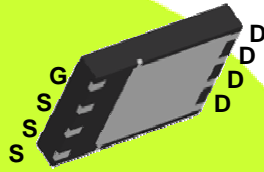


N-Channel CICLON NexFET™ Power MOSFETs CSD16401Q5

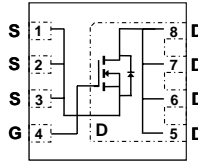


Features

- Ultra Low Qg & Qgd
- Low Thermal Resistance
- Avalanche Rated
- Pb Free Terminal Plating
- RoHS Compliant
- Halogen Free



QFN 5mm x 6mm Plastic Package



Top View

Product Summary

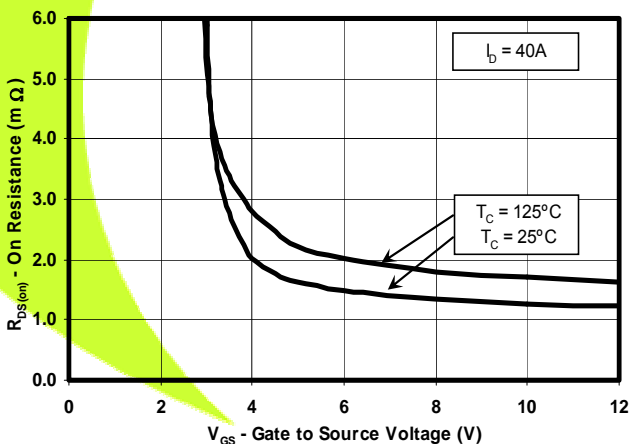
V_{DS}	25	V
Q_g	21	nC
Q_{gd}	5.2	nC
$R_{DS(on)}$	$V_{GS}=4.5V$	1.8 m Ω
	$V_{GS}=10V$	1.3 m Ω
V_{th}	1.5	V

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

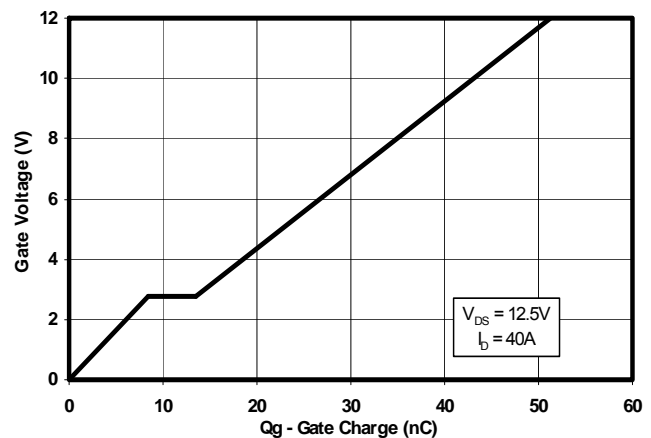
Symbol	Parameter	Value	Units
V_{DS}	Drain to Source Voltage	25	V
V_{GS}	Gate to Source Voltage	+16 / -12	V
I_D	Continuous Drain Current, $T_C = 25^\circ C$	100	A
	Continuous Drain Current ¹	38	A
I_{DM}	Pulsed Drain Current, $T_A = 25^\circ C^2$	240	A
P_D	Power Dissipation ¹	3.1	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ C$
E_{AS}	Avalanche Energy, single pulse $I_D=100A, L = 0.1mH, R_G = 25\Omega$	500	mJ

1. $R_{\theta JA} = 40^\circ C/W$ on 1in² 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
CSD16401Q5	QFN 5X6 Plastic Package	13 inch reel	2500	Tape and Reel

N-Channel
CICLON NexFET™ Power MOSFETs
CSD16401Q5



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	$V_{GS} = 0V, I_D = 250\mu A$	25	—	—	V
I_{DSS}	Drain to Source Leakage Current	$V_{GS} = 0V, V_{DS} = 20V$	—	—	1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{DS} = 0V, V_{GS} = +16/-12V$	—	—	100	nA
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.2	1.5	1.9	V
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 4.5V, I_D = 40A$	—	1.8	2.3	$m\Omega$
		$V_{GS} = 10V, I_D = 40A$	—	1.3	1.6	$m\Omega$
g_{fs}	Transconductance	$V_{DS} = 15V, I_D = 40A$	—	168	—	S
Dynamic Characteristics						
C_{ISS}	Input Capacitance	$V_{GS} = 0V, V_{DS} = 12.5V$ $f = 1MHz$	—	3150	4100	pF
C_{OSS}	Output Capacitance		—	2530	3300	pF
C_{RSS}	Reverse Transfer Capacitance		—	175	230	pF
R_g	Series Gate Resistance		—	1.1	—	Ω
Q_g	Gate Charge Total (4.5V)	$V_{DS} = 12.5V, I_D = 40A$	—	21	29	nC
Q_{gd}	Gate Charge Gate to Drain		—	5.2	—	nC
Q_{gs}	Gate Charge Gate to Source		—	8.3	—	nC
$Q_{g(th)}$	Gate Charge at V_{th}		—	4.8	—	nC
Q_{OSS}	Output Charge	$V_{DS} = 15V, V_{GS} = 0V$	—	55	—	nC
$t_{d(on)}$	Turn On Delay Time	$V_{DS} = 12.5V$ $V_{GS} = 4.5V, I_D = 40A$ $R_G = 2\Omega$	—	23	—	ns
t_r	Rise Time		—	40	—	ns
$t_{d(off)}$	Turn Off Delay Time		—	28	—	ns
t_f	Fall Time		—	24	—	ns
Diode Characteristics						
V_{SD}	Diode Forward Voltage	$I_S = 40A, V_{GS} = 0V$	—	0.85	1.0	V
Q_{rr}	Reverse Recovery Charge	$V_{dd} = 15V, I_F = 40A,$ $di/dt = 300A/\mu s$	—	72	—	nC
t_{rr}	Reverse Recovery Time	$V_{dd} = 15V, I_F = 40A,$ $di/dt = 300A/\mu s$	—	45	—	ns

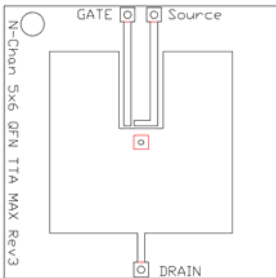
N-Channel CICLON NexFET™ Power MOSFETs CSD16401Q5



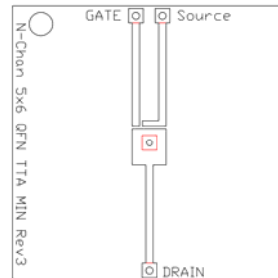
Thermal Characteristics (T_A = 25°C unless otherwise stated)

Symbol	Parameter	Min	Typ	Max	Units
Thermal Characteristics					
R _{θJC}	Thermal Resistance Junction to Case ³	—	—	1.1	°C/W
R _{θJA}	Thermal Resistance Junction to Ambient ^{3,4}	—	—	50	°C/W

- R_{θJC} is determined with the device mounted on a 1in square 2 oz. Cu pad on a 1.5x1.5 in .060in thick FR4 board. R_{θJC} is guaranteed by design while R_{θca} is determined by the user's board design.
- Device mounted on FR4 Material with 1in² of 2 oz. Cu.



Max R_{θJA} = 50 °C/W when mounted on 1in² of 2 oz. Cu.



Max R_{θJA} = 121 °C/W when mounted on min pad area of 2 oz. Cu.

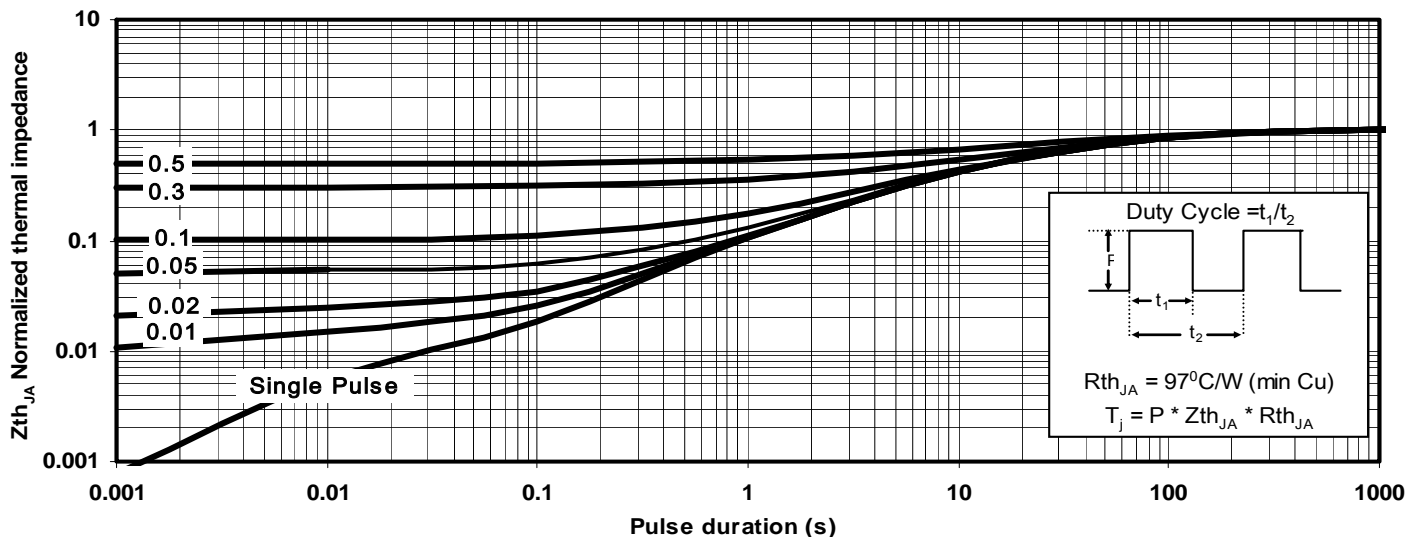


Figure 1: Transient Thermal Impedance

N-Channel CICLON NexFET™ Power MOSFETs CSD16401Q5



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

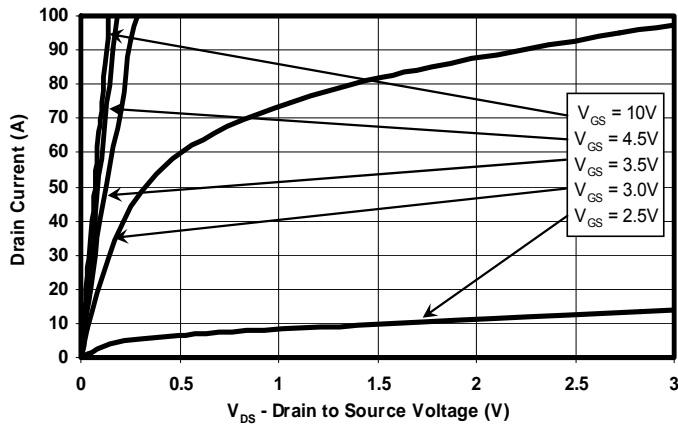


Figure 2: Saturation Characteristics

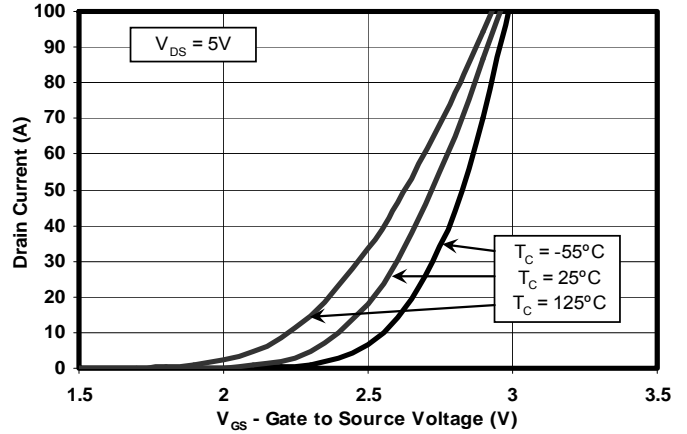


Figure 3: Transfer Characteristics

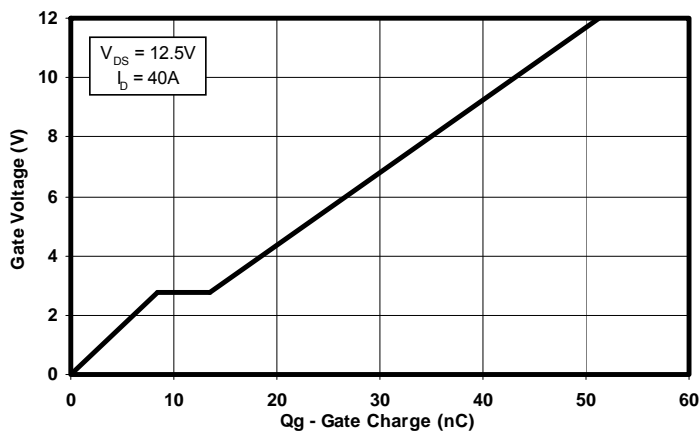


Figure 4: Gate Charge

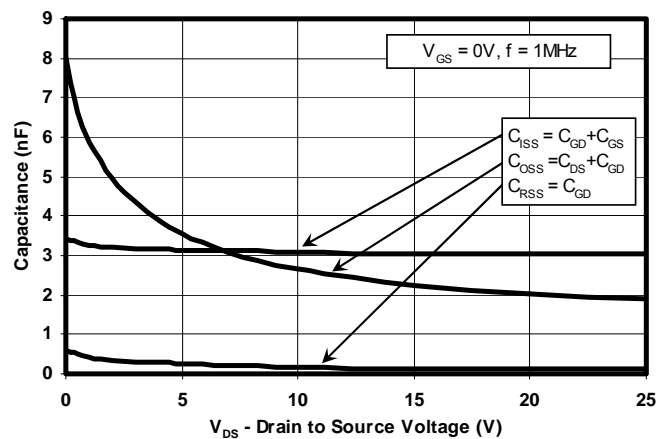


Figure 5: Capacitance

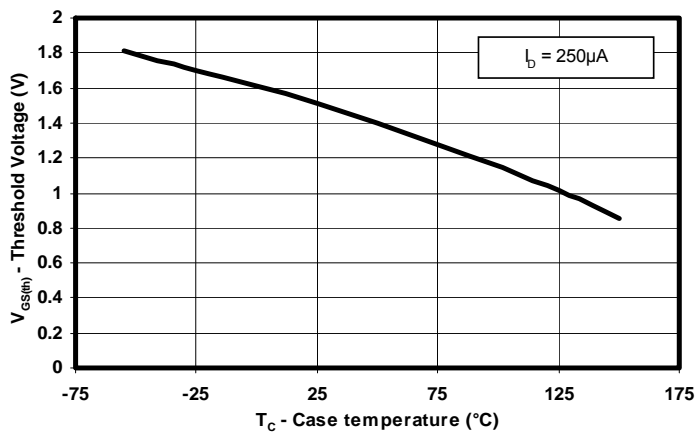


Figure 6: Threshold Voltage vs. Temperature

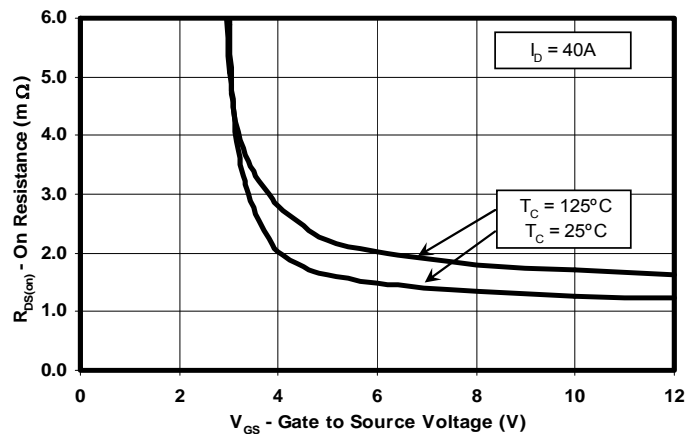


Figure 7: On Resistance vs. Gate Voltage

N-Channel CICLON NexFET™ Power MOSFETs CSD16401Q5



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

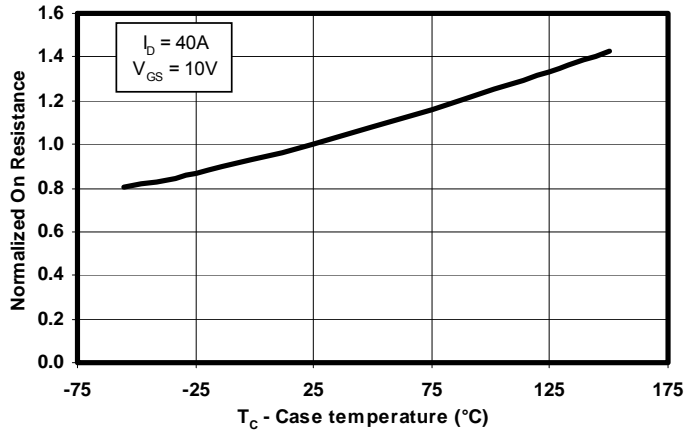


Figure 8: On Resistance vs. Temperature

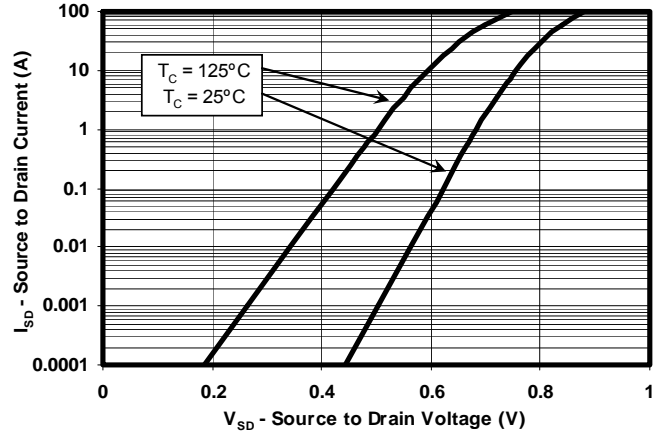


Figure 9: Typical Diode Forward Voltage

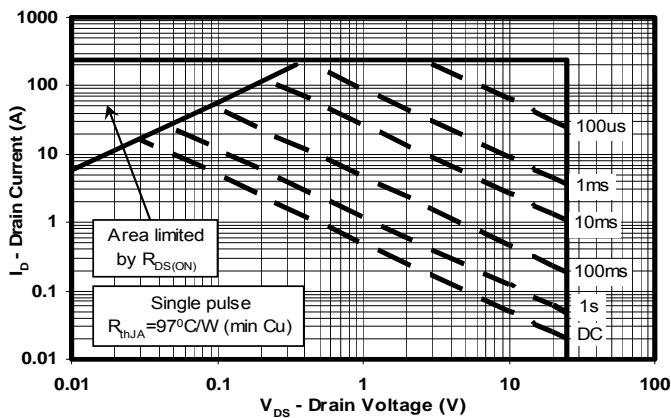


Figure 10: Maximum Safe Operating Area

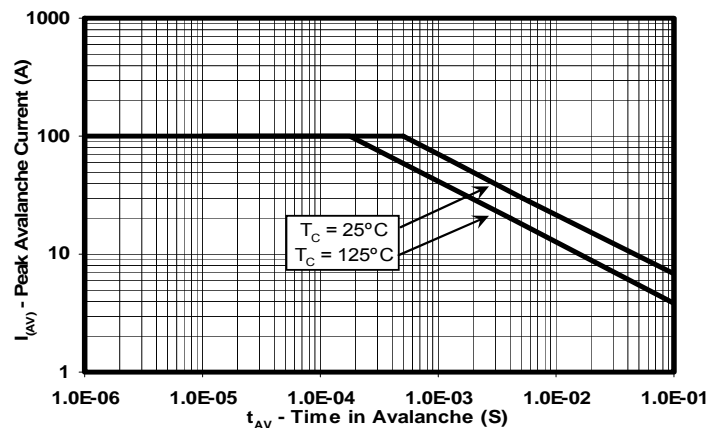


Figure 11: Single Pulse Unclamped Inductive Switching

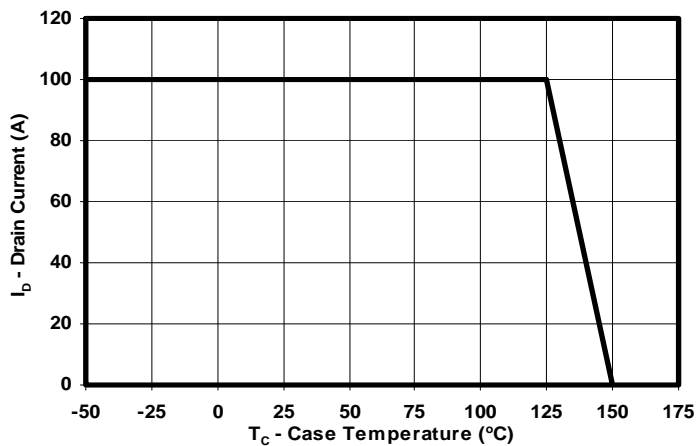
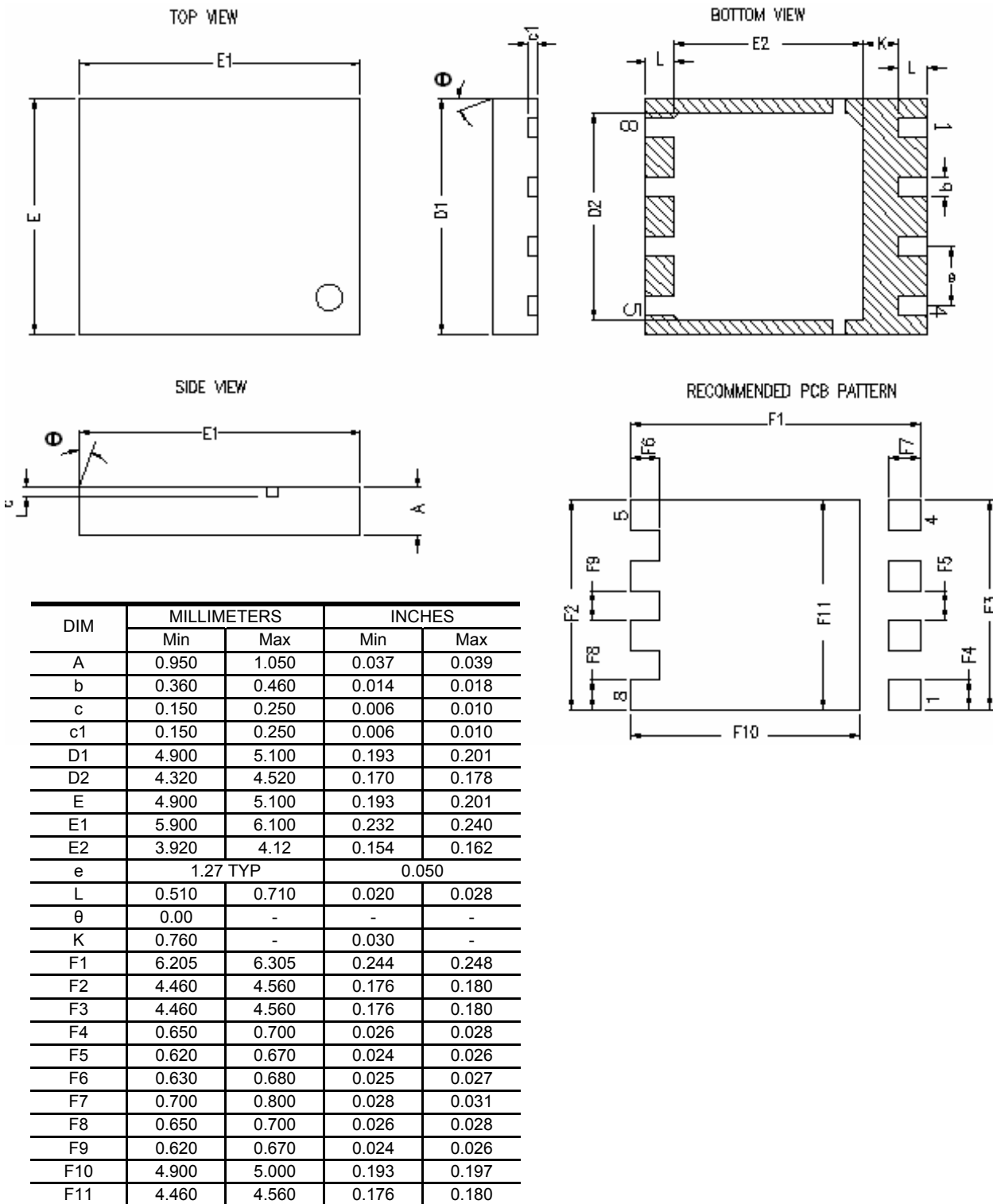


Figure 12: Maximum Drain Current vs. Temperature

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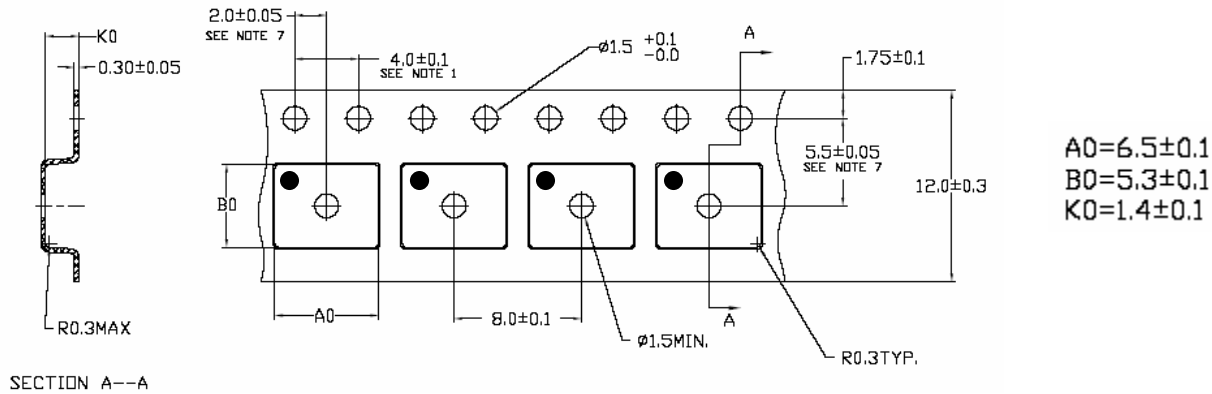
CSD16401Q5 Package Dimensions



N-Channel CICLON NexFET™ Power MOSFETs CSD16401Q5



Q5 Tape and Reel Information



Note:

1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE +/-0.2
2. CAMBER NOT TO EXCEED 1mm IN 100mm, NONCUMULATIVE OVER 250mm
3. MATERIAL:BLACK STATIC DISSIPATIVE POLYSTYRENE
4. ALL DIMENSIONS ARE IN mm (UNLESS OTHERWISE SPECIFIED)
5. THICKNESS: 0.30 +/-0.05mm

Package Marking Information

Location:

1st Line

CSD = Fixed Characters

NNNNN = Product Code

2nd Line (Date Code)

YY = Last 2 digits of the Year

WW = 2-digit Work Week

C = Country of Origin

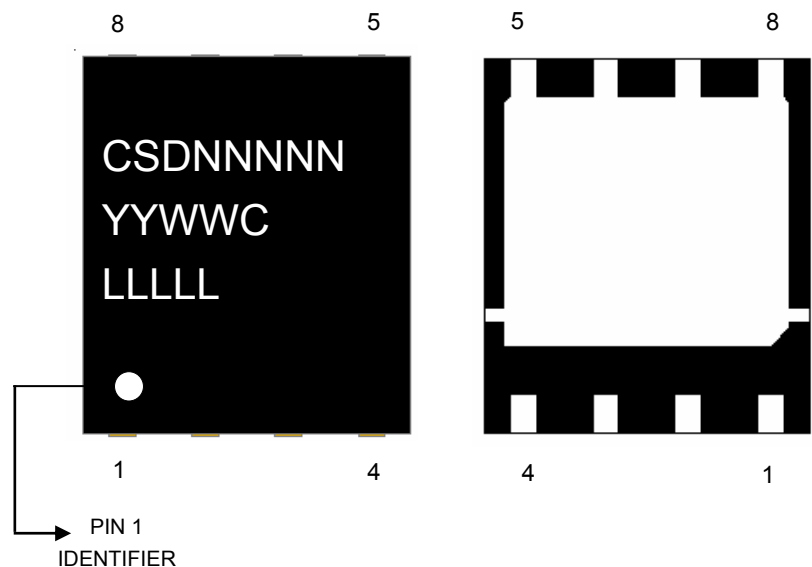
> Philippines = P

> Taiwan = T

> China = C

3rd Line

LLLLL= Last 5 digits of the Wafer Lot #



N-Channel
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CSD16401Q5



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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⁾
CSD16401Q5	ACTIVE	SON	DQH	8	2500	Green (RoHS & no Sb/Br)	CU SN	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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