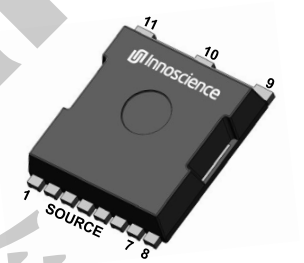
INN650TA080AH

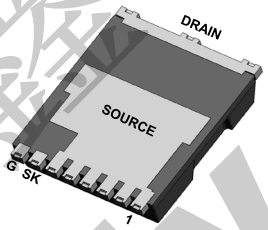
1. General description

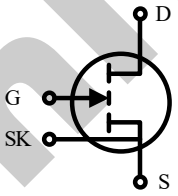
650V GaN-on-Silicon Enhancement-mode Power Transistor in TOLL package

2. Features

- Enhancement mode transistor-Normally off power switch
- Ultra high switching frequency
- No reverse-recovery charge
- Low gate charge, low output charge
- Qualified for industrial applications according to JEDEC Standards
- ESD safeguard
- RoHS, Pb-free, REACH-compliant







3. Applications

- DCM/BCM PFC
- AHB/LLC/QR Flyback/ACF DC-DC converter
- LED driver
- Fast battery charger
- Desktop PC and ATX power supply
- Industrial, Datacenter, Telecom power supply
- Power tool power supply

4. Key performance parameters

Table 1 Key performance parameters at T_j = 25 °C

Parameter	Value	Unit
$V_{DS,max}$	650	V
$R_{DS(on),max}$ @ V_{GS} = 6 V	80	mΩ
$Q_{G,typ}$ @ V_{DS} = 400 V	6.7	nC
$I_{D,pulse}$	58	A
Q_{OSS} @ V_{DS} = 400 V	70	nC
Q_{rr} @ V_{DS} = 400 V	0	nC

5. Pin information

Table 2 Pin information

Gate	Drain	Kelvin Source	Source
8	9,10,11	7	1,2,3,4,5,6

Table 3 Ordering information

Type/Ordering Code	Package	Product Code
INN650TA080AH	TOLL	65TA080A

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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

Parameter	Symbol	Values	Unit	Note/Test Condition
Drain source voltage	$V_{DS,max}$	650	V	V_{GS} = 0 V, T_j = -55 °C to 150 °C
Drain source voltage transient [1]	$V_{DS,transient}$	800	V	V_{GS} = 0 V
Drain source voltage, pulsed [2]	$V_{DS,pulse}$	750	V	T_j = 25 °C; total time < 10 h
				T_j = 125 °C; total time < 1 h
Continuous current, drain source	I_D	30	A	T_c = 25 °C
Pulsed current, drain source [3]	$I_{D,pulse}$	58	A	T_c = 25 °C; V_G = 6 V; t_{PULSE} = 10 µs
Pulsed current, drain source [3]	$I_{D,pulse}$	29	A	T_c = 125 °C; V_G = 6 V; t_{PULSE} = 10 µs
Gate source voltage, continuous [4]	V_{GS}	-6 to +7	V	T_j = -55 °C to 150 °C
Gate source voltage, pulsed	$V_{GS,pulse}$	-20 to +10	V	T_j = -55 °C to 150 °C; t_{PULSE} = 50 ns, f = 100 kHz; open drain
Power dissipation	P_{tot}	188	W	T_c = 25 °C
Operating temperature	T_j	-55 to +150	˚C	
Storage temperature	T_{stg}	-55 to +150	˚C	

1 $V_{DS,transient}$ is intended for non-repetitive events, t_{PULSE} < 200 µs

2 $V_{DS,pulse}$ is intended for repetitive pulse, t_{PULSE} < 100 ns

3 Limit was extracted from characterization test, not measured during production

4 The minimum V_{GS} is clamped by ESD protection circuit, as shown in Figure 10

7. Thermal characteristics

Table 5 Thermal characteristics

Parameter	Symbol	Values	Unit	Note/Test Condition
Thermal resistance, junction-ambient	R_{thJA}	26.0	°C/W	
Thermal resistance, junction-case	R_{thJC}	0.61	°C/W	
Maximum reflow soldering temperature	T_{sold}	260	°C	MSL3

8. Electric characteristics

at T_j = 25 °C, unless specified otherwise

Table 6 Static characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Gate threshold voltage	$V_{GS(th)}$	1.2	1.7	2.5	V	I_D = 30.7 mA; V_{DS} = V_{GS}; T_j = 25 °C
		-	1.6	-		I_D = 30.7 mA; V_{DS} = V_{GS}; T_j = 150 °C
Drain-source leakage current	I_{DSS}	-	1	65	μA	V_{DS} = 650 V; V_{GS} = 0 V; T_j = 25 °C
		-	13	390		V_{DS} = 650 V; V_{GS} = 0 V; T_j = 150 °C
Gate-source leakage current	I_{GSS}	-	163	-	μA	V_{GS} = 6 V; V_{DS} = 0 V
Drain-source on-state resistance	$R_{DS(on)}$	-	60	80	mΩ	V_{GS} = 6 V; I_D = 8 A; T_j = 25 °C
		-	128	-	mΩ	V_{GS} = 6 V; I_D = 8 A; T_j = 150 °C
Gate resistance	R_G	-	2	-	Ω	f = 5 MHz; open drain

Table 7 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	240	-	pF	V_{GS} = 0 V; V_{DS} = 400 V; f = 100 kHz
Output capacitance	C_{oss}	-	90	-	pF	V_{GS} = 0 V; V_{DS} = 400 V; f = 100 kHz
Reverse transfer Capacitance	C_{rss}	-	1	-	pF	V_{GS} = 0 V; V_{DS} = 400 V; f = 100 kHz
Effective output capacitance, energy related [1]	$C_{o(er)}$	-	129	-	pF	V_{GS} = 0 V; V_{DS} = 0 to 400 V
Effective output capacitance, time related [2]	$C_{o(tr)}$	-	179	-	pF	V_{GS} = 0 V; V_{DS} = 0 to 400 V
Output charge	Q_{OSS}	-	70	-	nC	V_{GS} = 0 V; V_{DS} = 0 to 400 V
Turn-on delay time	$t_{d(on)}$	-	TBD	-	nS	V_{DS} = 400 V; I_D = 16 A; L = 318 μH; V_{GS} = 6 V; R_{on} = 10 Ω; R_{off} = 2 Ω; See Figure 22
Turn-off delay time	$t_{d(off)}$	-	TBD	-	nS	
Rise time	t_r	-	TBD	-	nS	
Fall time	t_f	-	TBD	-	nS	
Output Capacitance Stored Energy	E_{oss}	-	8.4	-	μJ	V_{GS} = 0 V; V_{DS} = 400 V; f = 100 kHz

1. $C_{O(er)}$ is the fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 400 V
2. $C_{O(tr)}$ is the fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 400 V

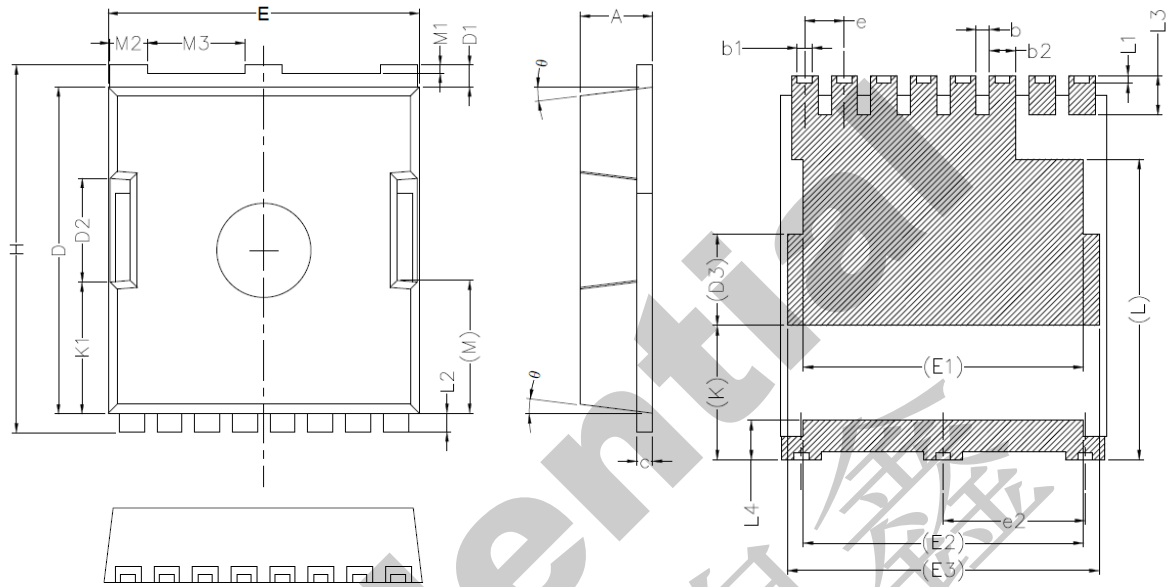
Table 8 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Gate charge	Q_G	-	6.7	-	nC	V_{GS} = 0 to 6 V; V_{DS} = 400 V; I_D = 8 A
Gate-source charge	Q_{GS}	-	0.5	-	nC	
Gate-drain charge	Q_{GD}	-	2.5	-	nC	
Gate Plateau Voltage	V_{Plat}	-	2.1	-	V	V_{DS} = 400 V; I_D = 8 A

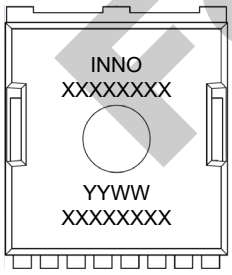
Table 9 Reverse conduction characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Source-Drain reverse voltage	V_{SD}	-	2.5	-	V	V_{GS} = 0 V; I_S = 8 A
Pulsed current, reverse	$I_{S,pulse}$	-	-	58	A	V_{GS} = 6 V; t_{PULSE} = 10 µs
Reverse recovery charge	Q_{rr}	-	0	-	nC	I_{SD} = 8 A; V_{DS} = 400 V
Reverse recovery time	t_{rr}	-	0	-	ns	
Peak reverse recovery current	I_{rrm}	-	0	-	A	

9. Package outlines



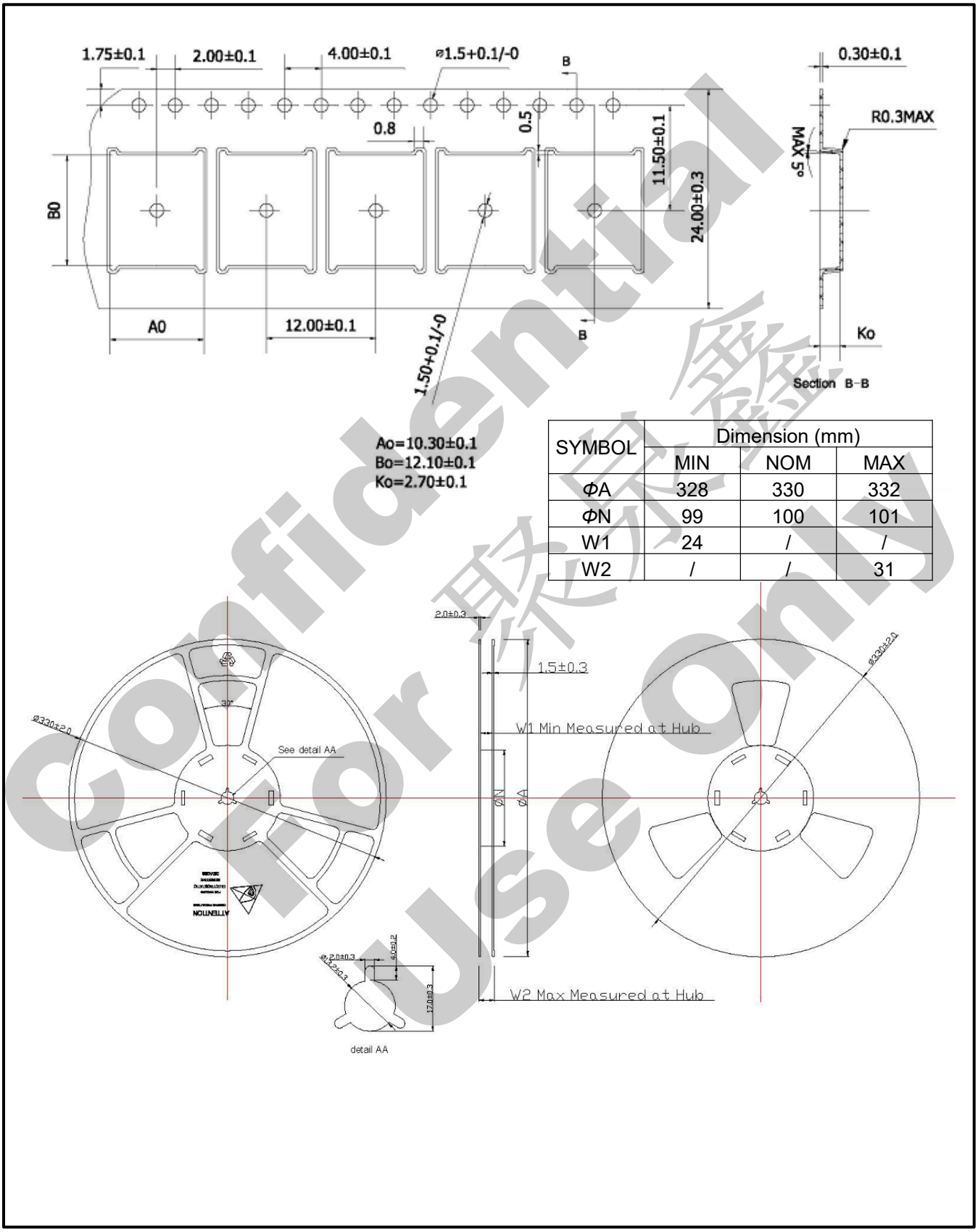
SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	2.20	2.40	H	11.48	11.88
b	0.30	0.50	K	(4.08)	
b1	0.35	0.55	K1	(4.17)	
b2	0.70	0.90	L	(9.13)	
c	0.40	0.60	L1	0.13	0.33
D	10.28	10.58	L2	0.50	0.70
D1	0.60	0.80	L3	1.10	1.30
D2	(3.30)		L4	1.10	1.30
D3	(2.77)		M	(4.23)	
E	9.70	10.10	M1	0.16	0.36
E1	(8.50)		M2	1.10	1.30
E2	(8.50)		M3	3.00	3.20
E3	(9.46)		θ	4°	10°
e	1.10	1.30	e2	4.20	4.40



Row	Description	Example
Row1	Company name	INNO
Row2	Product code (In short)	XXXXXXXX
Row3	Date code	YYWW
Row4	ASSY lot No.	XXXXXXXX

Notes:
(1) Dimensioning and toleranceing confirm to ASME Y14.5M-1994
(2) All dimensions are in millimeters, angles are in degrees
(3) Coplanarity applies to the exposed heat slug as well as the terminal
(4) Radius on terminal is optional
(5) General tolerance: ± 0.10 mm

10. Reel Information



SYMBOL	Dimension (mm)		
	MIN	NOM	MAX
ΦA	328	330	332
ΦN	99	100	101
W1	24	/	/
W2	/	/	31

11. Revision history

Major changes since the last revision

Revision	Date	Description of changes
0.1	2022-06-01	0.1 version release

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