

P-Channel CICLON NexFET™ Power MOSFETs CSD23201W10

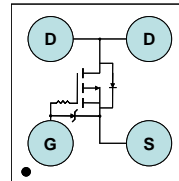


Features

- Ultra Low Qg & Qgd
- Small Footprint
- Low Profile 0.65mm height
- Pb Free
- Gate ESD Protection – 3kV
- RoHS Compliant
- Halogen Free



CSP 1.0 x 1.0 mm Wafer
Level Package



Top

Product Summary

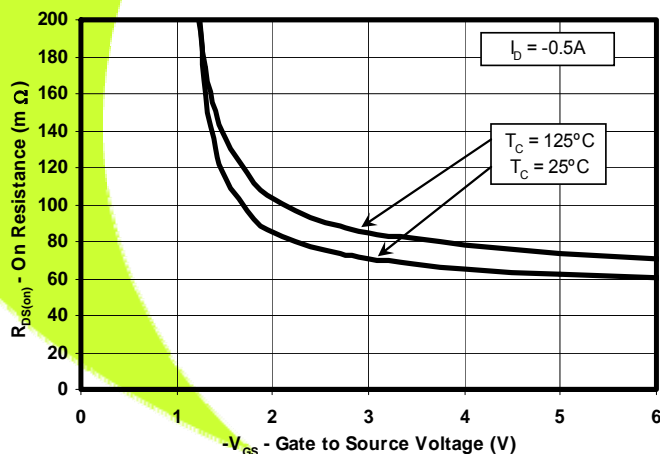
V_{DS}	-12	V
Q_g	1.8	nC
Q_{gd}	0.4	nC
$R_{DS(on)}$	$V_{GS} = -1.5V$	110 mΩ
	$V_{GS} = -2.5V$	77 mΩ
	$V_{GS} = -4.5V$	66 mΩ
V_{th}	-0.6	V

Maximum Values ($T_A = 25^\circ C$ unless otherwise stated)

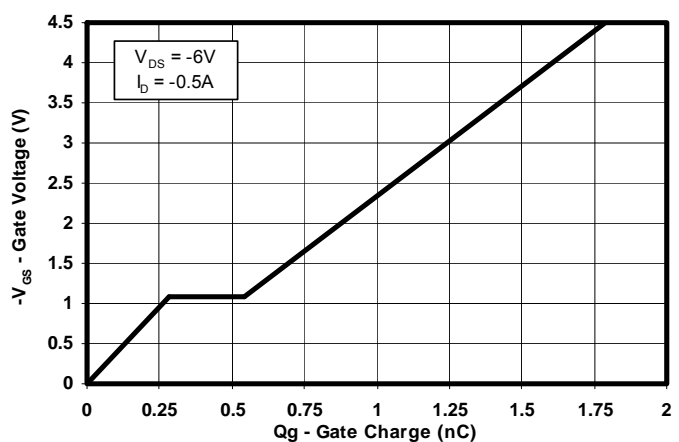
Symbol	Parameter	Value	Units
V_{DS}	Drain to Source Voltage	-12	V
V_{GS}	Gate to Source Voltage	-5	V
I_D	Continuous Drain Current, $T_A = 25^\circ C^1$	-1.1	A
I_{DM}	Pulsed Drain Current, $T_A = 25^\circ C^{1,2}$	-4.4	A
P_D	Power Dissipation ¹	1.0	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ C$

1. $R_{thJA} = 100^\circ C/W$ on 1 in² Cu (2 oz.) on 0.060" thick FR4 PCB
2. Pulse width $\leq 300 \mu s$, duty cycle $\leq 2\%$

$R_{DS(ON)}$ vs. V_{GS}



Gate Charge



Ordering Information

Type	Package	Package Media	Qty	Ship
CSD23201W10	1.0 X 1.0 Wafer Level Package	7 inch reel	3000	Tape and Reel

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CSD23201W10



Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise stated)

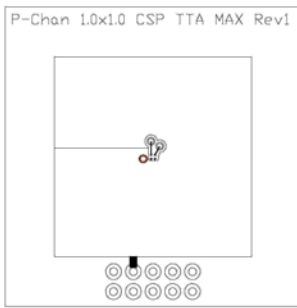
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
BV_{DSS}	Drain to Source Voltage	$V_{GS} = 0V, I_D = -250\mu A$	-12	—	—	V
I_{DSS}	Drain to Source Leakage Current	$V_{GS} = 0V, V_{DS} = -9.6V$	—	—	-1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{DS} = 0V, V_{GS} = -5V$	—	—	-100	nA
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	-0.4	-0.6	-1.0	V
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = -1.5V, I_D = -0.5A$	—	110	138	m Ω
		$V_{GS} = -2.5V, I_D = -0.5A$	—	77	96	m Ω
		$V_{GS} = -4.5V, I_D = -0.5A$	—	66	82	m Ω
g_{fs}	Transconductance	$V_{DS} = -6.0V, I_D = -0.5A$	—	9.0	—	S
Dynamic Characteristics						
C_{ISS}	Input Capacitance	$V_{GS} = 0V, V_{DS} = -6.0V$ $f = 1MHz$	—	250	325	pF
C_{OSS}	Output Capacitance		—	125	155	pF
C_{RSS}	Reverse Transfer Capacitance		—	32	42	pF
Q_g	Gate Charge Total (-4.5V)	$V_{DS} = -6.0V, I_D = -0.5A$	—	1.8	2.4	nC
Q_{gd}	Gate Charge Gate to Drain		—	0.26	—	nC
Q_{gs}	Gate Charge Gate to Source		—	0.28	—	nC
$Q_{g(th)}$	Gate Charge at V_{th}		—	0.11	—	nC
Q_{OSS}	Output Charge	$V_{DS} = -6.0V, V_{GS} = 0V$	—	1.7	—	nC
$t_{d(on)}$	Turn On Delay Time	$V_{DS} = -6.0V$ $V_{GS} = -2.5V, I_D = -0.5A$ $R_G = 20\Omega$	—	24	—	ns
t_r	Rise Time		—	19	—	ns
$t_{d(off)}$	Turn Off Delay Time		—	68	—	ns
t_f	Fall Time		—	29	—	ns
Diode Characteristics						
V_{SD}	Diode Forward Voltage	$I_S = -0.5A, V_{GS} = 0V$	—	-0.77	-1.0	V
Q_{rr}	Reverse Recovery Charge	$V_{dd} = -4.0V, I_F = -0.5A,$ $di/dt = 100A/\mu s$	—	2.0	—	nC
t_{rr}	Reverse Recovery Time	$V_{dd} = -4.0V, I_F = -0.5A,$ $di/dt = 100A/\mu s$	—	9.5	—	ns

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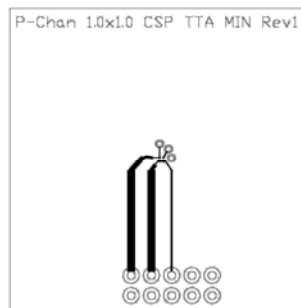


Thermal Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise stated)

Symbol	Parameter	Min	Typ	Max	Units
Thermal Characteristics					
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (Minimum Cu area)	—	—	245	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (1 in ² Cu area)	—	—	125	$^\circ\text{C/W}$



Max $R_{\theta JA} = 125^\circ\text{C/W}$
when mounted on 1in² of
2 oz. Cu.



Max $R_{\theta JA} = 245^\circ\text{C/W}$ when
mounted on min pad area of
2 oz. Cu.

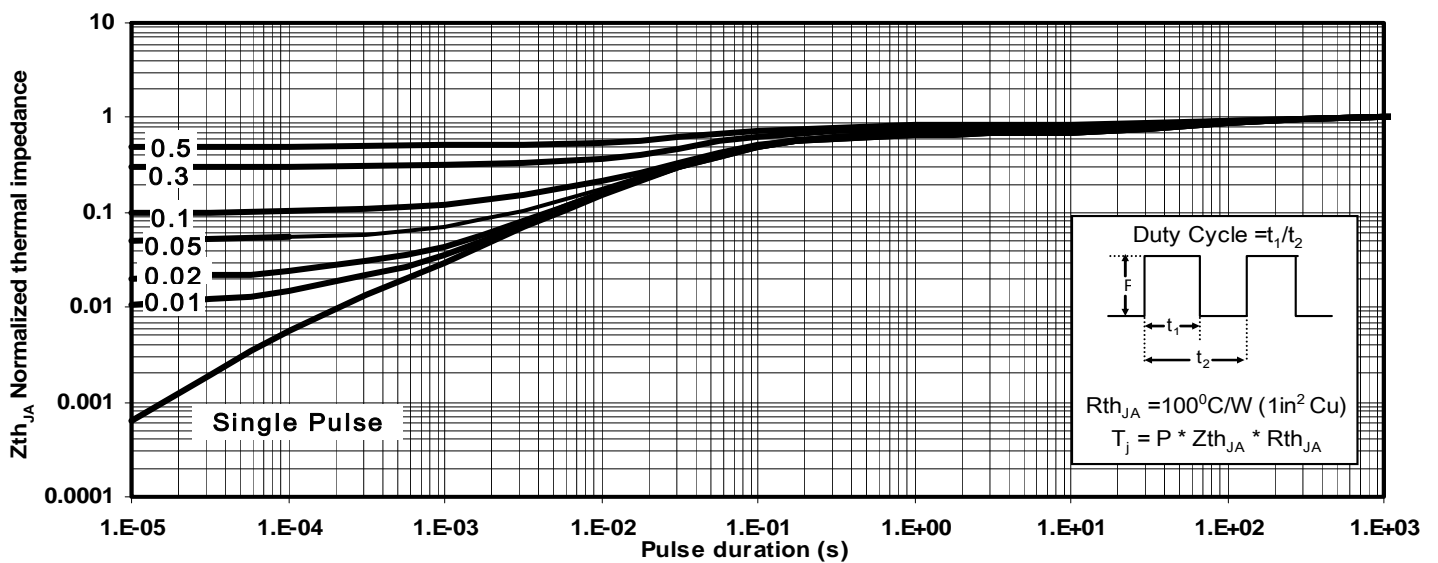


Figure 1: Transient Thermal Impedance

P-Channel
CICLON NexFET™ Power MOSFETs
CSD23201W10



Typical MOSFET Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise stated)

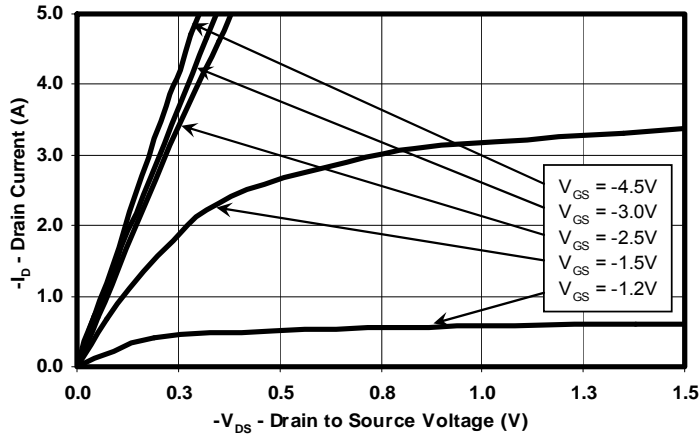


Figure 2: Saturation Characteristics

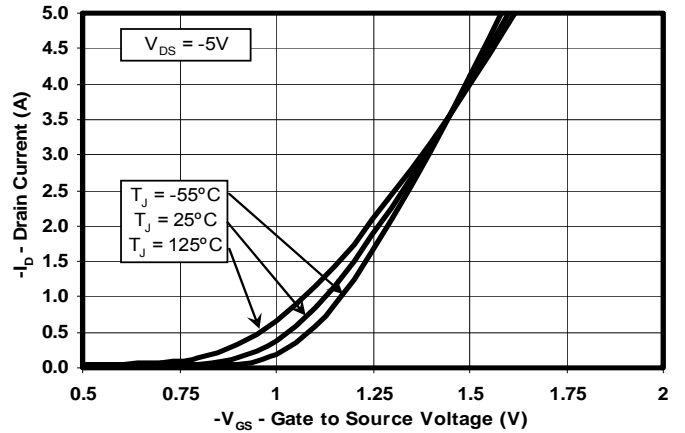


Figure 3: Transfer Characteristics

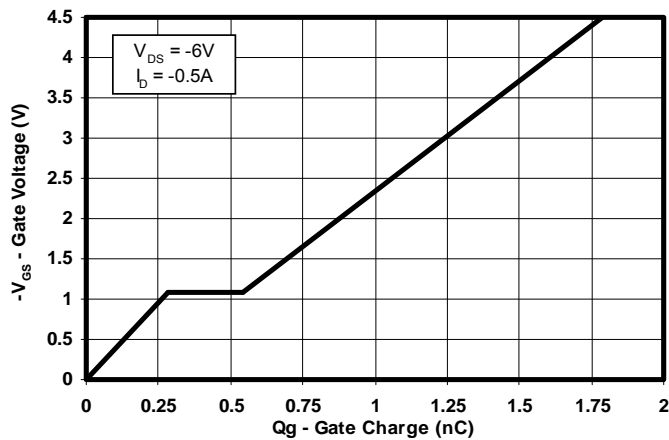


Figure 4: Gate Charge

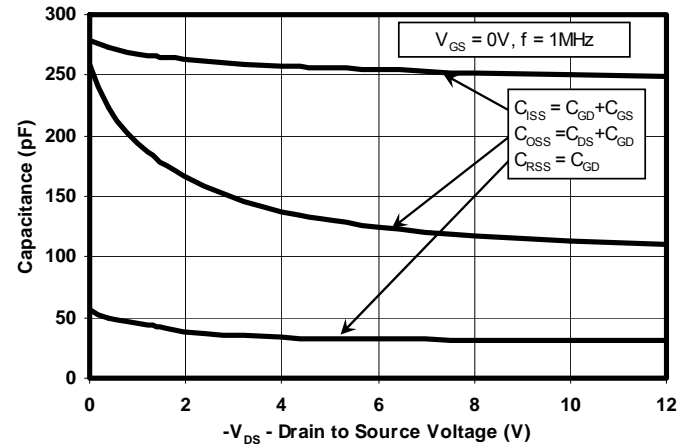


Figure 5: Capacitance

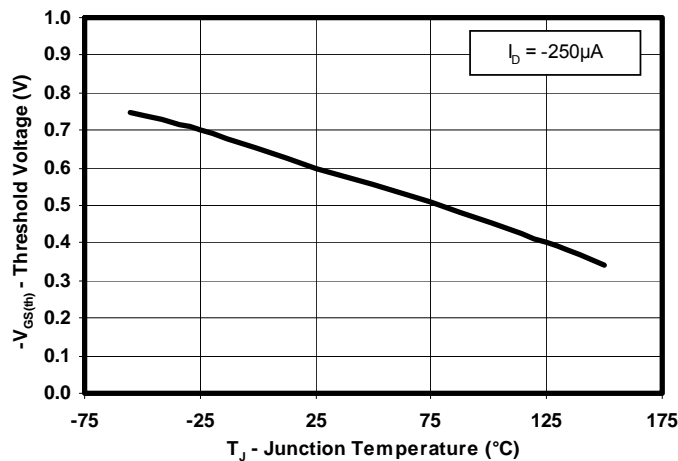


Figure 6: Threshold Voltage vs. Temperature

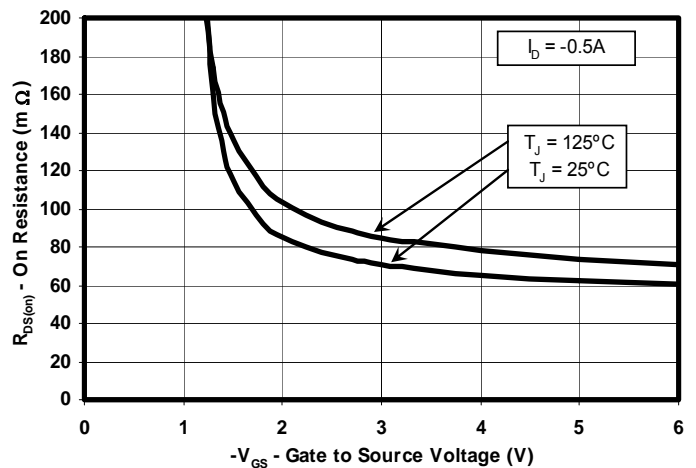


Figure 7: On Resistance vs. Gate Voltage

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Typical MOSFET Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise stated)

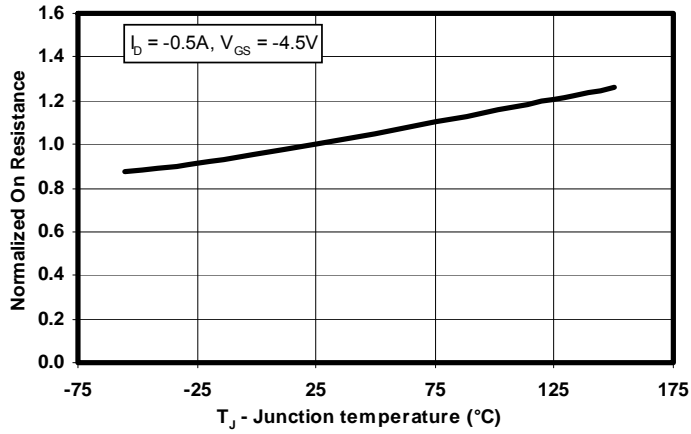


Figure 8: On Resistance vs. Temperature

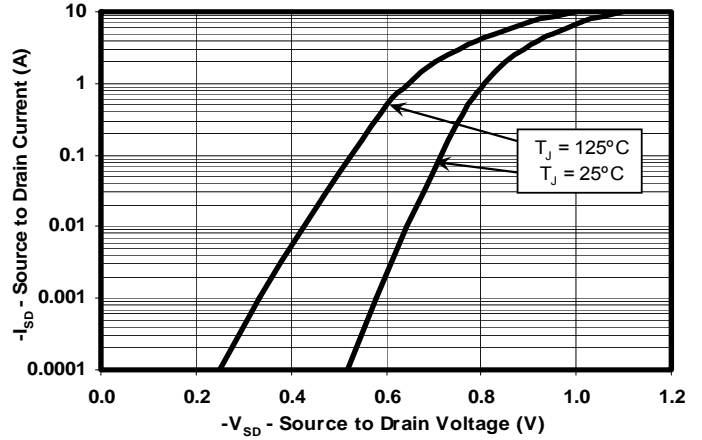


Figure 9: Typical Diode Forward Voltage

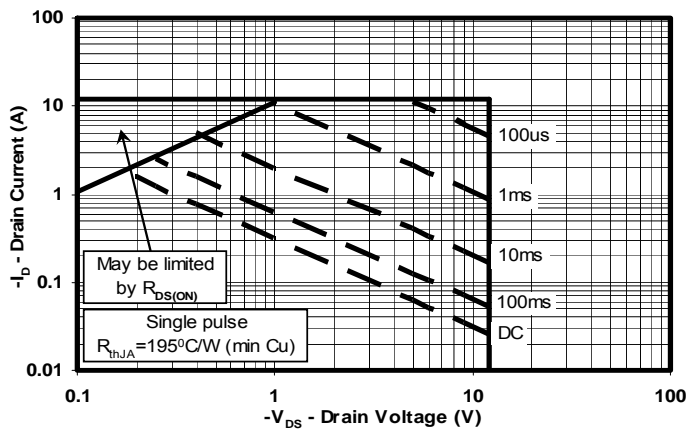


Figure 10: Maximum Safe Operating Area

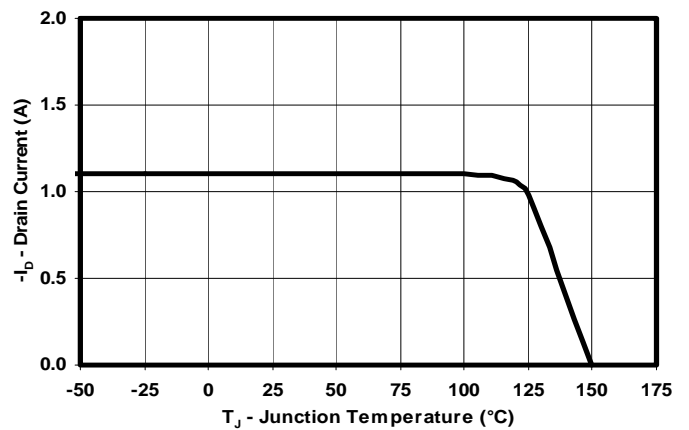
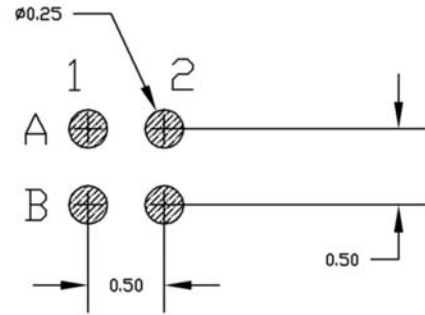
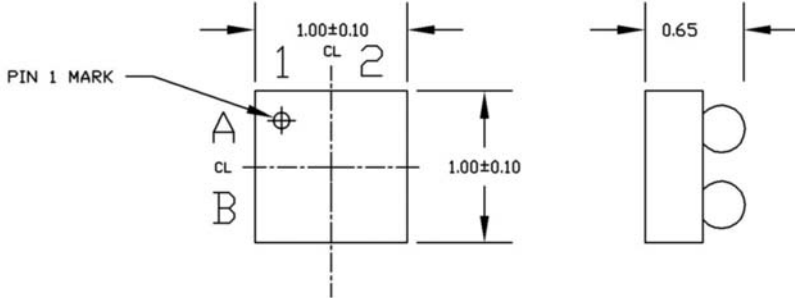


Figure 11: Maximum Drain Current vs. Temperature

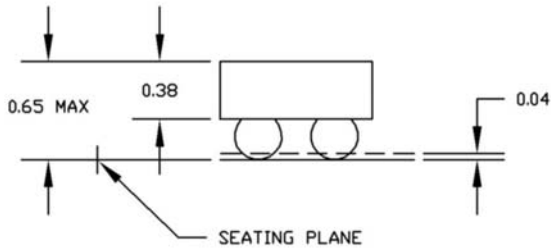
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CICLON NexFET™ Power MOSFETs
CSD23201W10



CSD23201W10 Package Dimensions



LAND PATTERN RECOMMENDATION

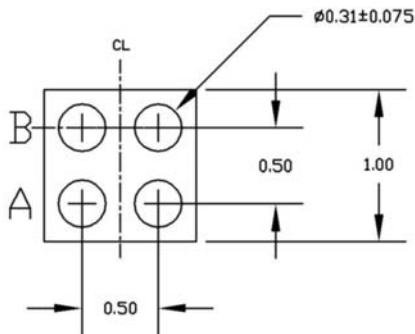


SOLDER BALL

NOTES: UNLESS OTHERWISE SPECIFIED

- A) ALL DIMENSIONS ARE IN MILLIMETERS
- B) TERMINAL CONFIGURATION TABLE.

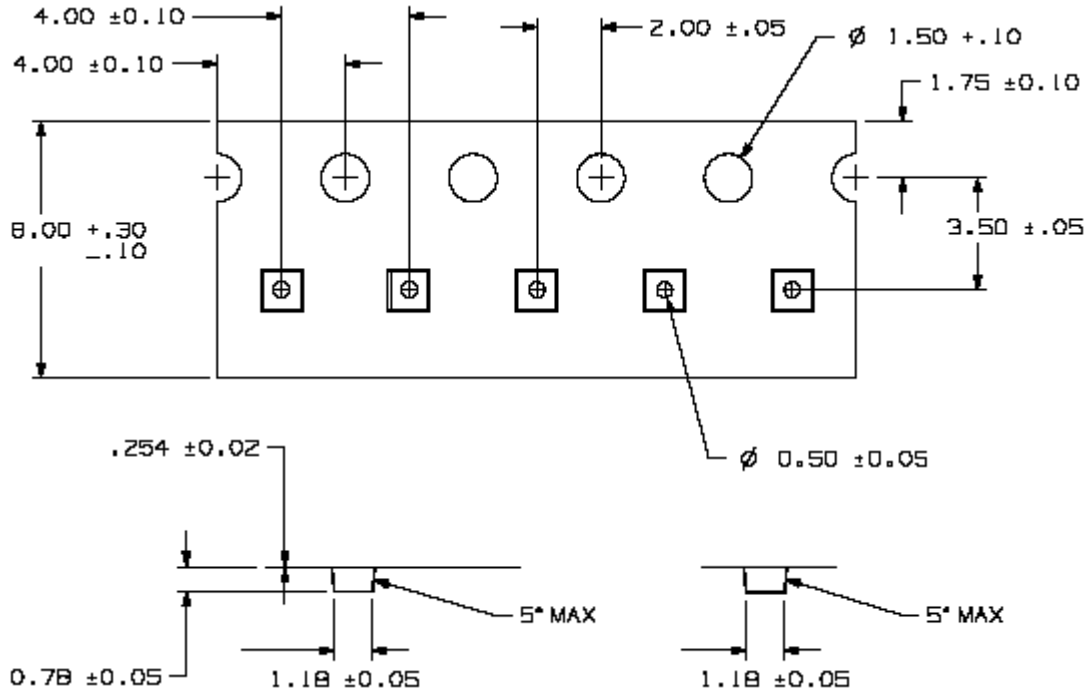
POSITION	DESIGNATION
A2, B2	DRAIN
A1	GATE
B1	SOURCE



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CSD23201W10



Tape and Reel Information



Package Marking Information

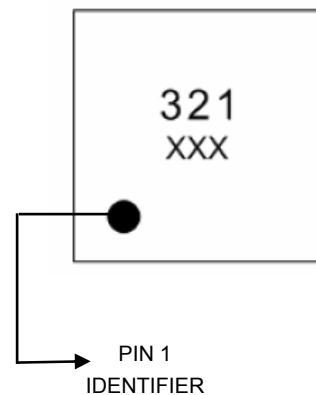
Location:

1st Line

Product Code = 321 (Fixed Text)

2nd Line

XXX = Last 3 digits of wafer lot number



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PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
CSD23201W10	ACTIVE	DSBGA	YZB	4	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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