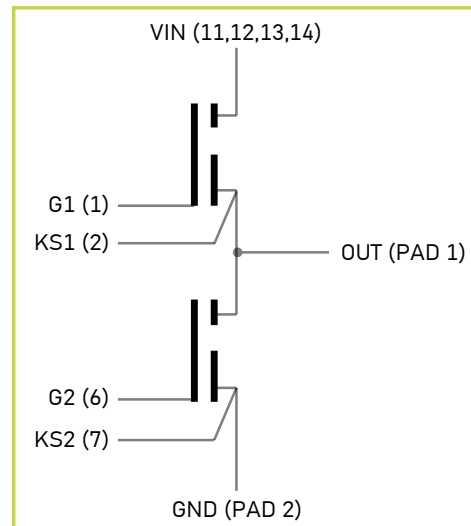


### Description

The WI62120 is an enhancement mode GaN-on-silicon half-bridge power circuit of the WiseGaN™ power integrated circuits family of Wise-integration. The properties of GaN allow high current, high voltage breakdown and high switching frequency.

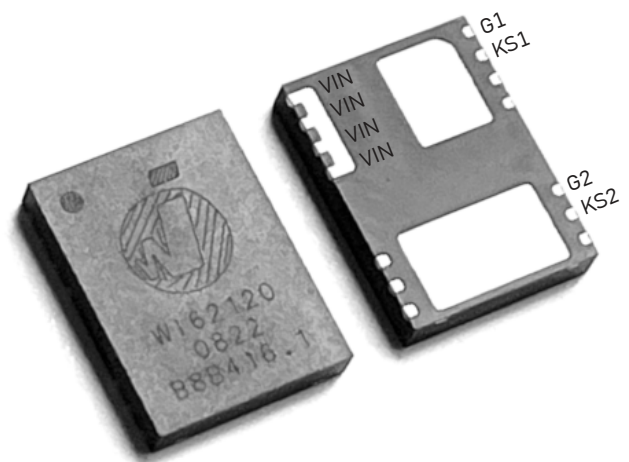
### Applications

- High efficiency power conversion
- High density power conversion
- AC-DC, DC-DC, DC-AC
- Bridgeless Totem Pole PFC
- ACF (active clamp flyback)
- LLC resonant converter
- Half-bridge topologies
- Synchronous Buck or Boost
- Small-Medium UPS
- Fast Battery Charging



### Features

- 650 V enhancement mode half-bridge
- Bottom-side cooled configuration
- $R_{DS(on)} = 120 \text{ m}\Omega$  per switch
- $I_{DS(max)} = 13 \text{ A}$
- Low inductance PQFN package
- Easy gate drive requirements (0 V to 6 V)
- Transient tolerant gate drive up to 7 V
- High switching frequency (>1 MHz)
- Zero reverse recovery loss
- Small 6 x 8 mm PCB footprint



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## Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Drain-to-Source Transient Voltage <sup>1</sup>	V <sub>DS</sub>	750	V
Gate-to-Source Transient Voltage <sup>2</sup>	V <sub>GS</sub>	-2 to +7	V
Operating Junction Temperature	T <sub>J</sub>	-40 to +150	°C
Operating Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

<sup>1</sup> maximum duration is 1ms

<sup>2</sup> maximum duration is 1μs

## Operating conditions

Parameter	Symbol	Value	Units
Continuous Drain-to-Source Voltage	V <sub>DS (max)</sub>	650	V
Gate-to-Source Voltage	V <sub>GS</sub>	0 to +6	V
Continuous Drain Current (T <sub>J</sub> = 25°C)	I <sub>D</sub>	13	A

## Thermal Characteristics

Parameter	Symbol	Value	Units
Thermal Resistance (junction-to-case) – bottom side	R <sub>θJC</sub>	1.9	K/W
Thermal Resistance (junction-to-ambient)	R <sub>θJA</sub>	35.5	K/W

## ESD Ratings

Parameter	Symbol	Value	Units
Human Body Model	HBM	1000	V
Charged Device Model	CDM	1500	V

## Static Electrical Characteristics

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS} = 6\text{ V}, T_J = 25\text{ }^\circ\text{C}, I_{DS} = 2\text{ A}$		110	165	m $\Omega$
		$V_{GS} = 6\text{ V}, T_J = 150\text{ }^\circ\text{C}, I_{DS} = 2\text{ A}$		250		m $\Omega$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, T_J = 25\text{ }^\circ\text{C}, I_{DS} = 10\text{ mA}$	0.8	1.6	2.2	V
		$V_{DS} = V_{GS}, T_J = 150\text{ }^\circ\text{C}, I_{DS} = 10\text{ mA}$		1.8		V
Internal Gate Resistance	$R_G$	open drain		2.82		$\Omega$
Drain-to-Source Leakage Current	$I_{DSS}$	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}, T_J = 25\text{ }^\circ\text{C}$		0.4	0.7	$\mu\text{A}$
		$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$		12		$\mu\text{A}$
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{GS} = 6\text{ V}, V_{DS} = 0\text{ V}, T_J = 25\text{ }^\circ\text{C}$		42	130	$\mu\text{A}$
		$V_{GS} = 6\text{ V}, V_{DS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$		350		$\mu\text{A}$
Source-to-Drain Reverse Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_{SD} = 5\text{ A}$		3.25		V
		$V_{GS} = 0\text{ V}, I_{SD} = 6\text{ A}$		3.55		V

## Dynamic Electrical Characteristics

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Input Capacitance	$C_{ISS}$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 100\text{ kHz}$		92.7		pF
Reverse Transfer Capacitance	$C_{RSS}$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 100\text{ kHz}$		0.7		pF
Output Capacitance	$C_{OSS}$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 100\text{ kHz}$		22.1		pF
Total Gate Charge	$Q_G$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V to } 6\text{ V}$		2.75		nC
Gate to Source Charge	$Q_{GS}$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V to } 6\text{ V}$		0.3		nC
Gate to Drain Charge	$Q_{GD}$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V to } 6\text{ V}$		1.0		nC
Output Charge	$Q_{OSS}$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$		22.7		nC
Output Capacitance Stored Energy	$E_{OSS}$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$		2.8		$\mu\text{J}$
Effective Output Capacitance (Energy related)	$C_{O(ER)}$	$V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$		34.6		pF
Effective Output Capacitance (Time related)	$C_{O(TR)}$	$V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$		56.7		pF

Static main characteristics ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Figure 1. Output  $I_{DS} . V_{DS}$

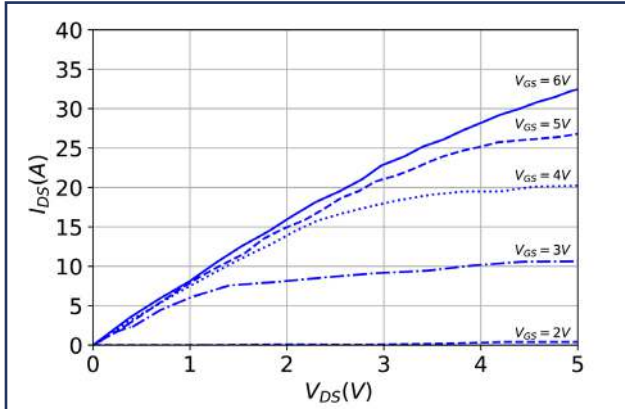


Figure 2. Simulated output  $I_{DS} . V_{DS}$   
 $T_J = 125^\circ\text{C}$

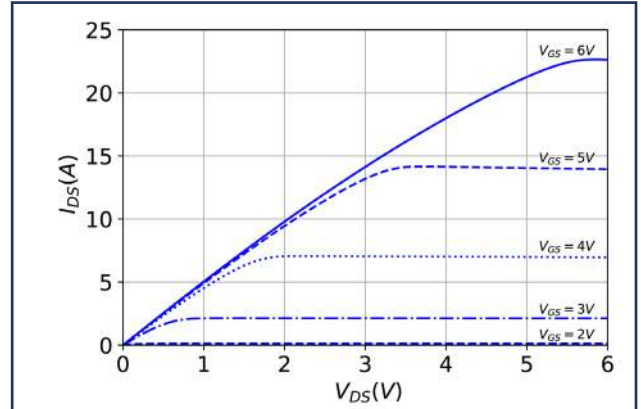


Figure 3. Capacitance

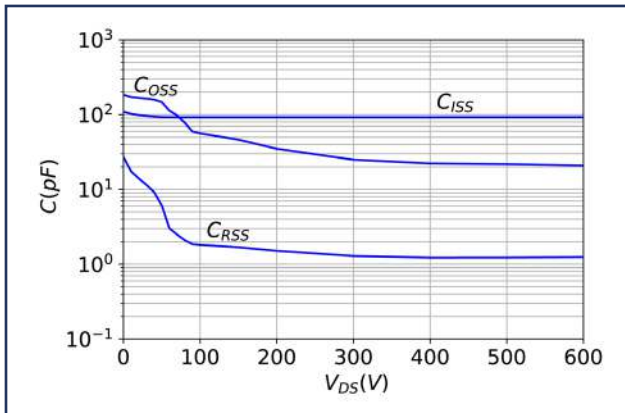


Figure 4. Gate Charge,  $Q_G$

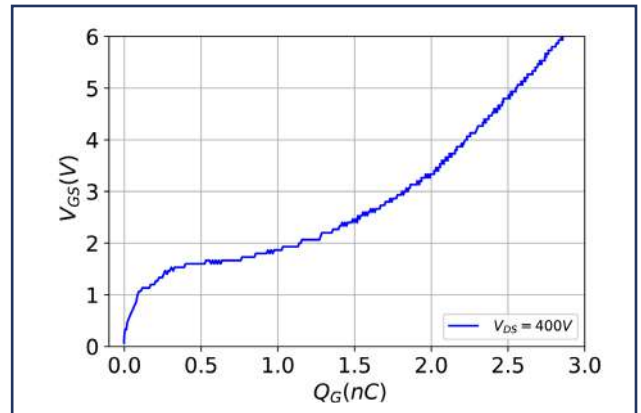


Figure 5. Stored Energy

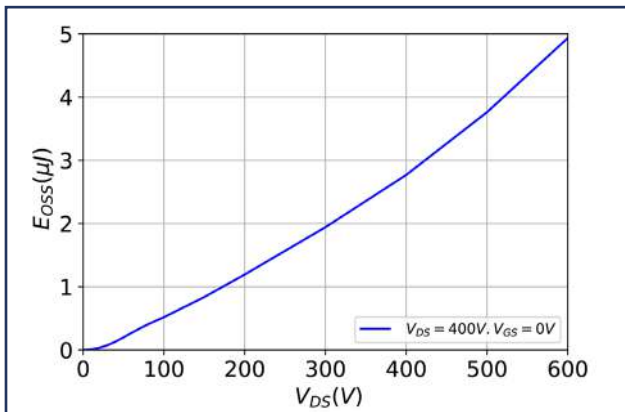
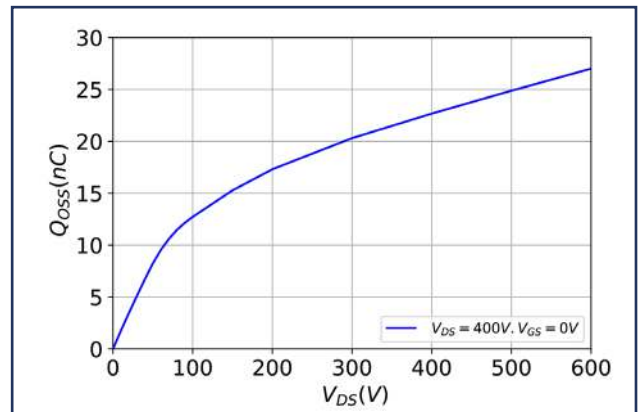
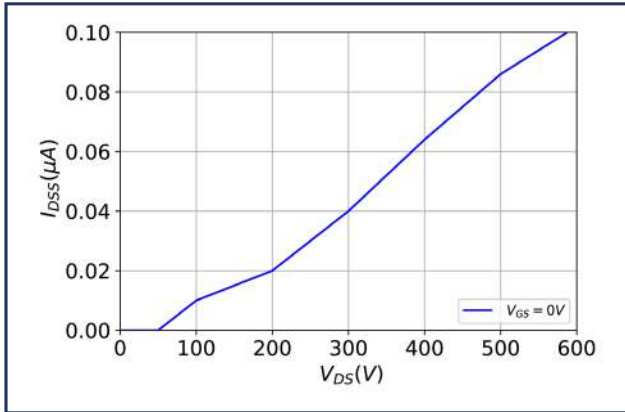


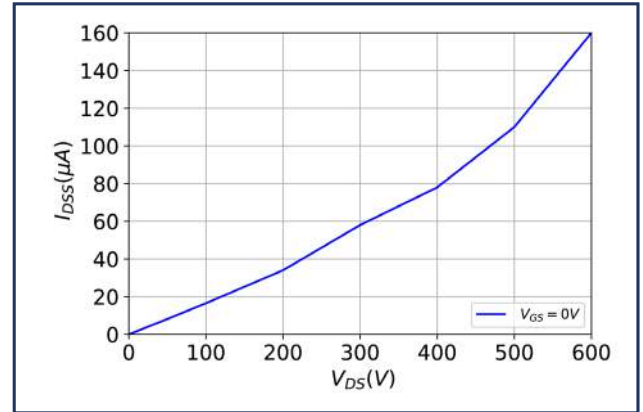
Figure 6. Output charge



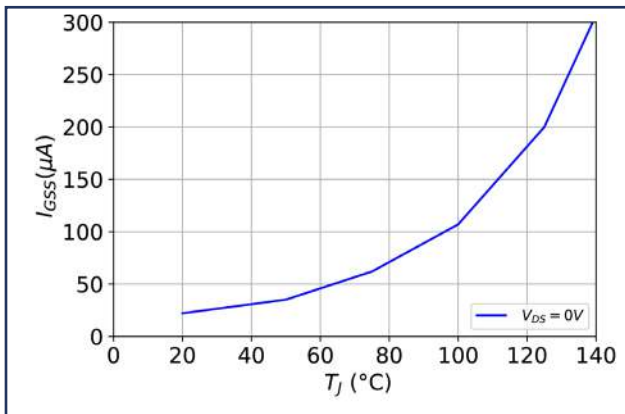
**Figure 7. Drain-source leakage**



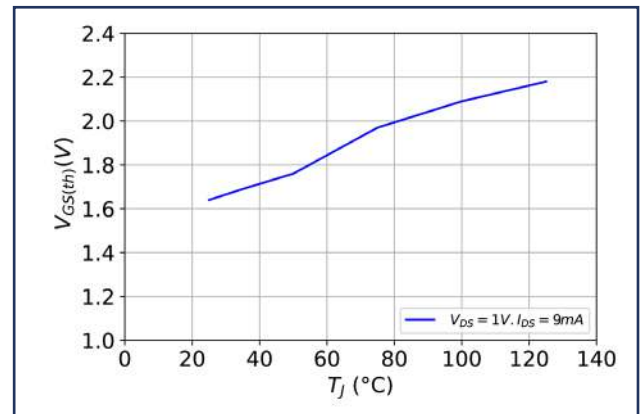
**Figure 8. Drain-source leakage**  
 $T_J = 125^\circ C$



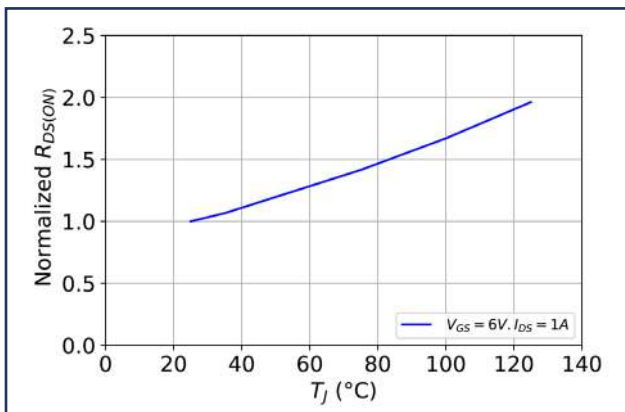
**Figure 9. Gate-source leakage vs Temperature**



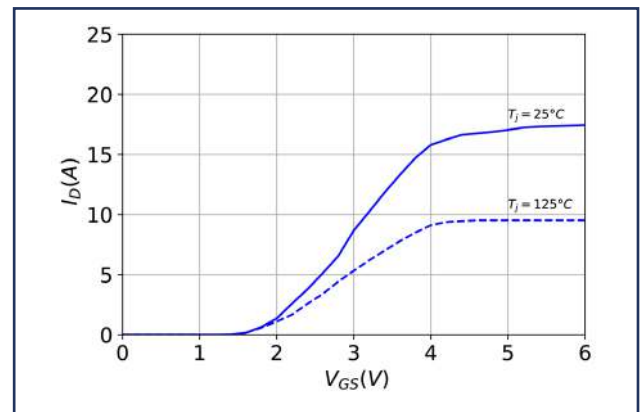
**Figure 10.  $V_{GS(th)}$  vs Temperature**



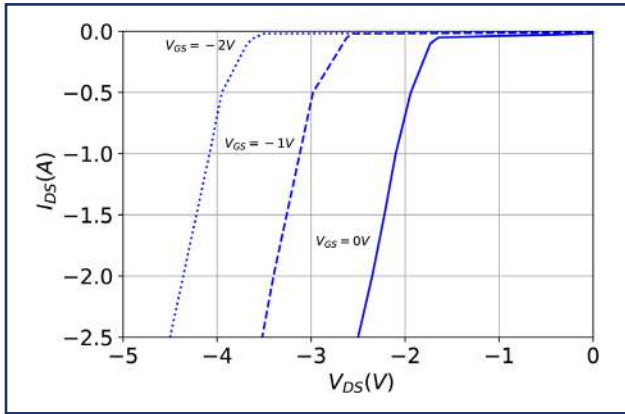
**Figure 11.  $R_{DS(on)}$  vs Temperature**



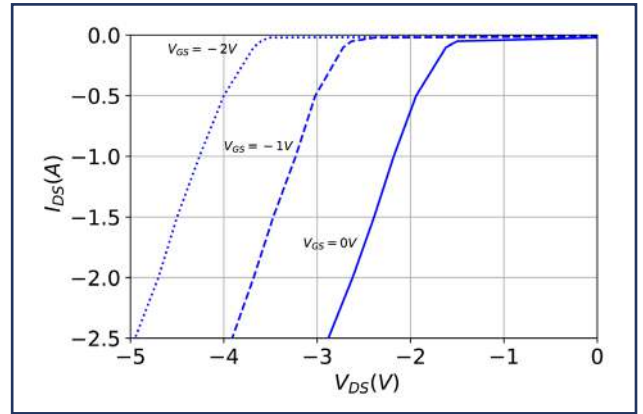
**Figure 12. Transfer characteristics**



**Figure 13. Reverse Conduction**

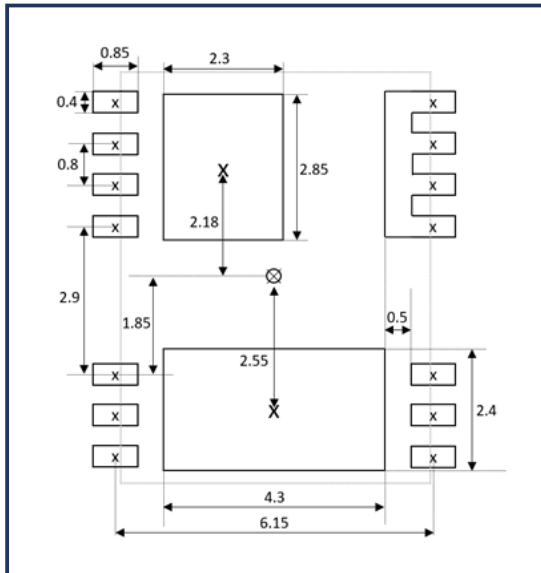


**Figure 14. Reverse Conduction**  
 $T_J = 125^\circ C$

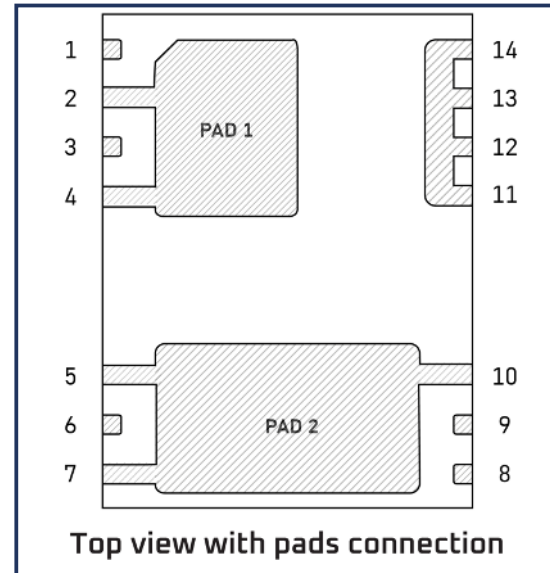


## Package and Packing information

### Land Pattern

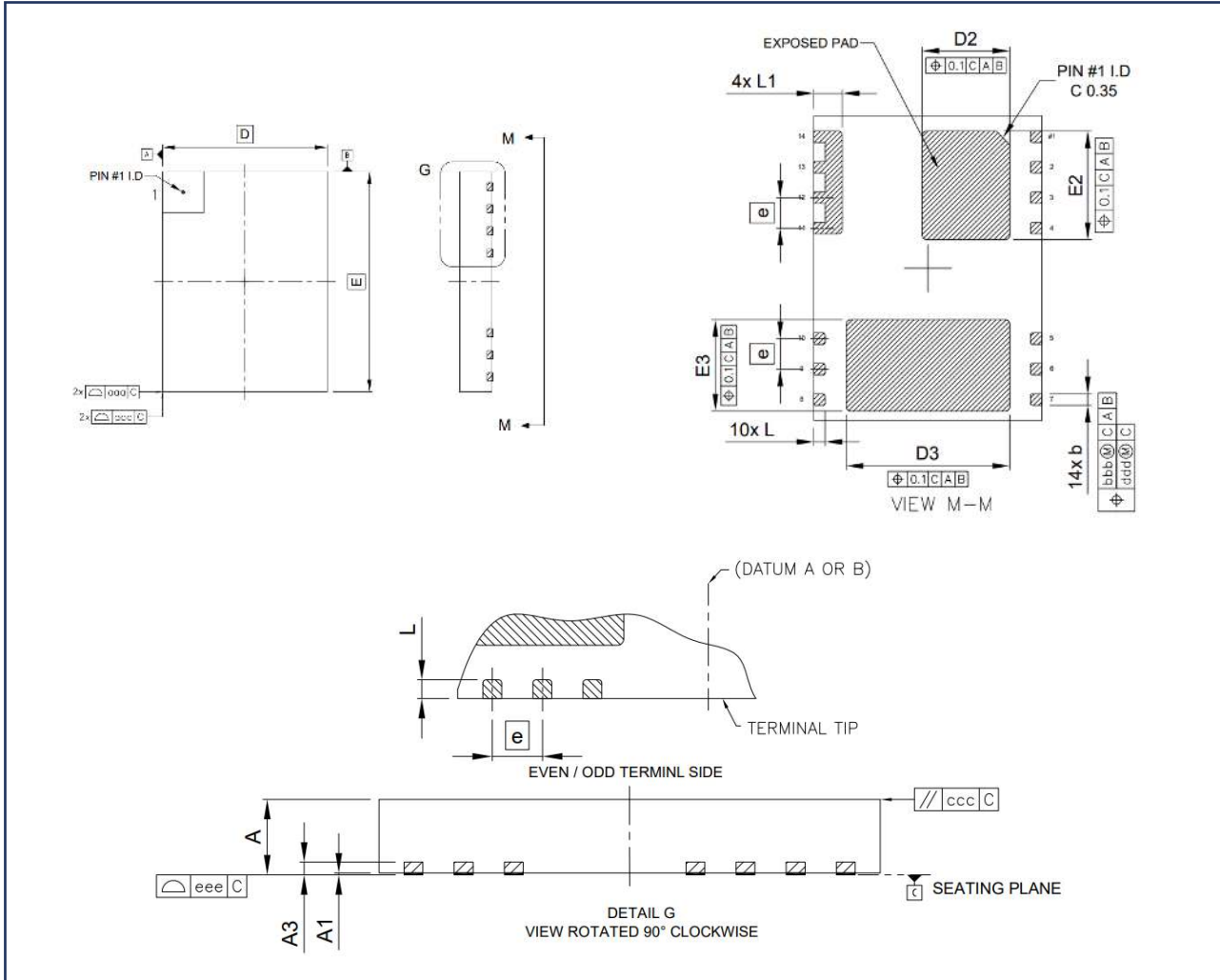


### Pinout



Number	Name	Function	Description
1	G1	Signal	Gate of high side GaN transistor
2	KS1	Signal	Kelvin source of high side GaN transistor
3		NC	Not connected pin
4	OUT	Supply	Connected to PAD 1
5		Supply	Connected to PAD 2
6	G2	Signal	Gate of low side GaN transistor
7	KS2	Signal	Kelvin source of low side GaN transistor
8		NC	Not connected pin
9		NC	Not connected pin
10		Supply	Connected to PAD 2
11	VIN	Power	Drain of high side GaN transistor
12	VIN	Power	Drain of high side GaN transistor
13	VIN	Power	Drain of high side GaN transistor
14	VIN	Power	Drain of high side GaN transistor
PAD1	OUT	Power	Source of high side and drain of low side GaN transistor
PAD2	GND	Power	Source of low side GaN transistor

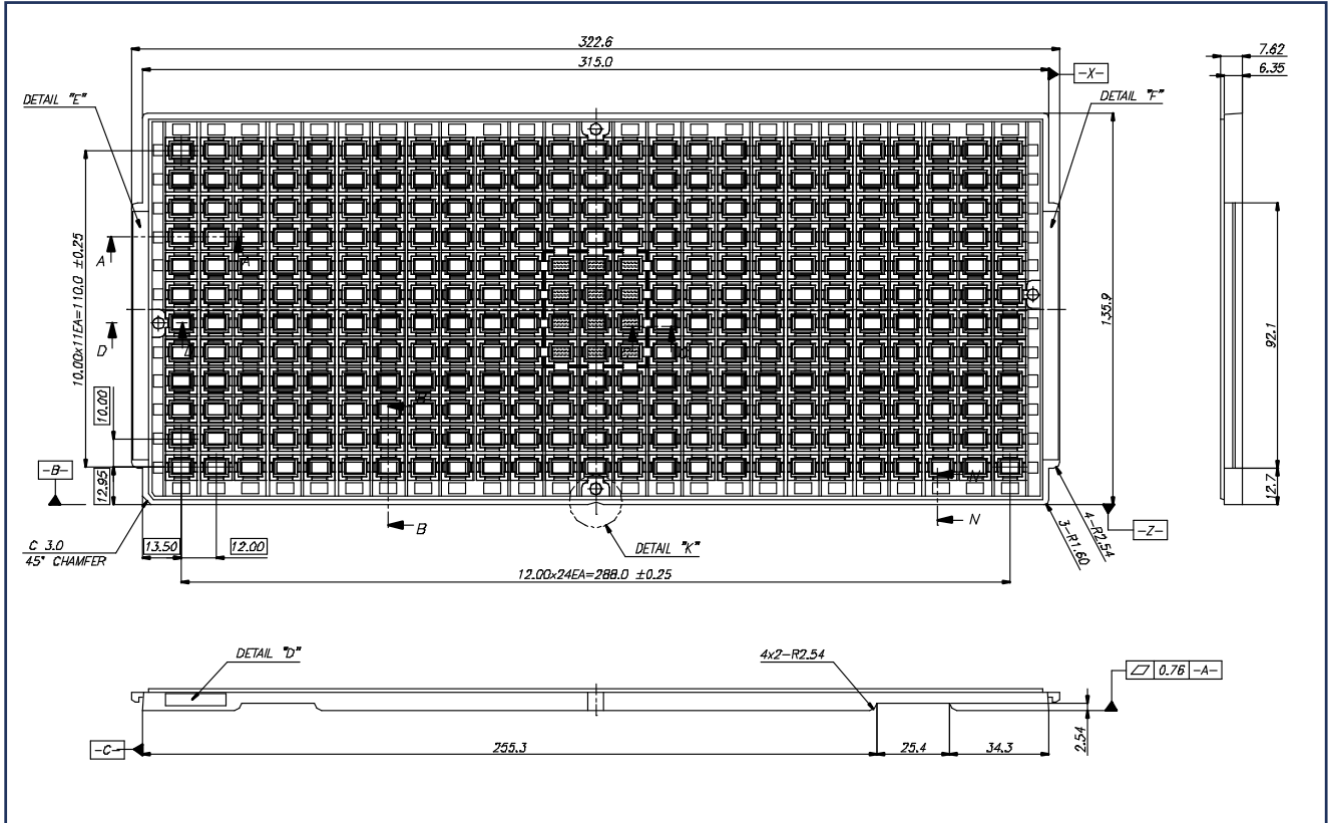


**Package Outline Drawing**


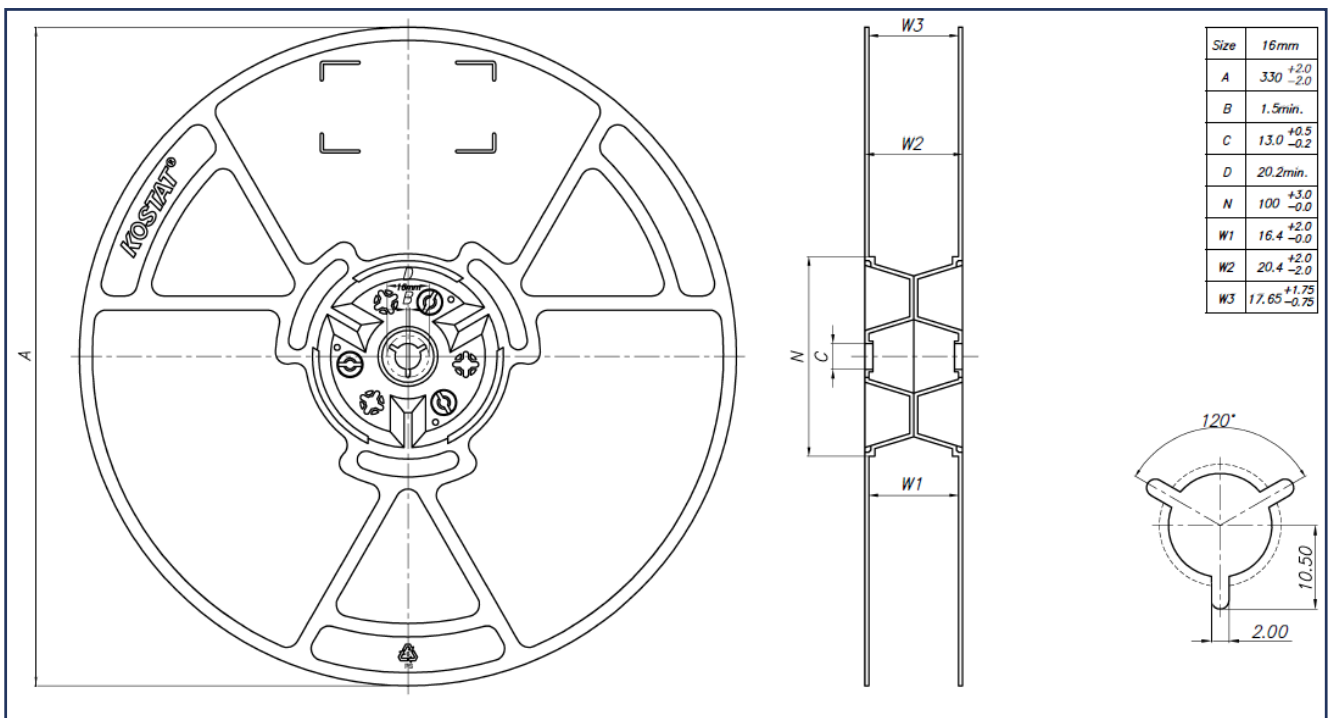
Dim	Min	Nom	Max	Unit
A	1.15	1.20	1.25	mm
A1	0.00		0.05	mm
A3	0.203 REF			mm
b	0.25	0.30	0.35	mm
D	6.00BSC			mm
E	8.00 BSC			mm
D2	2.20	2.30	2.40	mm
E2	2.75	2.85	2.95	mm
D3	4.20	4.30	4.40	mm

Dim	Min	Nom	Max	Unit
E3	2.30	2.40	2.50	mm
e	0.80 BSC			mm
L	0.25	0.30	0.35	mm
L1	0.70	0.75	0.80	mm
aaa	0.10			mm
bbb	0.10			mm
ccc	0.10			mm
ddd	0.05			mm
eee	0.08			mm

Tray dimensions (in mm)



Tape and Reel Dimensions (in mm)



## Ordering Information

Ordering code	Package type	Packing method	Qty	Tray Qty	Box tray
WI62120AT	6 x 8 mm PDFN	Tray	1500	12 x 25 parts	5
WI62120ATR	6 x 8 mm PDFN	Tape and Reel	5000	N/A	N/A

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