



CTL0412ND

N-Channel Enhancement MOSFET

Features

- Drain-Source Breakdown Voltage V_{DS} 20 V
- Drain-Source On-Resistance
 $R_{DS(ON)}$ 22m Ω , at V_{GS} = 4.5V, I_D = 4.1A
 $R_{DS(ON)}$ 27m Ω , at V_{GS} = 2.5V, I_D = 3.8A
- Continuous Drain Current at $T_C=25^\circ\text{C}$ I_D = 4.1A
- Advanced high cell density Trench Technology
- RoHS Compliance & Halogen Free

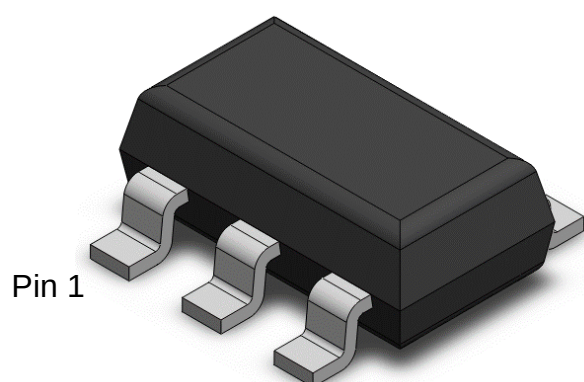
Applications

- Power Management
- Lithium Ion Battery

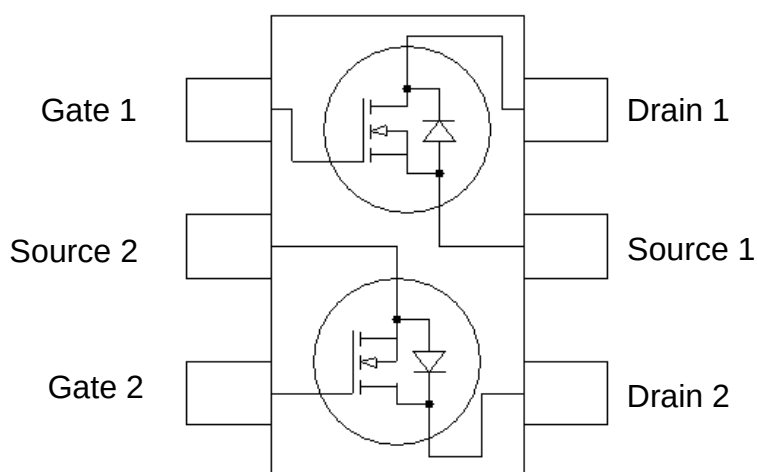
Description

The CTL0412ND uses high performance Trench Technology to provide excellent $R_{DS(ON)}$ and low gate charge which is suitable for most of the synchronous buck converter applications.

Package Outline



Schematic



**CTL0412ND****N-Channel Enhancement MOSFET**

Absolute Maximum Rating at 25°C

Symbol	Parameters	Test Conditions	Min	Notes
V _{DS}	Drain-Source Voltage	20	V	
V _{GS}	Gate-Source Voltage	±8	V	
I _D	Continuous Drain Current	4.1	A	1
I _{DM}	Pulsed Drain Current	12	A	1
P _D	Total Power Dissipation	1.25	W	2
T _{STG}	Storage Temperature Range	-55 to 150	°C	
T _J	Operating Junction Temperature Range	-55 to 150	°C	

Thermal Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
R _{ΘJA}	Thermal Resistance Junction-Ambient		--	150	--	°C /W	1,4

**CTL0412ND****N-Channel Enhancement MOSFET****Electrical Characteristics** $T_A = 25^\circ\text{C}$ (unless otherwise specified)**Static Characteristics**

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
$B_{V_{DS}}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	20	-	-	V	
I_{DSS}	Drain-Source Leakage Current	$V_{DS} = 20V, V_{GS} = 0V$	-	-	1	μA	
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = \pm 8V, V_{DS} = 0V$	-	-	± 100	nA	

On Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
$R_{DS(ON)}$	Drain-Source On-Resistance	$V_{GS} = 4.5V, I_D = 4.1A$	-	22	47	m Ω	3
		$V_{GS} = 2.5V, I_D = 3.8A$	-	27	55	m Ω	
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu A$	0.4	---	1.0	V	3

Dynamic Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
C_{ISS}	Input Capacitance	$V_{GS} = 0V,$ $V_{DS} = 10V$ $f = 1MHz$	-	599	-	pF	
C_{OSS}	Output Capacitance		-	81	-		
C_{RSS}	Reverse Transfer Capacitance		-	73	-		

Switching Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
$T_{D(ON)}$	Turn-On Delay Time	$V_{DS} = 15V,$ $V_{GS} = 4.5V,$ $R_G = 6\Omega,$ $I_D = 1A$	-	3.5	-	ns	
T_R	Rise Time		-	23	-		
$T_{D(OFF)}$	Turn-Off Delay Time		-	39	-		
T_F	Fall Time		-	24	-		
Q_G	Total Gate Charge	$V_{DS} = 10V,$ $V_{GS} = 4.5V,$ $I_D = 1A$	-	7.5	-	nC	
Q_{GS}	Gate-Source Charge		-	1	-		
Q_{GD}	Gate-Drain (Miller) Charge		-	2	-		



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Drain-Source Diode Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0V, I_D = 4.1$	-	-	1.2	V	
I_{SD}	Body Diode Continuous Current		-	-	4.1	A	1

Note:

1. The power dissipation is limited by 150°C junction temperature.
2. Device mounted on a glass-epoxy board
FR-4
25.4 × 25.4 mm
2 Oz Copper
3. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
4. Thermal Resistance follow JESD51-3.



Typical Characteristic Curves

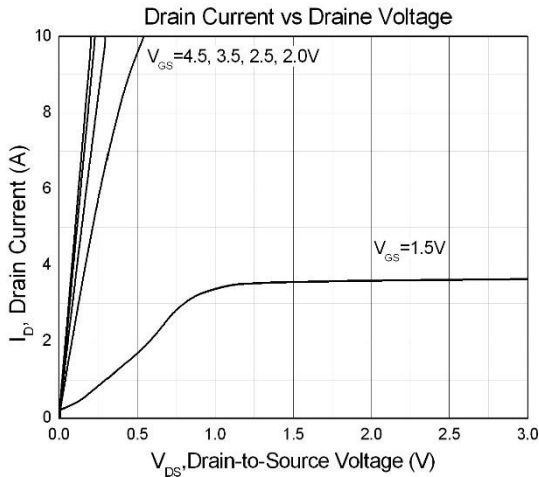


Figure 1

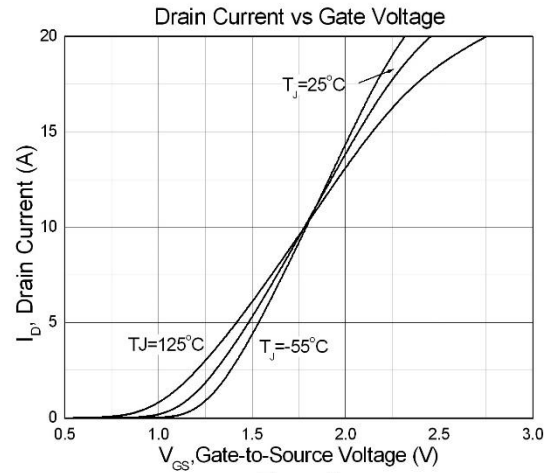


Figure 2

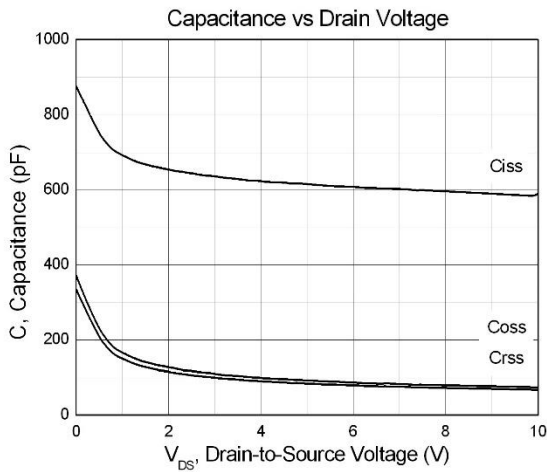


Figure 3

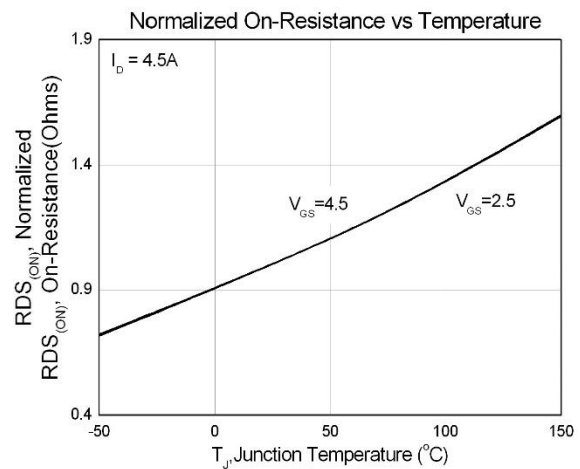


Figure 4

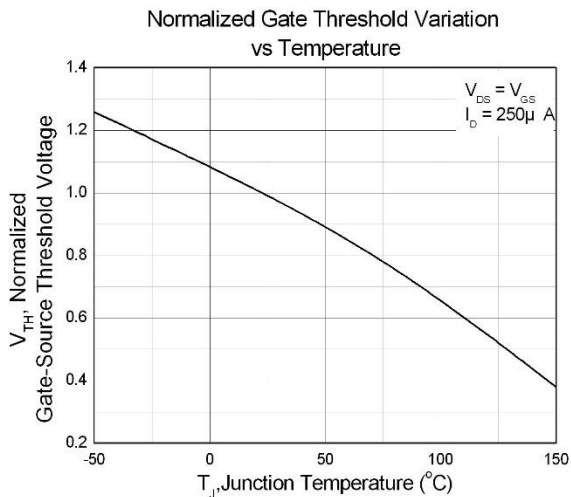


Figure 5

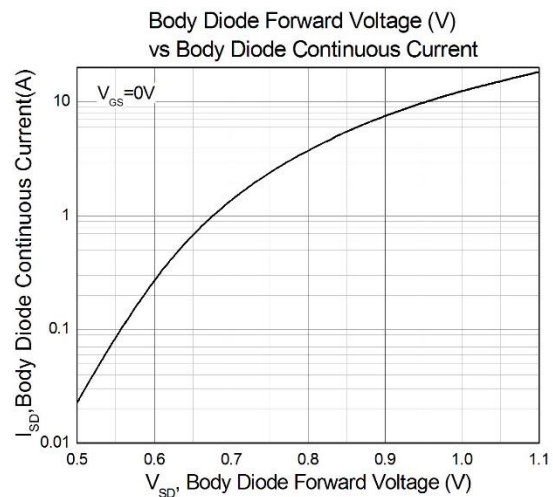
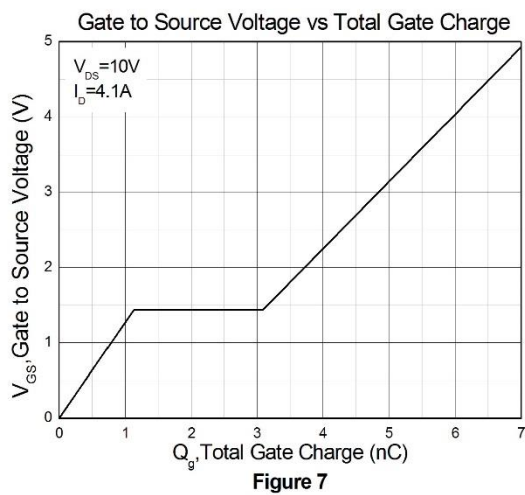
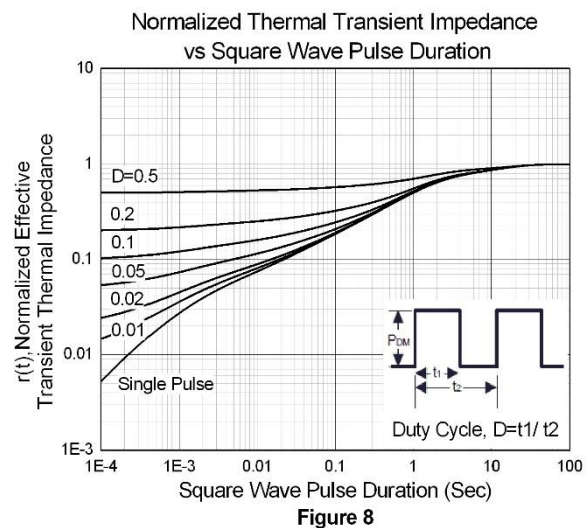


Figure 6





Test Circuits & Waveforms

Figure 9: Gate Charge Test Circuit

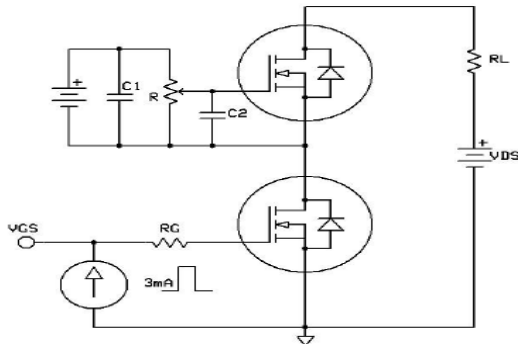


Figure 10: Gate Charge Waveform

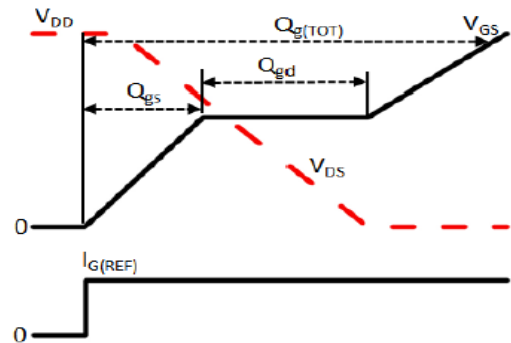


Figure 11: Switching Time Test Circuit

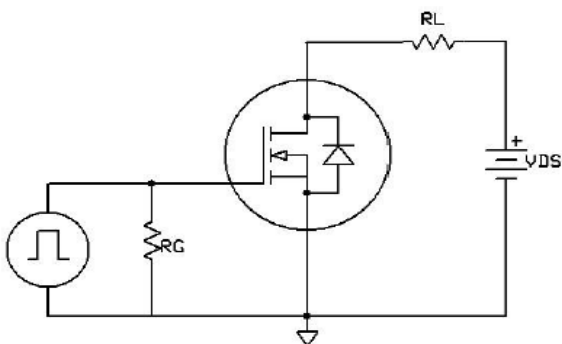
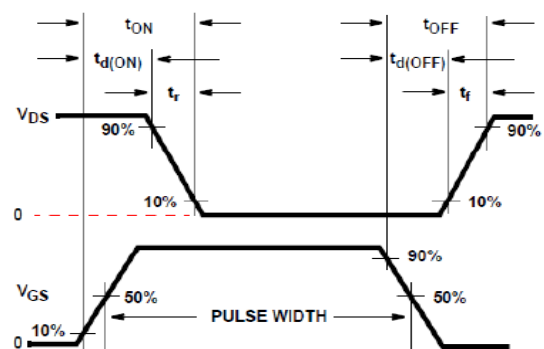


Figure 12: Switching Time Waveform

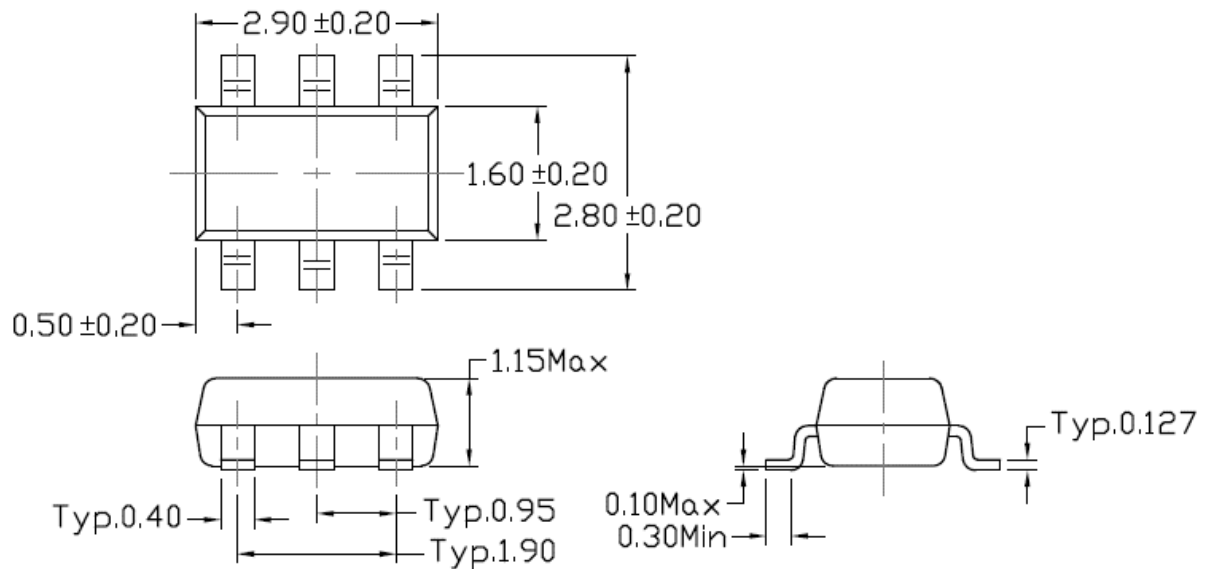




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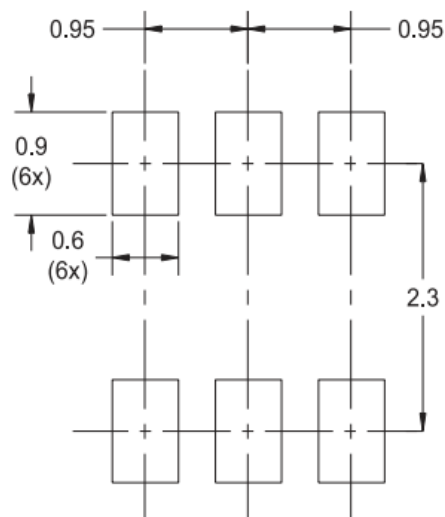
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Package Dimension *Dimensions in mm unless otherwise stated*



Note: Dimensions in mm

Recommended pad layout for surface mount leadform



Note: Dimensions in mm



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Marking Information



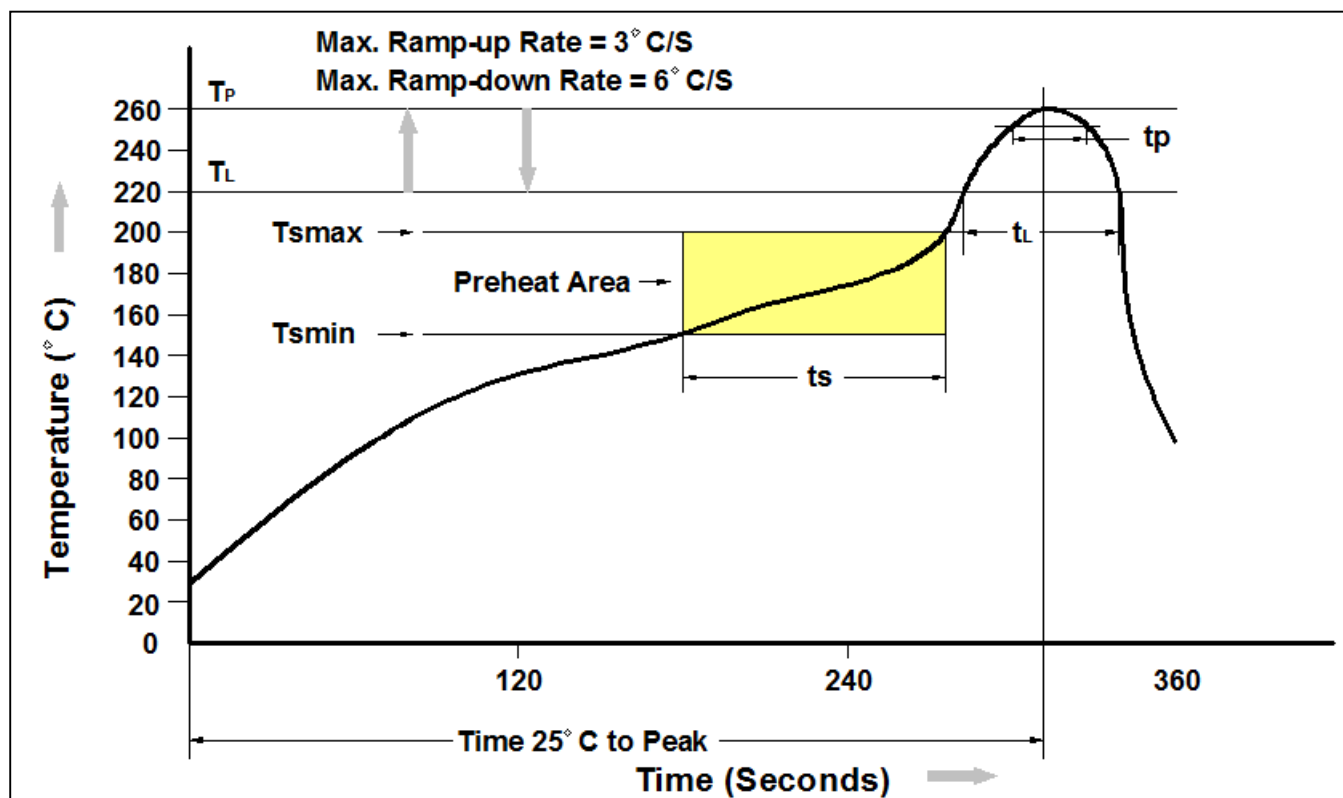
0412: Device Number

Ordering Information

Part Number	Description	Quantity
CTL0412ND	SOT-26 Reel	3000 pcs



Reflow Profile



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (ts) from (Tsmin to Tsmax)	60-120 seconds
Ramp-up Rate (tL to tP)	3°C/second max.
Liquidous Temperature (TL)	217°C
Time (tL) Maintained Above (TL)	60 – 150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (tP) within 5°C of 260°C	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.



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