

INN100FQ025A

100V Enhancement-mode GaN Power Transistor

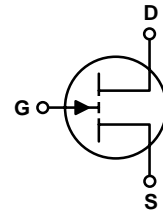
INN100FQ025A

1. General description

GaN-on-Silicon enhancement mode high-electron-mobility-transistor (HEMT) in FCQFN with 3.0 mm x 5.0 mm package size.

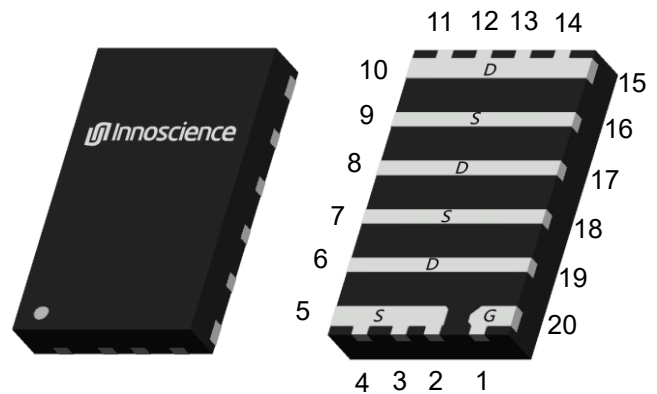
2. Features

- 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
- BMS protection
- RF envelope tracking
- PC charger
- Mobile power bank
- Motor driver



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
$R_{DS(on),max}$ @ $V_{GS} = 5\text{ V}$	2.8	m Ω
$Q_{G,typ}$ @ $V_{DS} = 50\text{ V}$	14	nC
$I_{DS,Pulse}$	320	A
Q_{OSS} @ $V_{DS} = 50\text{ V}$	85	nC

5. Pin information

Table 2 Pin information

Pin	Pin description	Pin function
1,20	Gate	Driver Gate
2-5,7,9,16,18	Source	Source
6,8,10-15,17,19	Drain	Power Drain

Table 3 Ordering information

Type/Ordering Code	Package	Product Code
INN100FQ025A	FCQFN 3X5	J22

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6. Maximum ratings

at $T_J = 25\text{ °C}$ 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)	100	V
$V_{DS(tr)}$	Drain-to-Source Voltage (up to 300,000 5ms pulse at 150 °C)	120	V
I_D	Continuous current	80	A
	Pulsed (25 °C, $T_{Pulse} = 100\ \mu s$)	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

7. Thermal characteristics

Table 5 Thermal characteristics

SYMBOL	PARAMETER	TYP	UNIT	Note/Test Condition
$R_{\theta JC}$	Thermal Resistance, Junction to Case	14.15	$^{\circ}C/W$	
$R_{\theta JB}$	Thermal Resistance, Junction to Board	1.89	$^{\circ}C/W$	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ¹	61.06	$^{\circ}C/W$	
T_{sold}	Maximum reflow soldering temperature	260	$^{\circ}C$	MSL3

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 specified otherwise

Table 6 Static characteristics

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS
BV_{DSS}	Drain-to-Source Voltage	100	-	-	V	$V_{GS} = 0\text{ V}$, $I_D = 600\text{ }\mu\text{A}$
I_{DSS}	Drain Source Leakage	-	12	24	μA	$V_{GS} = 0\text{ V}$, $V_{DS} = 80\text{ V}$
I_{GSS}	Gate-to-Source Forward Leakage	-	2.5	9	μA	$V_{GS} = 5\text{ V}$
	Gate-to-Source Reverse Leakage	-	0.3	0.5	μA	$V_{GS} = -4\text{ V}$
$V_{GS(TH)}$	Gate Threshold Voltage	0.8	1.1	2.5	V	$V_{DS} = V_{GS}$, $I_D = 13\text{ mA}$
$R_{DS(on)}$	Drain-Source On-state Resistance	-	2.2	2.8	$\text{m}\Omega$	$V_{GS} = 5\text{ V}$, $I_D = 30\text{ A}$
V_{SD}	Source-Drain Forward Voltage	-	1.5	-	V	$I_S = 0.5\text{ A}$, $V_{GS} = 0\text{ V}$

Table 7 Dynamic characteristics

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS
C _{ISS}	Input Capacitance	-	1500	-	pF	V _{GS} = 0 V, V _{DS} = 50 V
C _{OSS}	Output Capacitance	-	700	-		V _{GS} = 0 V, V _{DS} = 50 V
C _{RSS}	Reverse Transfer Capacitance	-	12.5	-		V _{GS} = 0 V, V _{DS} = 50 V
C _{OSS(ER)}	Energy Related C _{OSS}	-	1150	-		V _{GS} = 0 V, V _{DS} = 0 V to 50 V
C _{OSS(TR)}	Time Related C _{OSS}	-	1600	-		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	-	14	-	nC	V _{GS} = 5 V, V _{DS} = 50 V, I _D =30 A
Q _{GS}	Gate to Source Charge	-	2.8	-		V _{DS} = 50 V, I _D =30 A
Q _{GD}	Gate to Drain Charge	-	3	-		V _{DS} = 50 V, I _D =30 A
Q _{G(TH)}	Gate Charge at Threshold	-	1.5	-		V _{DS} = 50 V, I _D =30 A
Q _{OSS}	Output Charge	-	85	-		V _{GS} = 0 V, V _{DS} = 50 V

9. Electric characteristics diagrams

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

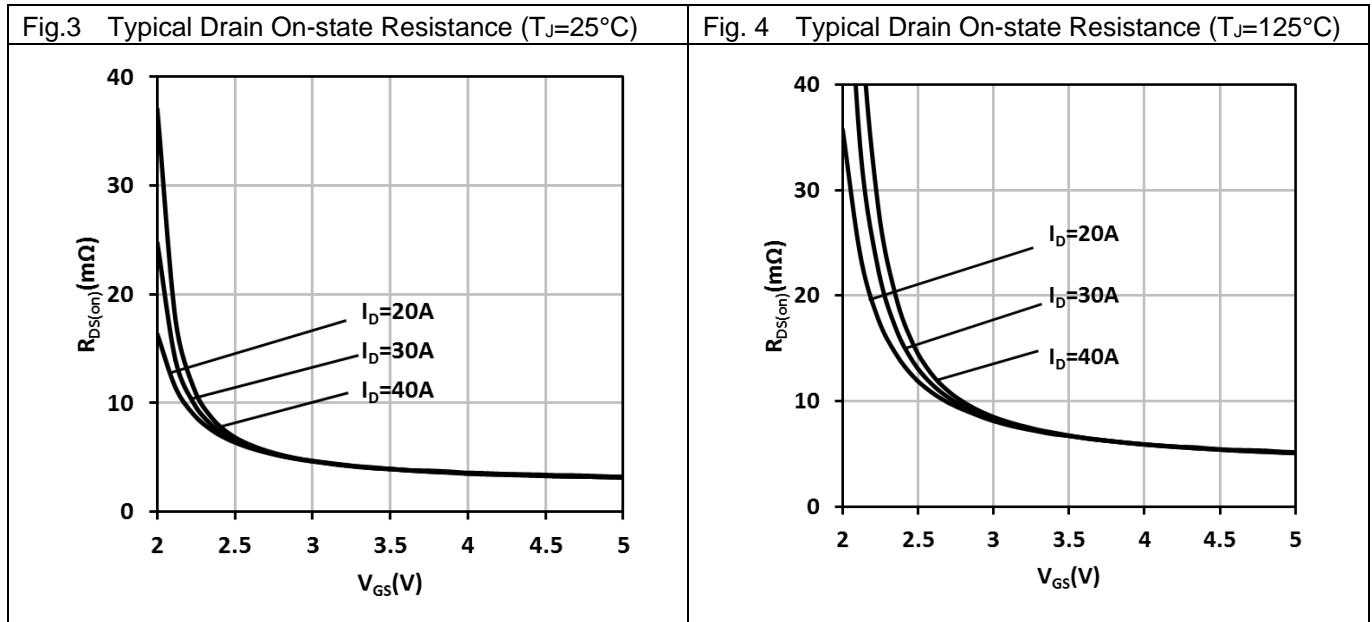
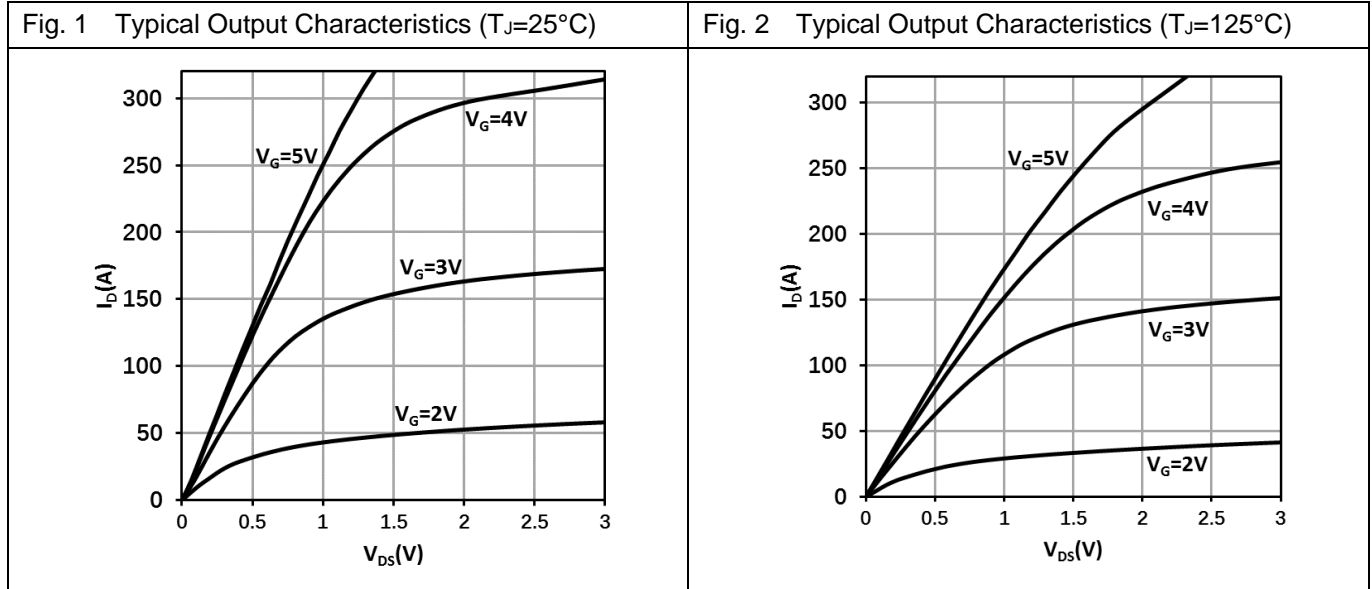


Fig. 5 Normalized On-State Resistance vs. Temp.

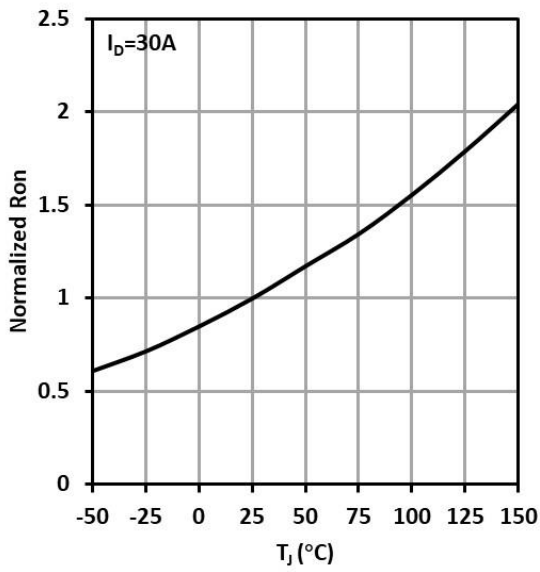


Fig. 6 Typical Transfer Characteristics

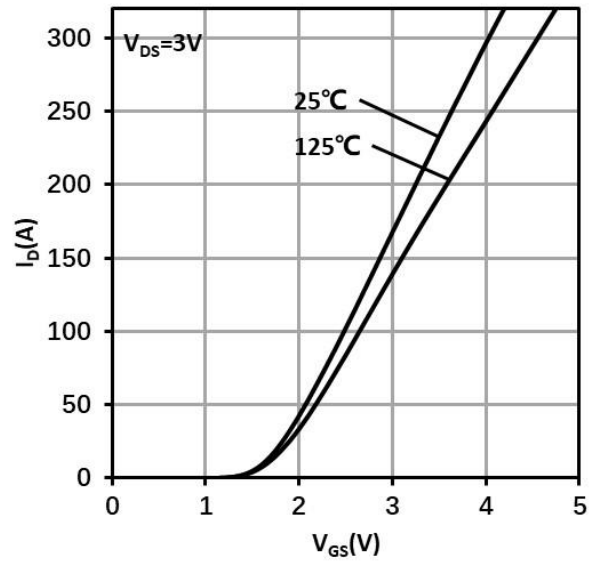


Fig. 7 Typ. Reverse Drain-Source Characteristics ($V_{GS} \leq 0, T_J = 25^\circ C$)

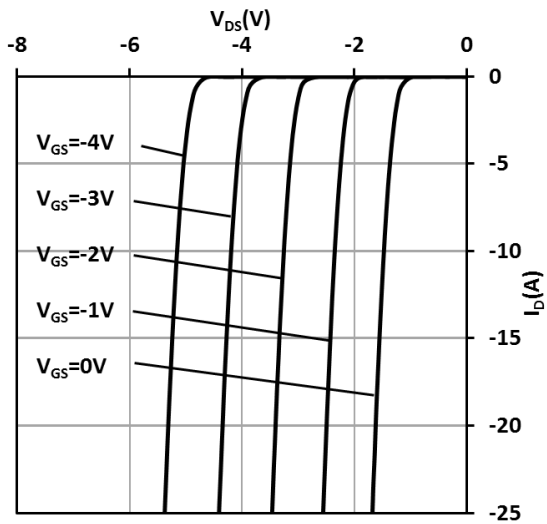


Fig. 8 Typ. Reverse Drain-Source Characteristics ($V_{GS} \geq 0, T_J = 25^\circ C$)

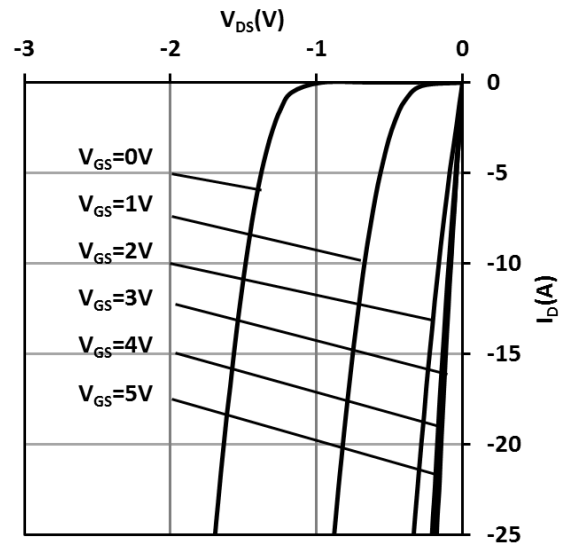


Fig. 9 Typ. Reverse Drain-Source Characteristics ($V_{GS} \leq 0$, $T_J = 125^\circ\text{C}$)

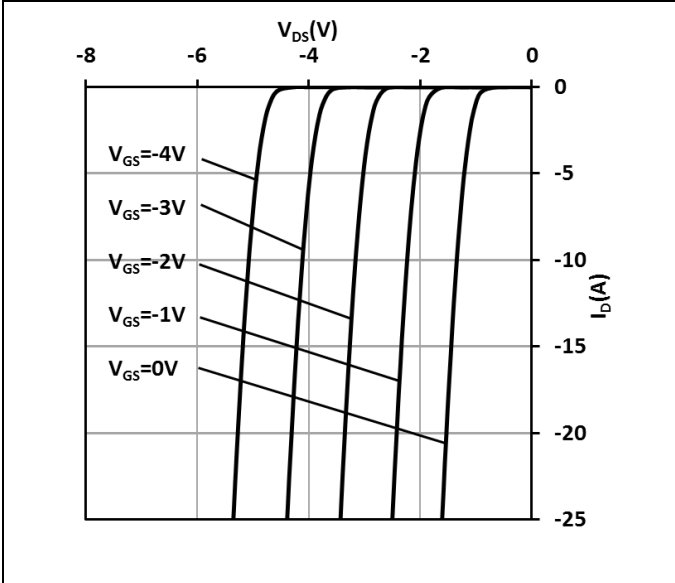


Fig. 10 Typ. Reverse Drain-Source Characteristics ($V_{GS} \geq 0$, $T_J = 125^\circ\text{C}$)

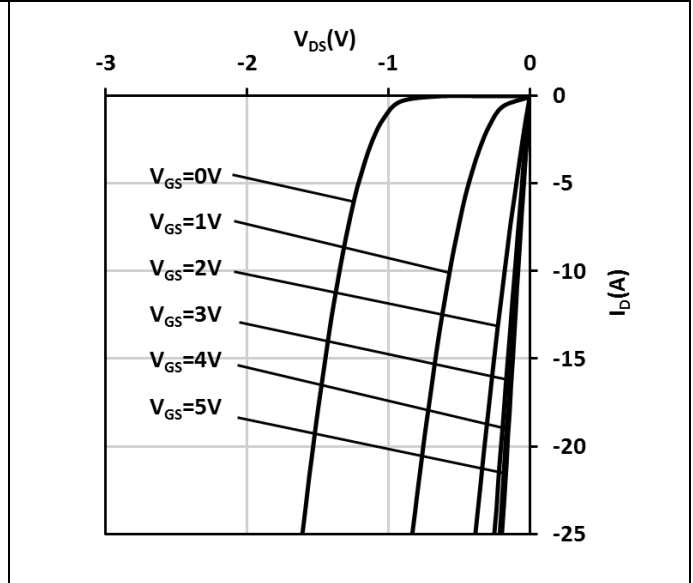


Fig. 11 Typ. Capacitances Characteristics

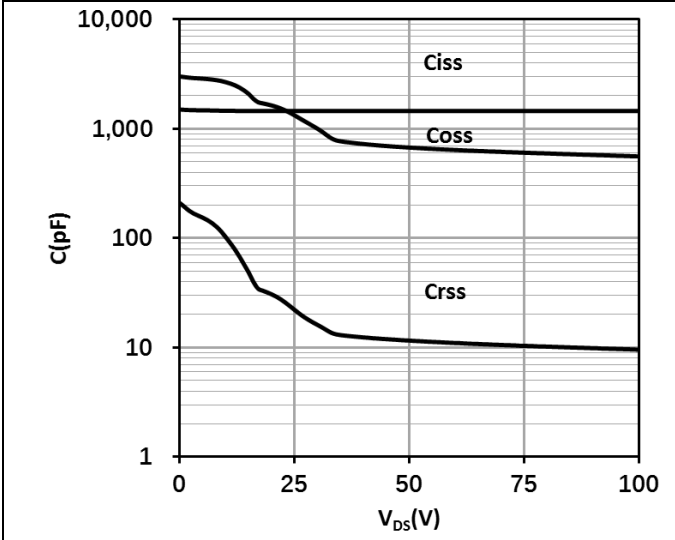


Fig. 12 Typ. Gate Charge

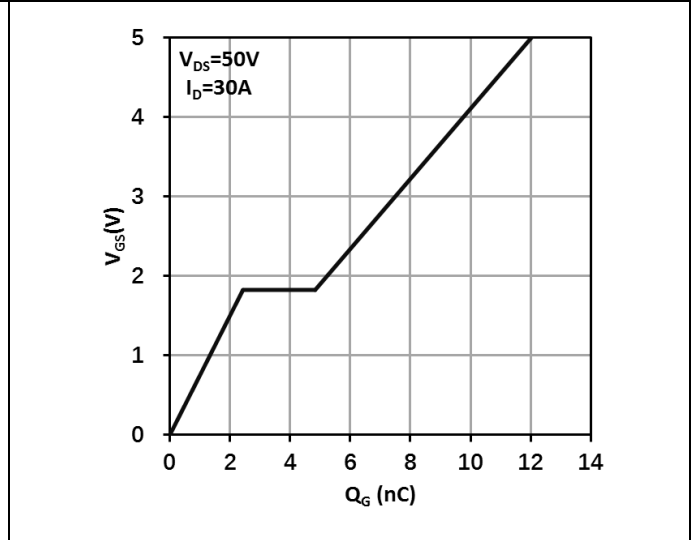


Fig. 13 Normalized Threshold Voltage vs. Temp.

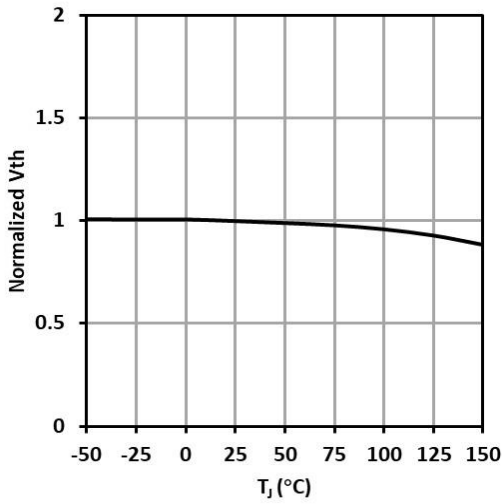


Fig. 14 Output Charge

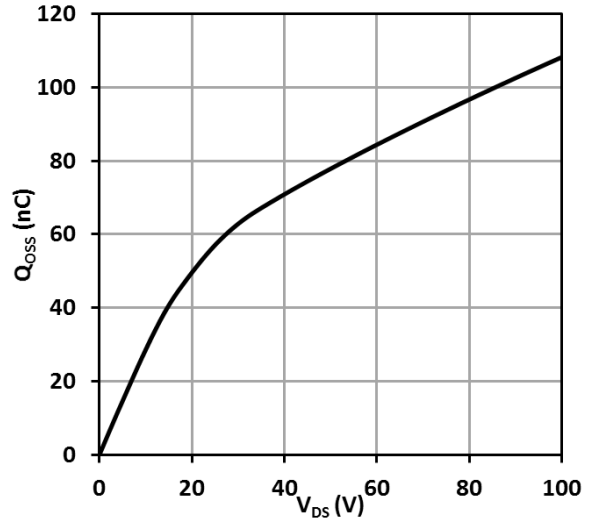


Fig. 15 Output Capacitance Stored Energy

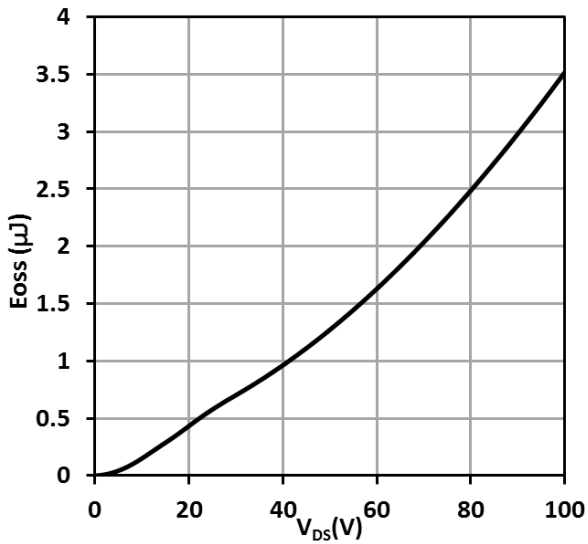
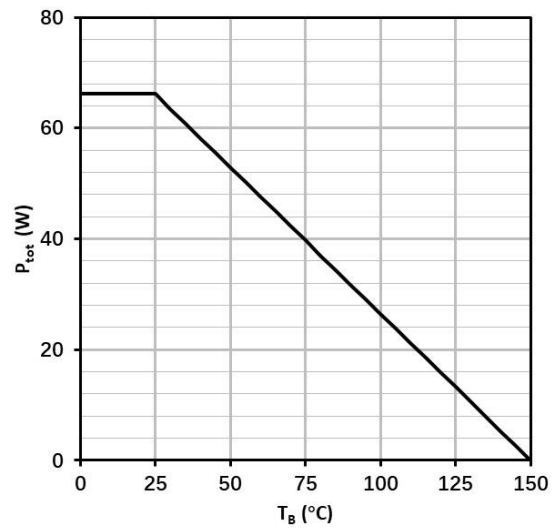


Fig. 16 Power Dissipation



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Fig. 17 Safe Operating Area

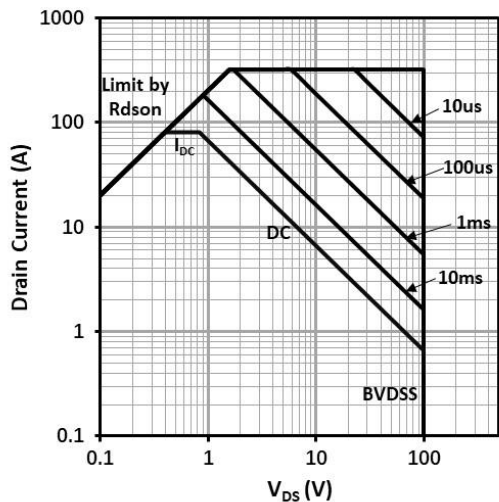
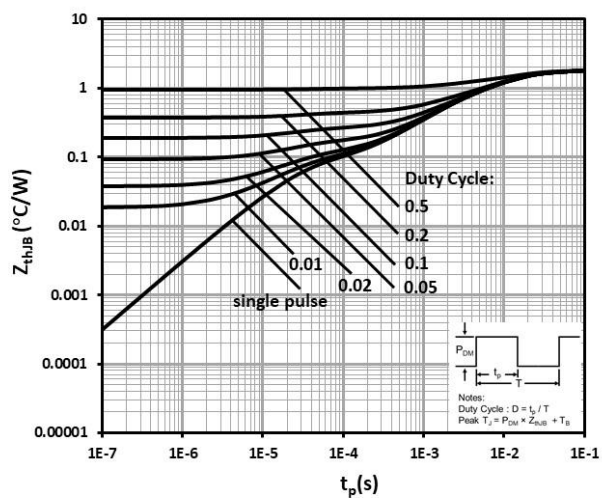
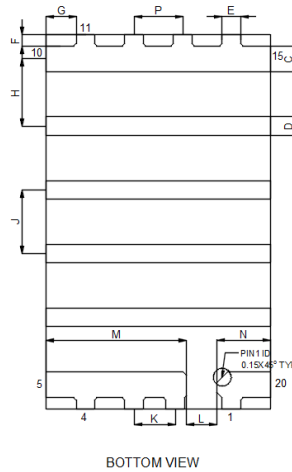
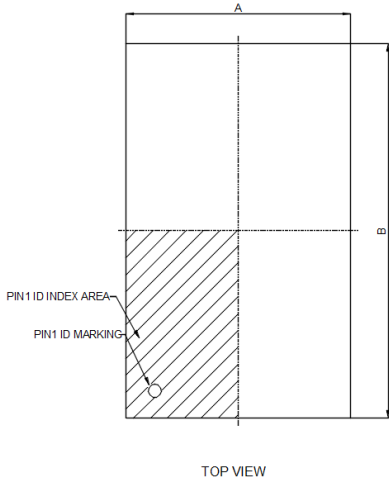


Fig. 18 Max. Transient Thermal Impedance

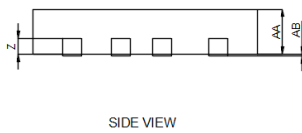


10. Package Outlines

Package Reference



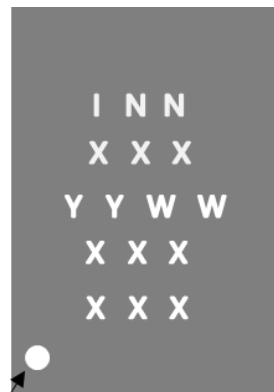
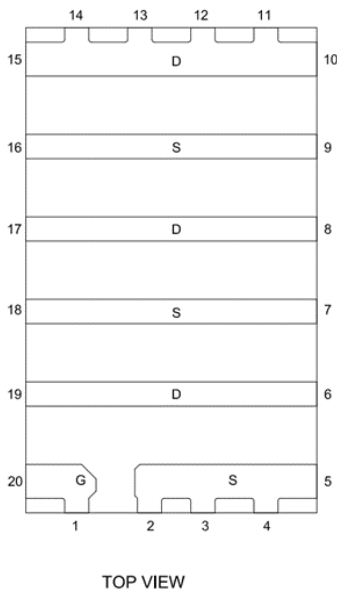
SYMBOL	MILLIMETER			NOTE
	MIN	NOM	MAX	
A	2.90	3.00	3.10	
B	4.90	5.00	5.10	
C	0.30	0.35	0.40	3X
D	0.20	0.25	0.30	4X
E	0.20	0.25	0.30	8X
F	0.15 REF			3X
G	0.40 REF			4X
H	0.90 BASIC			2X
J	0.85 BASIC			3X
K	0.55 BASIC			
P	0.65 BASIC			4X
L	0.35	0.40	0.45	
M	1.775	1.875	1.975	
N	0.625	0.725	0.825	
Z	0.203 REF			
AA	0.65	0.75	0.85	
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.

Pin Information

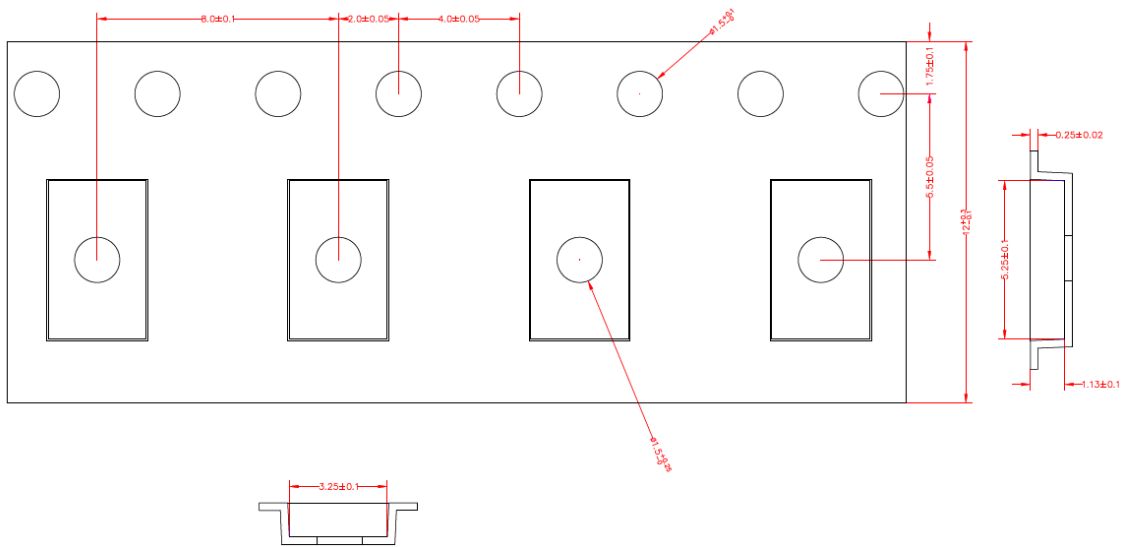
Marking Reference :



Die Orientation Dot
& Gate Position

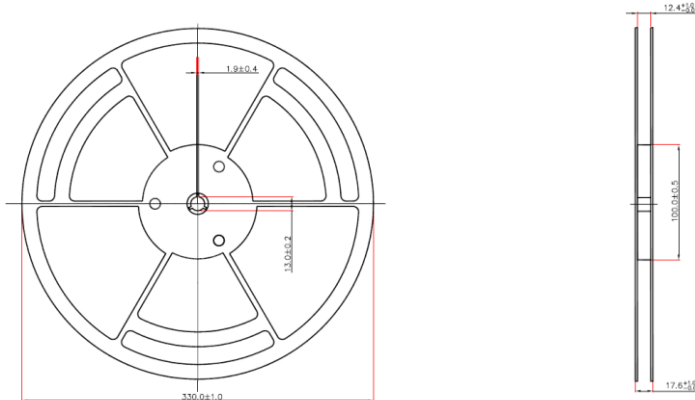
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Row 2 [⚠]	Product code [⚠]	XXX [⚠]
Row 3 [⚠]	Date code [⚠]	YYWW [⚠]
Row 4 [⚠]	Lot No [⚠]	XXX [⚠]
Row 5 [⚠]	Lot No [⚠]	XXX [⚠]

11. Reel information



NOTES:

1. CARRIER TAPE COLOR: BLACK.
2. COVER TAPE WIDTH: 9.5±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# 3 X 5 X 0.85
7. ALL DIMS IN MM.
8. BAN TO USE THE ENVIRONMENT-RELATED SUBSANCES OF JCET PRESCRIBING.

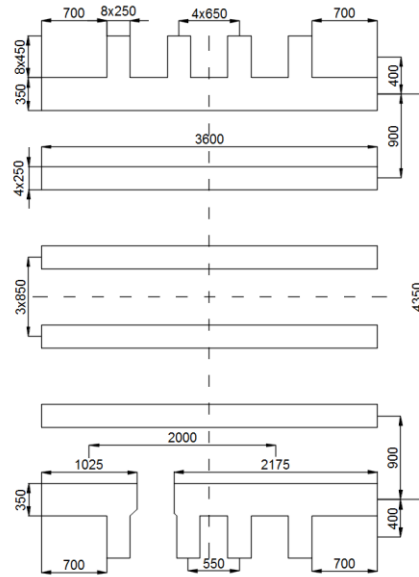


NOTES:

1. COLOR: BLUE.
2. ALL DIM IN mm.
3. GENERAL TOLERANCE±0.25.
4. BAN TO USE THE ENVIRONMENT-RELATED SUBSANCES OF JCET PRESCRIBING.

12. Land pattern

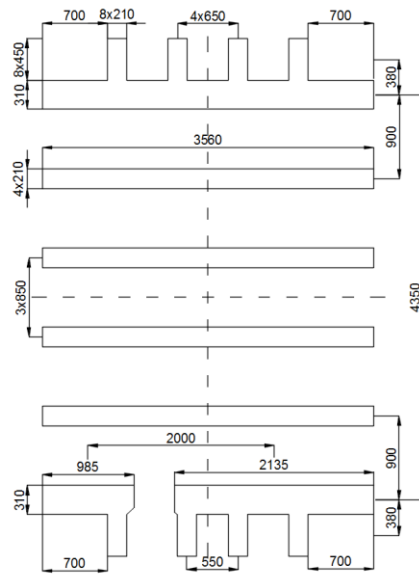
Recommended land pattern



TOP VIEW

Unit: μm

Recommended Stencil drawing



TOP VIEW

Unit: μm

13. Revision history

Major changes since the last revision

Revision	Date	Description of changes
1.0	2023-07-19	Version 1.0 release
1.1	2023-09-26	Version 1.1 release, add $V_{DS(tr)}$ in Table 4

Important Notice

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