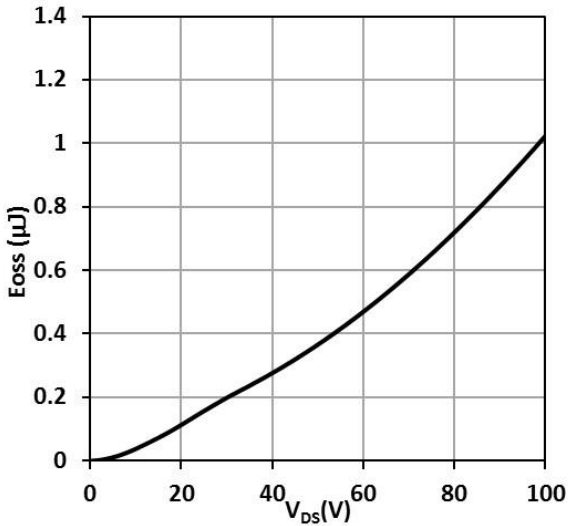


Fig. 16 Power Dissipation

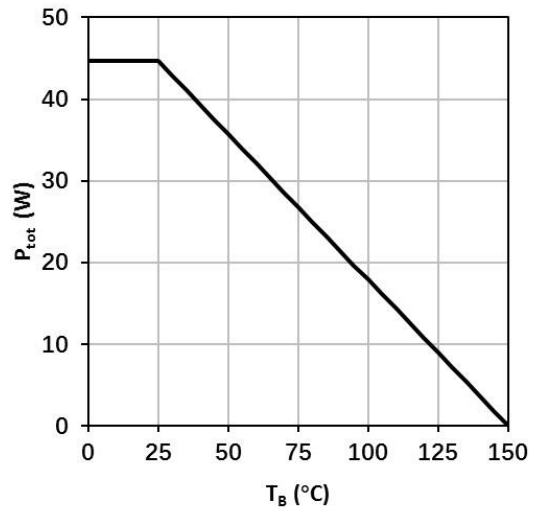


Fig. 17 Safe Operating Area

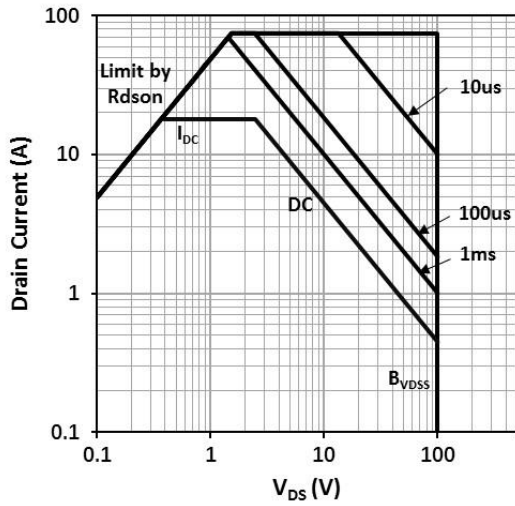
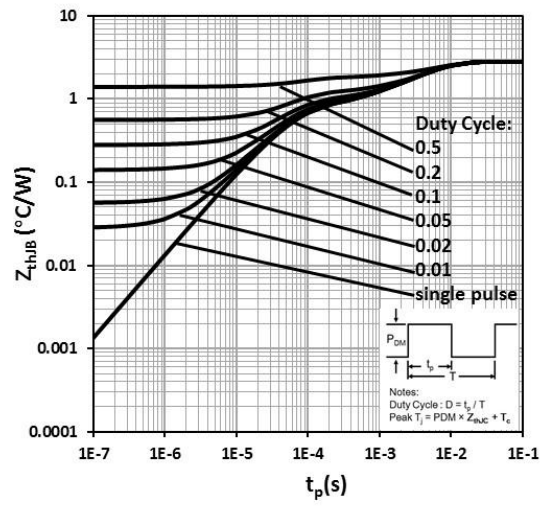
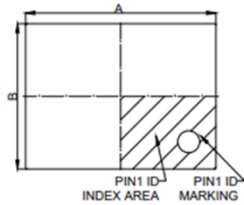


Fig. 18 Max. Transient Thermal Impedance

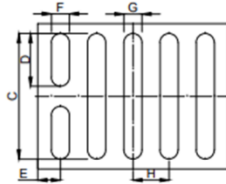


### 10. Package outlines

#### Package Reference



**TOP VIEW**



**BOTTOM VIEW**



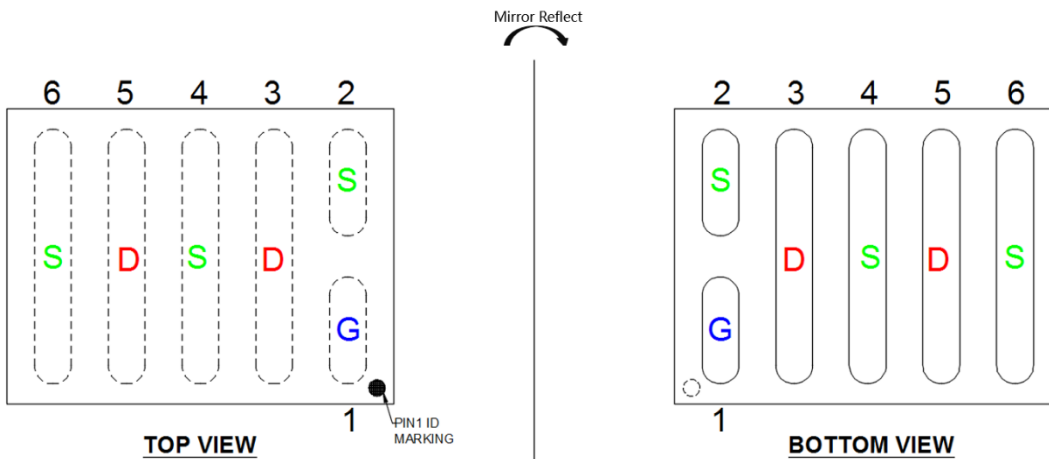
**SIDE VIEW**

SYMBOL	MILLIMETER			NOTE
	MIN	NOM	MAX	
A	2.105	2.130	2.155	
B	1.605	1.630	1.655	
C	1.362	1.382	1.402	4X
D	0.560	0.580	0.600	2X
E	0.265 REF			
F	0.180	0.200	0.220	2X
G	0.180	0.200	0.220	4X
H	0.4 BASIC			5X
J	0.374	0.409	0.444	
K	0.080	0.100	0.120	
L	0.022	0.025	0.028	

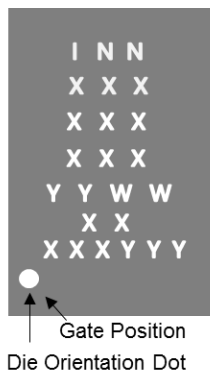
**NOTE:**

- 1) ALL DIMENSION ARE IN MILLIMETERS.
- 2) BOTTOM VIEW IS SOLDER BAR SIDE VIEW
- 3) BAR COPLANARITY SHALL BE 0.05 MILLIMETERS MAX.
- 4) COMPLIES WITH JEDEC MO-211.
- 5) DRAWING IS NOT TO SCALE.

#### PIN configuration

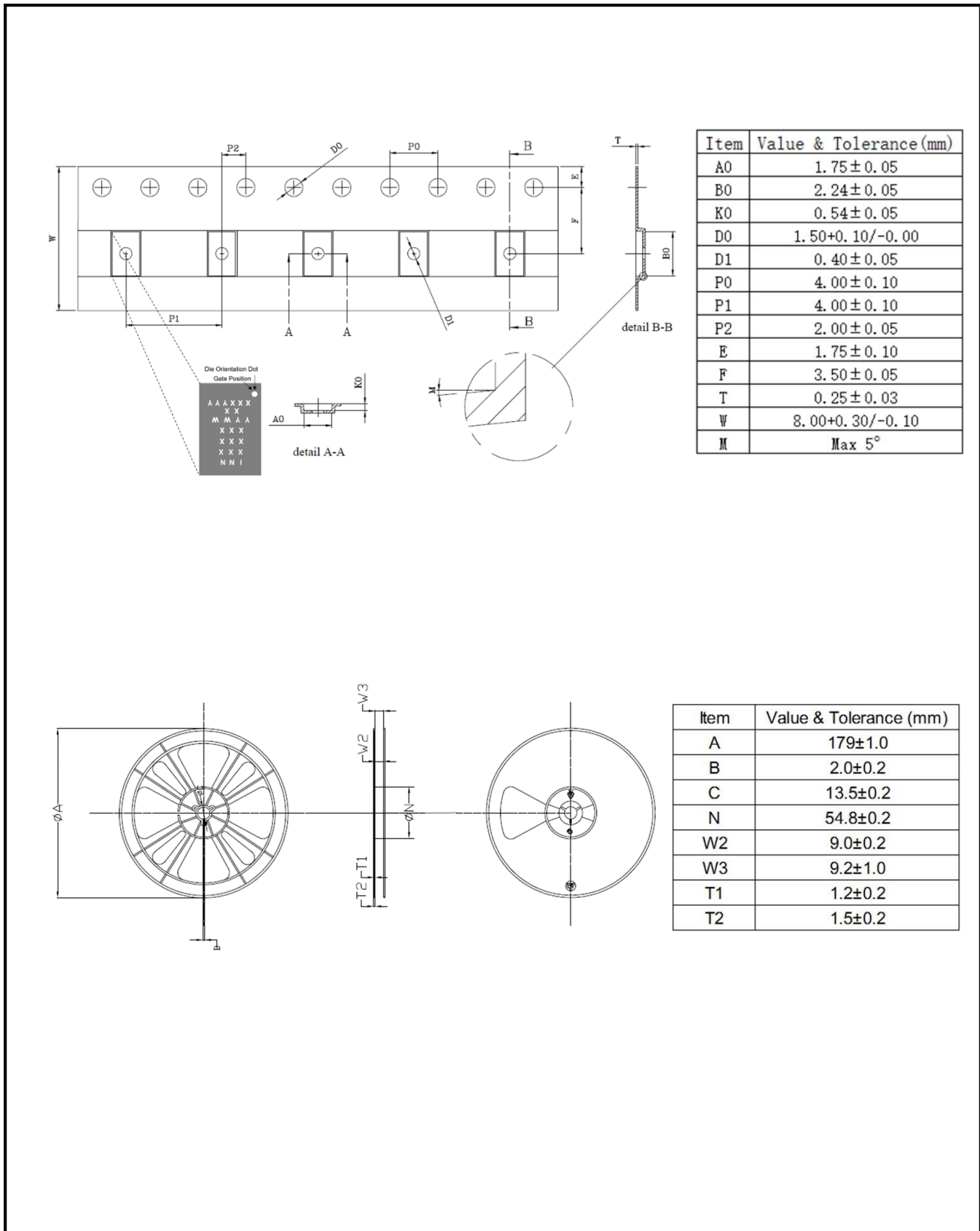


#### Marking Reference:



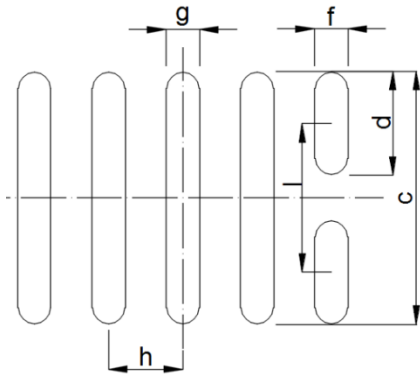
Row	Description	Example
Row 1	Company name	INN
Row 2	Product code	XXX
Row 3	Lot Code	XXX
Row 4		XXX
Row 5	Date code	YYWW
Row 6	Wafer ID	XX
Row 7	Location ID	XXXYYY

### 11. Reel information



**12. Land Pattern**

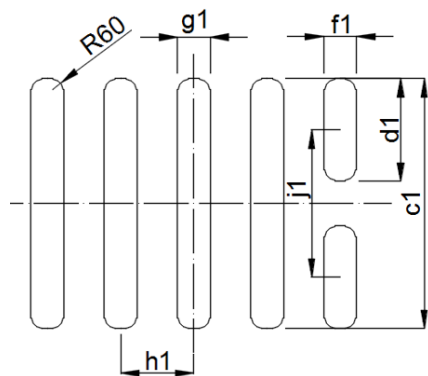
**Recommended land pattern**



SYMBOL	MILLIMETER	NOTE
	NOM	
c	1.362	4x
d	0.560	2x
f	0.180	2x
g	0.180	4x
h	0.400	5x
l	0.802	

Unit:  $\mu\text{m}$

**Recommended Stencil drawing**



SYMBOL	MILLIMETER	NOTE
	NOM	
c1	1.362	4x
d1	0.560	2x
f1	0.180	2x
g1	0.180	4x
h1	0.400	5x
j1	0.802	

Unit:  $\mu\text{m}$

### 13. Revision history

**Major changes since the last revision**

Revision	Date	Description of changes
1.0	2023-11-27	Version 1.0 Release

## Important Notice

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