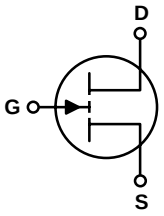
INN100EQ016A

1. General description

GaN-on-Silicon enhancement mode high-electron-mobility-transistor (HEMT) in En-FCQFN with 4.0 mm x 6.0 mm package size.

2. Features

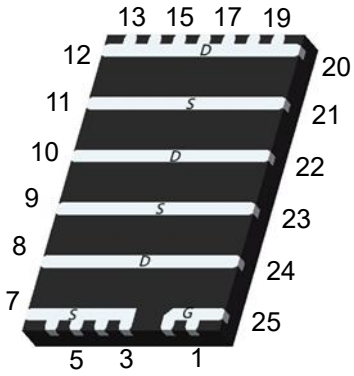


- GaN-on-Silicon E-mode HEMT technology
- Very low gate charge
- Ultra-low on resistance
- Very small footprint

3. Applications

- High frequency DC-DC converter
- Point of Load
- RF envelope tracking
- PC charger
- Mobile power bank
- Motor driver

Top View



Bottom View

4. Key performance parameters

Table 1 Key performance parameters at T_J = 25 °C

Parameter	Value	Unit
$V_{DS,max}$	100	V
$R_{DS(on),max}$ @ V_{GS} = 5 V	1.8	mΩ
$Q_{G,typ}$ @ V_{DS} = 50V	22	nC
$I_{DS,Pulse}$(T_J = 25 °C)	320	A
Q_{OSS} @ V_{DS} = 50V	125	nC

5. Pin information

Table 2 Pin information

Pin	Pin description	Pin function
1,2,25	Gate	Driver Gate
3-7,9,11,21,23	Source	Source
8,10,12-20,22,24	Drain	Power Drain

Table 3 Ordering information

Type/Ordering Code	Package	Product Code
INN100EQ016A	En-FCQFN 4X6	J27

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6. Maximum ratings

at T_J = 25 °C unless otherwise specified.

Exceeding the maximum ratings may destroy the device. For further information, contact Innoscience sales office.

Table 4 Maximum ratings

SYMBOL	PARAMETER	MAX	UNIT
V_{DS}	Drain-to-Source Voltage (Continuous)	100	V
$V_{DS(tr)}$	Drain-to-Source Voltage [1] (V_{GS} = 0 V, 1h total time, $T_A = T_{JMAX}$)	120	V
I_D	Continuous current (V_{GS} = 5 V, T_C=25 ˚C, $R_{\theta JC}$ = 0.24 ˚C/W)	320	A
	Continuous current (V_{GS} = 5 V, T_C=100 ˚C, $R_{\theta JC}$ = 0.24 ˚C/W)	240	A
	Continuous current (V_{GS} = 5 V, T_A=25 ˚C, $R_{\theta JA}$ = 56.63 ˚C/W)	25	A
	Pulsed (T_J = 25 °C, T_{Pulse} = 100 µs)	320	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

Note:

1. Provided as measure of robustness under abnormal operating conditions and not recommended for normal operation;

7. Thermal characteristics

Table 5 Thermal characteristics

SYMBOL	PARAMETER	TYP	UNIT	Note/Test Condition
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.24	˚C/W	-
$R_{\theta JB}$	Thermal Resistance, Junction to Board	1.31	˚C/W	-
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient [2]	56.63	˚C/W	-
T_{sold}	Maximum reflow soldering temperature	260	°C	MSL3

Note

2. $R_{\theta JA}$ 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	100	-	-	V	V_{GS} = 0 V, I_D = 900 μA
I_{DSS}	Drain Source Leakage	-	9.5	93	μA	V_{GS} = 0 V, V_{DS} = 80 V
I_{GSS}	Gate-to-Source Forward Leakage	-	2.8	55	μA	V_{GS} = 5 V
	Gate-to-Source Reverse Leakage	-	0.3	1.2	μA	V_{GS} = -4 V
$V_{GS(TH)}$	Gate Threshold Voltage	0.8	1.1	2.5	V	V_{DS} = V_{GS}, I_D = 21 mA
$R_{DS(on)}$	Drain-Source On-state Resistance[3]	-	1.4	1.8	mΩ	V_{GS} = 5 V, I_D = 40 A
V_{SD}	Source-Drain Forward Voltage	-	1.5	-	V	I_S = 0.5 A, V_{GS} = 0 V

Note:

3. $R_{DS(on)}$ is measured without prior drain bias or switching stress.

Table 7 Dynamic characteristics [4]

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS
C_{ISS}	Input Capacitance	-	2500	-	pF	V_{GS} = 0 V, V_{DS} = 50 V
C_{OSS}	Output Capacitance	-	1100	-		V_{GS} = 0 V, V_{DS} = 50 V
C_{RSS}	Reverse Transfer Capacitance	-	19	-		V_{GS} = 0 V, V_{DS} = 50 V
$C_{OSS(ER)}$	Energy Related C_{OSS}	-	1700	-		V_{GS} = 0 V, V_{DS} = 0 V to 50 V
$C_{OSS(TR)}$	Time Related C_{OSS}	-	2500	-		V_{GS} = 0 V, V_{DS} = 0 V to 50 V
R_G	Gate resistance	-	1.8	-	Ω	f = 5 MHz, open drain
Q_G	Total Gate Charge	-	22	-	nC	V_{GS} = 5 V, V_{DS} = 50 V, I_D=40 A
Q_{GS}	Gate to Source Charge	-	4.5	-		V_{DS} = 50 V, I_D=40 A
Q_{GD}	Gate to Drain Charge	-	4.5	-		V_{DS} = 50 V, I_D=40 A
$Q_{G(TH)}$	Gate Charge at Threshold	-	2.5	-		V_{DS} = 50 V, I_D=40 A
Q_{OSS}	Output Charge	-	125	-		V_{GS} = 0 V, V_{DS} = 50 V

Note:

4. Guaranteed by design.

9. Electric characteristics diagrams

at T_J = 25 °C, unless specified otherwise

Fig. 1 Typical Output Characteristics (T_J=25°C)

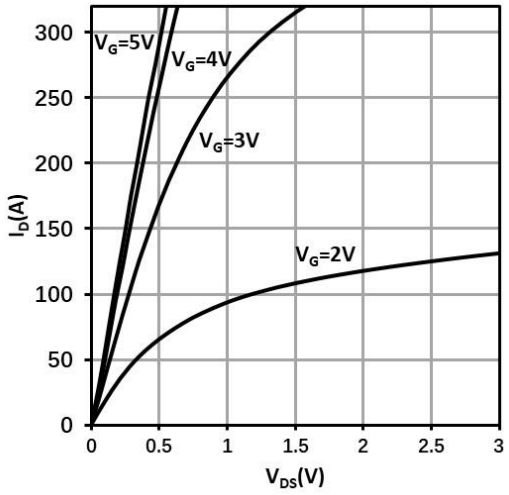


Fig. 2 Typical Output Characteristics (T_J=125°C)

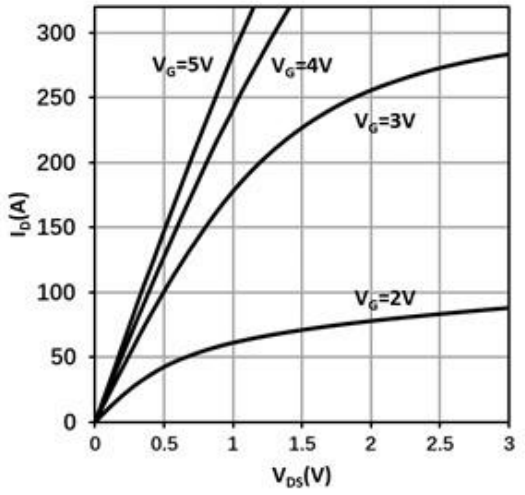


Fig.3 Typical Drain On-state Resistance (T_J=25°C)

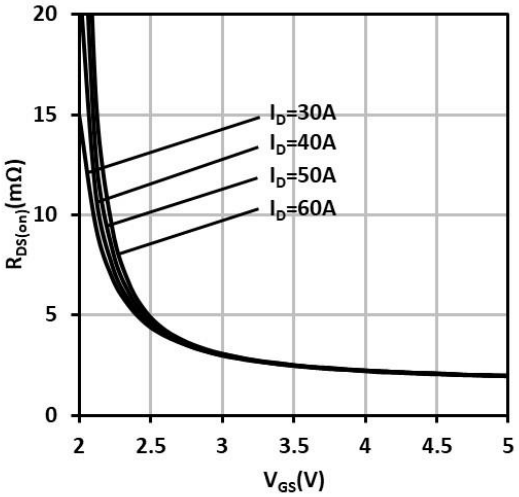


Fig. 4 Typical Drain On-state Resistance (T_J=125°C)

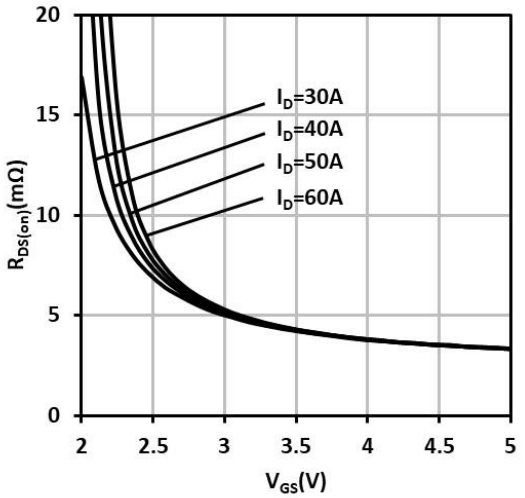


Fig. 5 Normalized On-State Resistance vs. Temp.

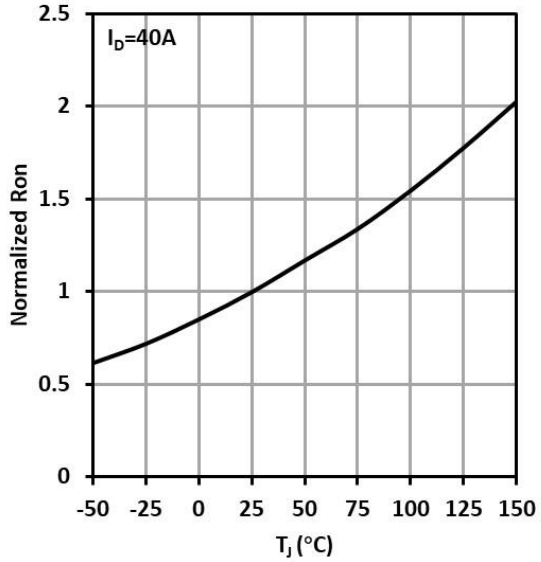


Fig. 6 Typical Transfer Characteristics

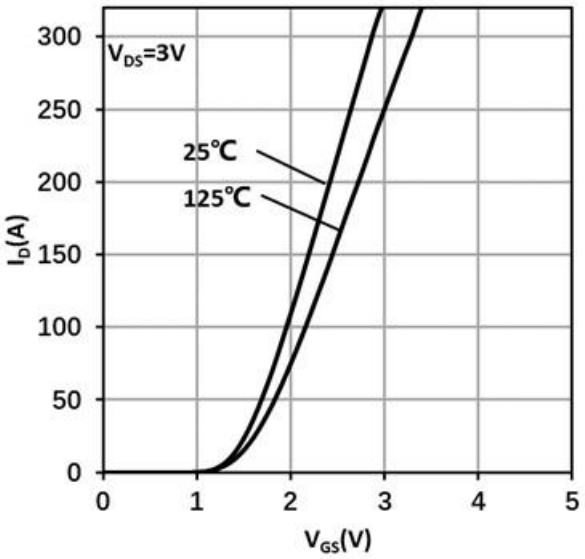


Fig. 7 Typ. Reverse Drain-Source Characteristics (V_{GS}≤0,T_J =25°C)

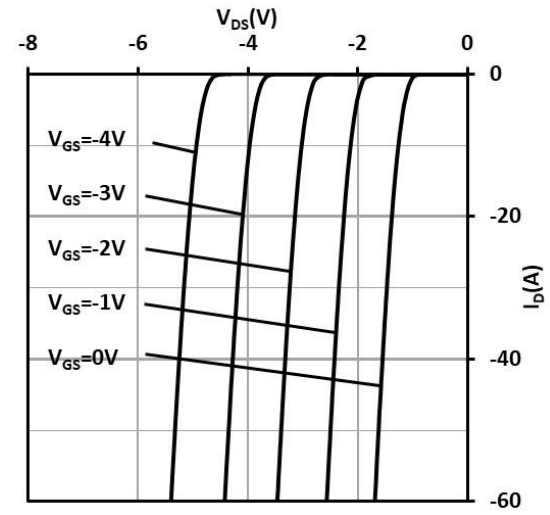


Fig. 8 Typ. Reverse Drain-Source Characteristics (V_{GS}≥0,T_J =25°C)

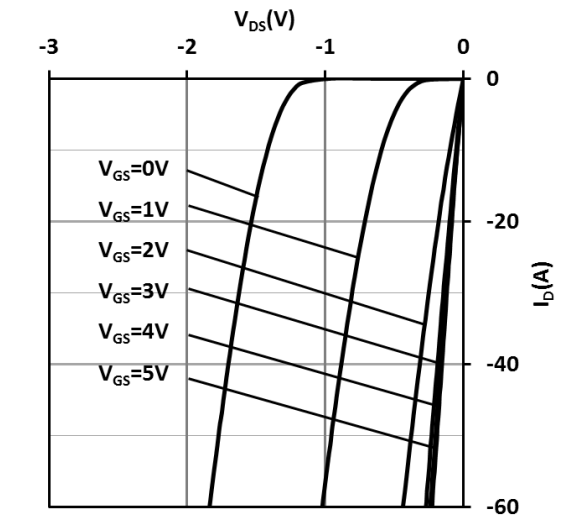


Fig. 9 Typ. Reverse Drain-Source Characteristics (V_{GS}≤0, T_J = 125°C)

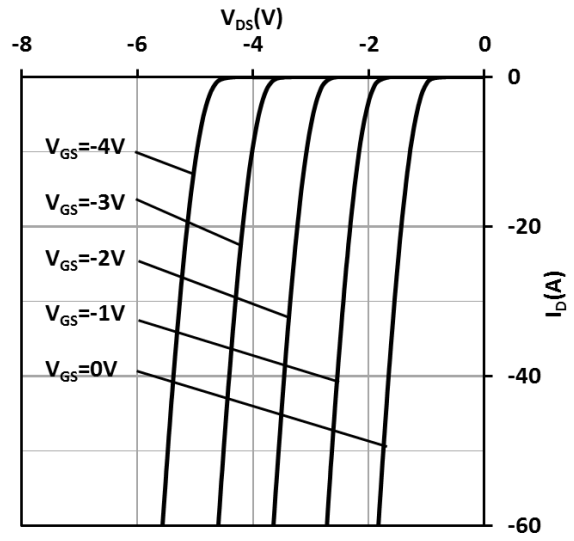


Fig. 10 Typ. Reverse Drain-Source Characteristics (V_{GS}≥0,T_J = 125°C)

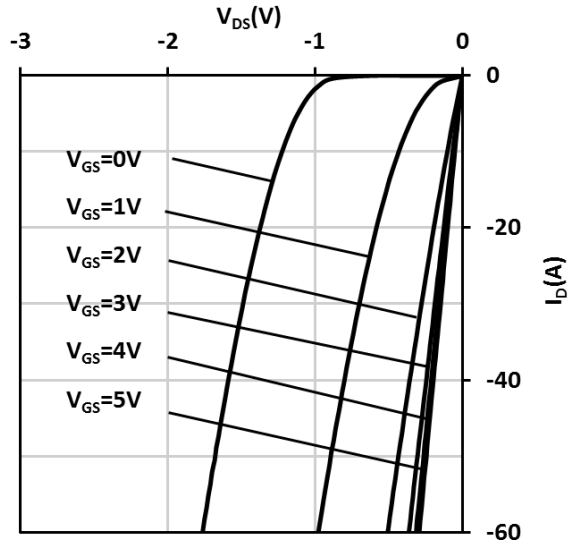


Fig. 11 Typ. Capacitances Characteristics

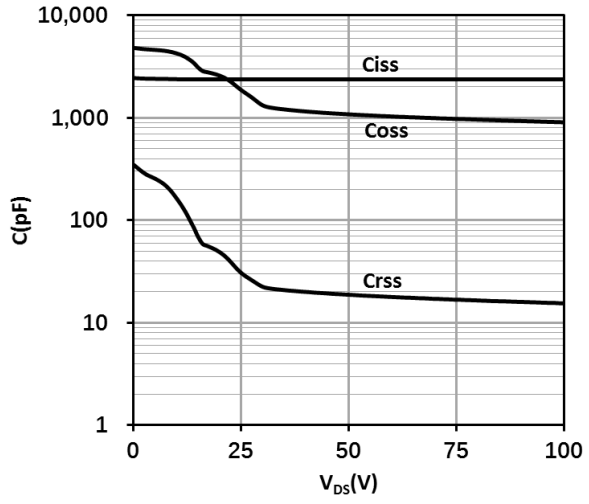


Fig. 12 Typ. Gate Charge

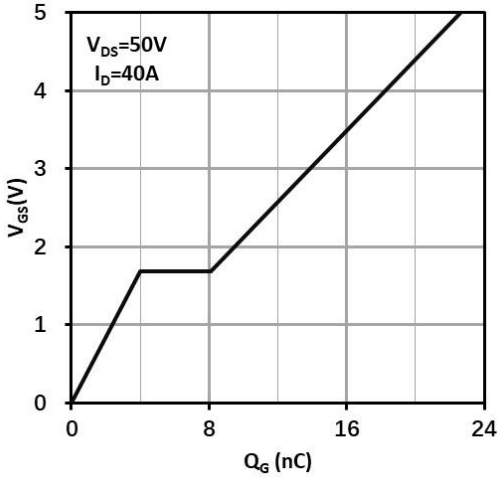


Fig. 13 Normalized Threshold Voltage vs. Temp.

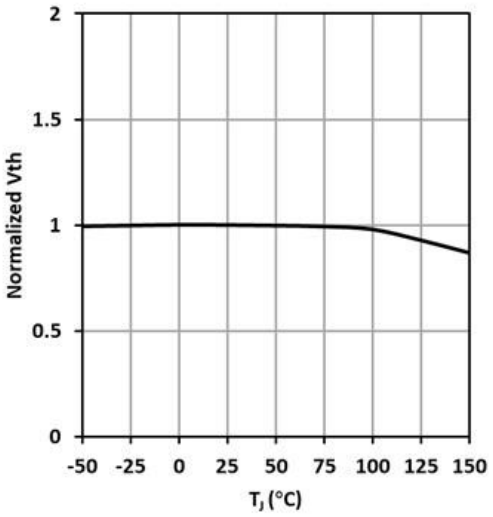


Fig. 14 Output Charge

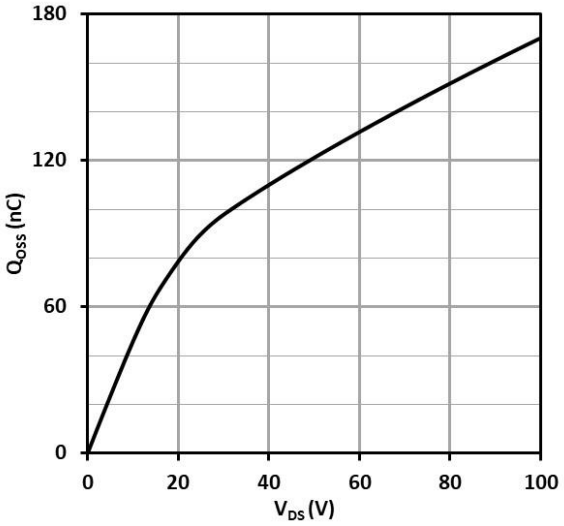


Fig. 15 Output Capacitance Stored Energy

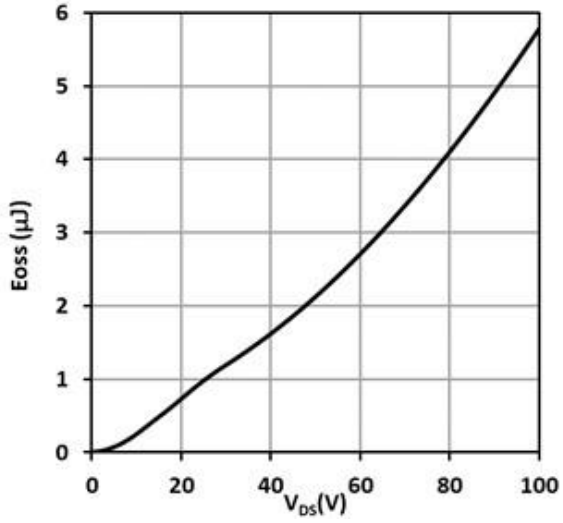


Fig. 16 Power Dissipation

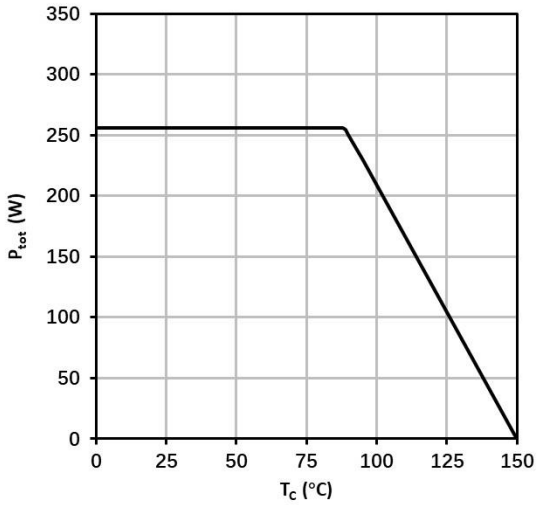


Fig. 17 Safe Operating Area

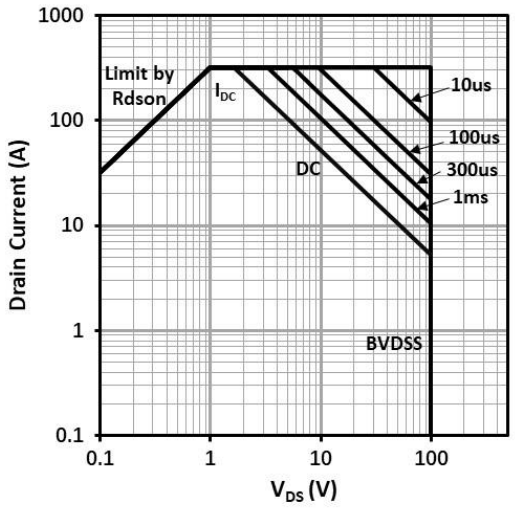
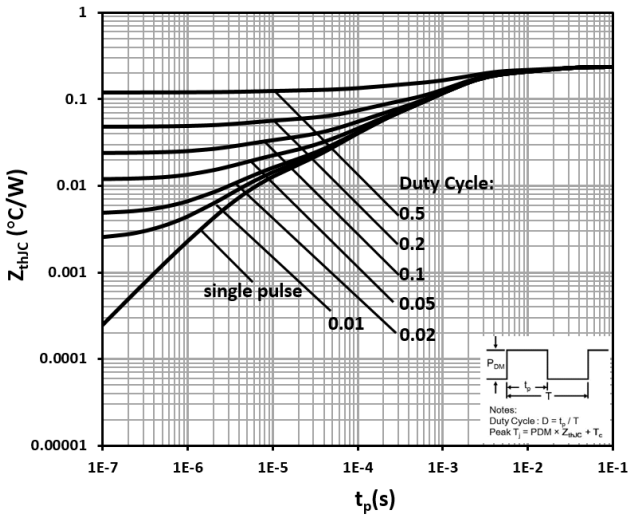
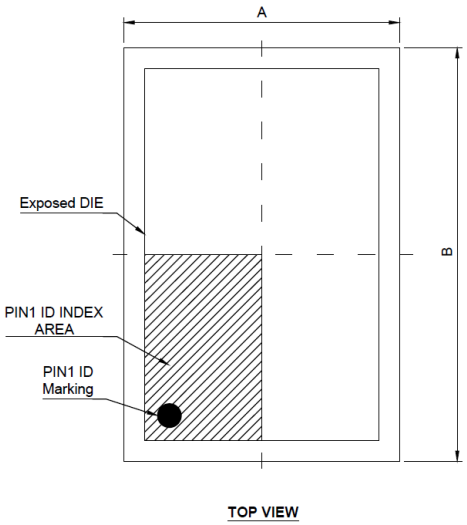


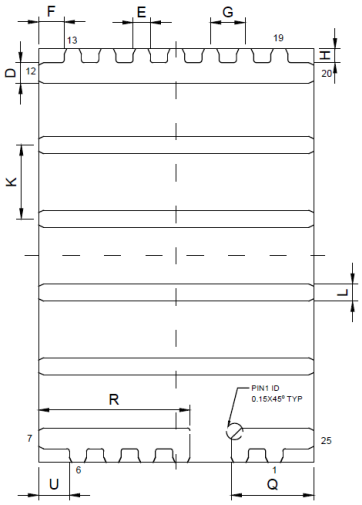
Fig. 18 Max. Transient Thermal Impedance



10. Package outlines

Package Reference

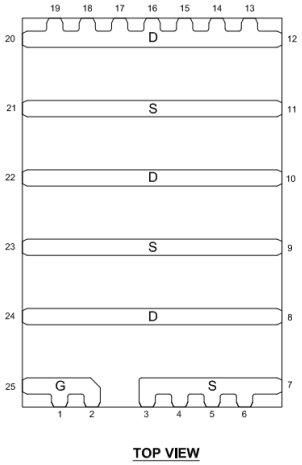




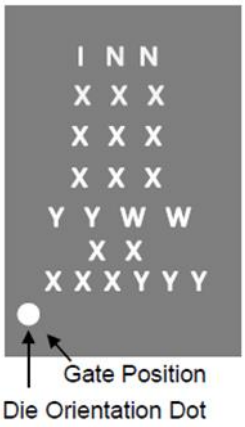
SYMBOL	MILLIMETER			NOTE
	MIN	NOM	MAX	
A	3.9	4.0	4.1	
B	5.9	6.0	6.1	
D	0.20	0.25	0.30	3X
E	0.20	0.25	0.30	13X
F		0.375 REF		2X
G		0.5 BASIC		10X
H		0.2 REF		3X
K		1.07 BASIC		6X
L	0.20	0.25	0.30	4X
Q	1.1	1.2	1.3	
R	2.1	2.2	2.3	
U		0.45 REF		2X
Z		0.203 REF		
AA	0.75	0.85	0.95	
AB	0.00	0.02	0.05	

NOTE:
1)ALL DIMENSION ARE IN MILLIMETERS.
2)BOTTOM VIEW IS FT TESTER SIDE VIEW.
3)LEAD COPLANARITY SHALL BE 0.08 MILLIMETERS MAX.
4)COMPLIES WITH JEDEC MO-220.
5)DRAWING IS NOT TO SCALE.
6)BOTTOM LEAD SURFACE FINISH IS SN.

Pin information:

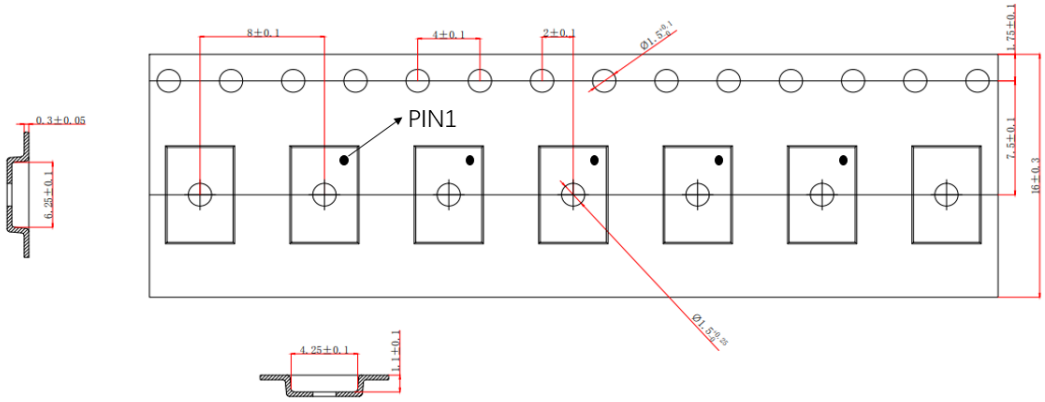


Marking Reference:



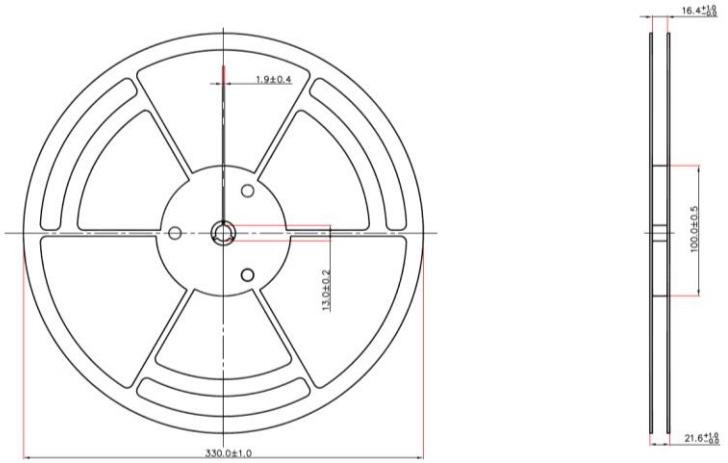
Row	Description	Example
Row1	Company name	INN
Row2	Product code	XXX
Row3	Lot Code	XXX
Row4		XXX
Row5	Date code	YYWW
Row6	Wafer ID	XX
Row7	Location ID	XXXYYY

11. Reel information



NOTES:

1. CARRIER TAPE COLOR: BLACK.
2. COVER TAPE WIDTH: 13.3±0.10.
3. COVER TAPE COLOR: TRANSPARENT.
4. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.20 MAX.
5. CAMBER NOT TO EXCEED 1MM IN 100MM.
6. MOLD# QFN/DFN/MIS6X4X0.75/0.85.
7. ALL DIMS IN MM.
8. BAN TO USE THE ENVIRONMENT-RELATED SUBSANCES OF JCET PRESCRIBING.

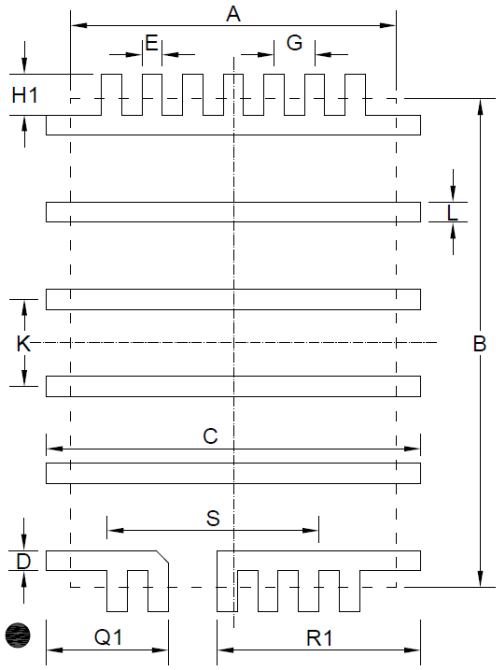


NOTES:

1. 2500 UNITS PER TRAY.
2. COLOR: WHITE.
3. ALL DIM IN mm.
4. GENERAL TOLERANCE±0.25.
5. BAN TO USE THE ENVIRONMENT-RELATED SUBSANCES OF JCET PRESCRIBING.
6. THE DERECTION OF VIEW:

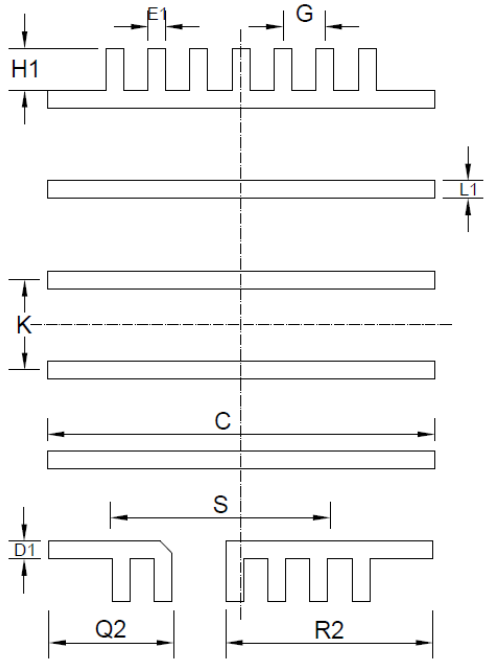
12. Land pattern

Recommended land pattern



SYMBOL	MILLIMETER	NOTE
A	4.0	
B	6.0	
C	4.6	5X
D	0.25	3X
E	0.25	13X
G	0.5	10X
H1	0.5	13X
K	1.07	6X
L	0.25	4X
R1	2.5	
Q1	1.5	
S	2.6	

Recommended Stencil drawing



SYMBOL	MILLIMETER	NOTE
C	4.56	5X
D1	0.21	3X
E1	0.21	13X
G	0.5	10X
H1	0.5	13X
K	1.07	6X
L1	0.21	4X
R2	2.46	
Q2	1.46	
S	2.6	

13. Revision history

Major changes since the last revision

Revision	Date	Description of changes
1.0	2024-02-29	1.0 Version Release.
1.1	2024-09-12	Update POD& Reel information.
1.2	2025-03-10	1. Update Id,continuous in table 4; 2. Update SOA chart base on new Id,continuous in Fig.17

Important Notice

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