CTL0502NS

N-Channel Enhancement MOSFET

Features

- Drain-Source Breakdown Voltage V_{DSS} 20 V
- Drain-Source On-Resistance
  $R_{DS(ON)}$ 21mΩ, at V_{GS}= 4.5V, I_D= 5.0A
  $R_{DS(ON)}$ 24mΩ, at V_{GS}= 2.5V, I_D= 3.5A
  $R_{DS(ON)}$ 31mΩ, at V_{GS}= 1.8V, I_D= 2.8A
- Continuous Drain Current at T_C=25˚C I_D = 5.0A
- Advanced high cell density Trench Technology
- RoHS Compliance & Halogen Free

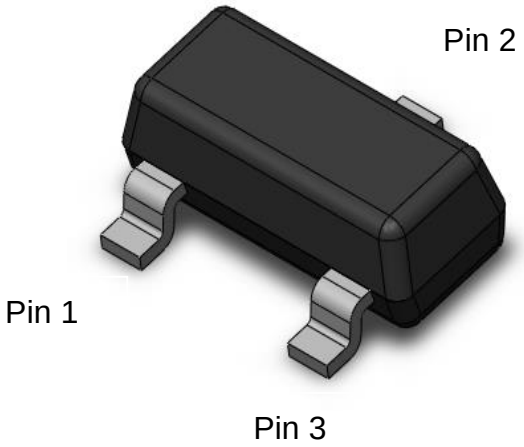
Description

The CTL0502NS 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.

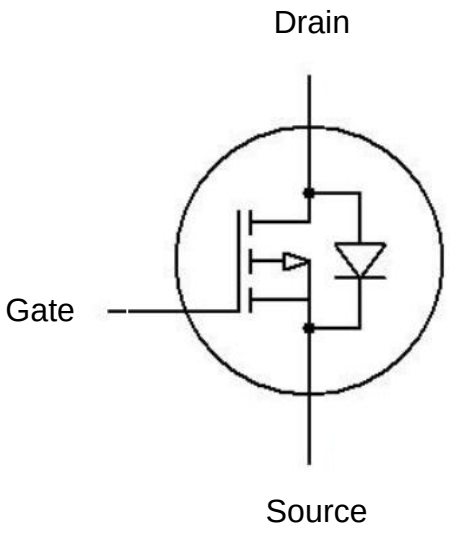
Applications

- Power Management
- Lithium Ion Battery

Package Outline



Schematic



Gate: ***Pin 1***
Drain: ***Pin 2***
Source: ***Pin 3***

Absolute Maximum Rating at 25°C

Symbol	Parameters	Test Conditions	Min	Notes
V_{DS}	Drain-Source Voltage	20	V	
V_{GS}	Gate-Source Voltage	±12	V	
I_D	Continuous Drain Current	5.0	A	1
I_{DM}	Pulsed Drain Current	25	A	1
P_D	Total Power Dissipation	1.4	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
$R_{\Theta JA4}$	Thermal Resistance Junction-Ambient (t=10s)		--	175	--	°C /W	1,4

Electrical Characteristics T_A = 25°C (unless otherwise specified)

Static Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
B_{VDSS}	Drain-Source Breakdown Voltage	V_{GS}= 0V, I_D= 250μA	20	-	-	V	
I_{DSS}	Drain-Source Leakage Current	V_{DS} = 20V, V_{GS} = 0V	-	-	1	μ A	
I_{GSS}	Gate-Source Leakage Current	V_{GS} = ±12V, 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 = 3.0A	-	21	31	mΩ	3
		V_{GS} = 2.5V, I_D = 2.6A	-	24	37	mΩ	
		V_{GS} = 1.8V, I_D = 1.0A	-	31	47	mΩ	
$V_{GS(th)}$	Gate-Source Threshold Voltage	V_{GS} = V_{DS}, I I_D =250μA	0.7	---	1.4	V	3

Dynamic Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
C_{ISS}	Input Capacitance	V_{GS} =0V,	-	668	-	pF	
C_{OSS}	Output Capacitance	V_{DS} =10V	-	118	-		
C_{RSS}	Reverse Transfer Capacitance	f=1MHz	-	86	-		

Switching Characteristics

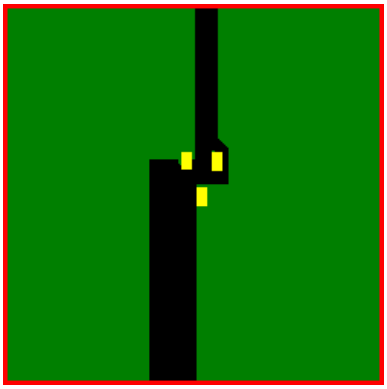
Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
$T_{D(ON)}$	Turn-On Delay Time	V_{DS} = 5V ,	-	10.5	21	ns	
T_R	Rise Time	V_{GS} = 4.5V,	-	5	10		
$T_{D(OFF)}$	Turn-Off Delay Time	R_G = 6Ω,	-	29.5	59		
T_F	Fall Time	I_D =3.6A	-	4.5	9		
Q_G	Total Gate Charge	V_{DS} = 10V ,	-	7.0	-	nC	
Q_{GS}	Gate-Source Charge	V_{GS} = 4.5V,	-	1.0	-		
Q_{GD}	Gate-Drain Charge	I_D = 3.6A	-	1.5	-		

Drain-Source Diode Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
V_{SD}	Body Diode Forward Voltage	V_{GS} = 0V, I_D = 5.0	-	-	1.2	V	
I_{SD}	Body Diode Continuous Current		-	-	5.0	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

Test Board

3. The data tested by pulsed , pulse width ≦ 300μs , duty cycle ≦ 2%
4. Thermal Resistance follow JESD51-3.

Typical Characteristic Curves

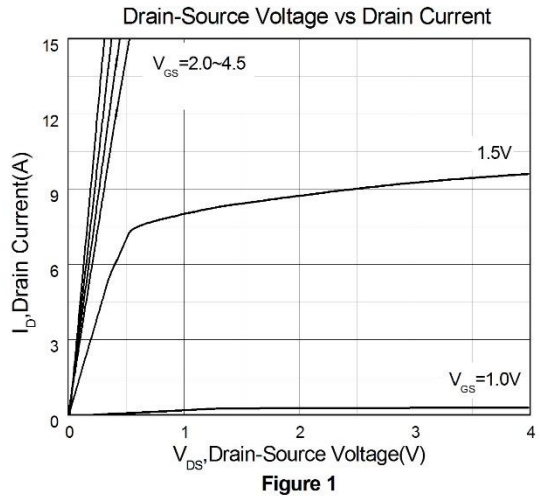


Figure 1

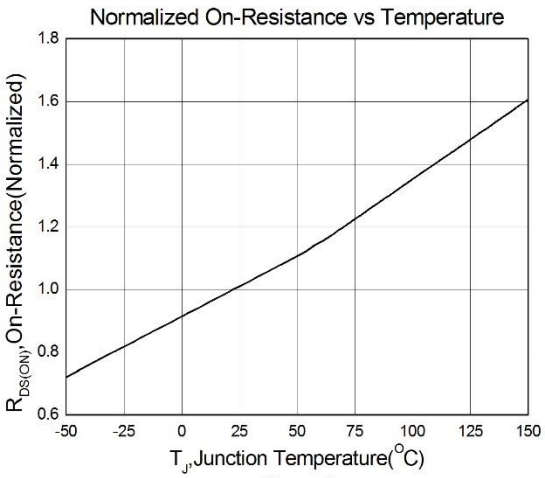


Figure 2

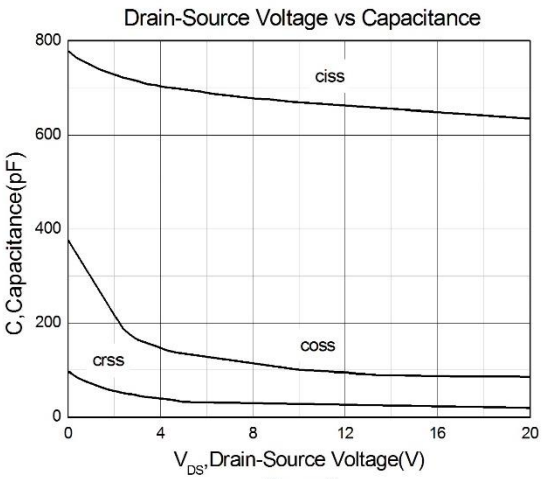


Figure 3

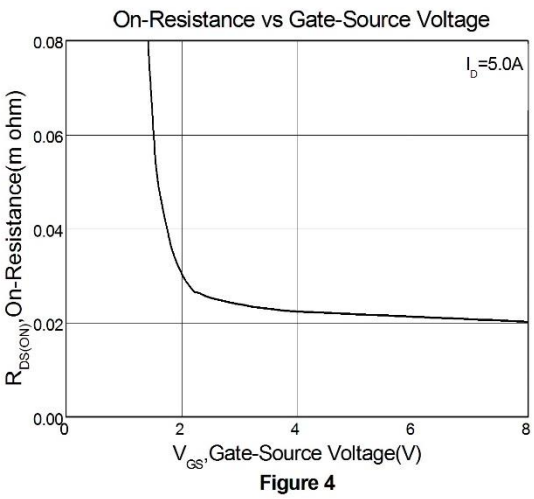


Figure 4

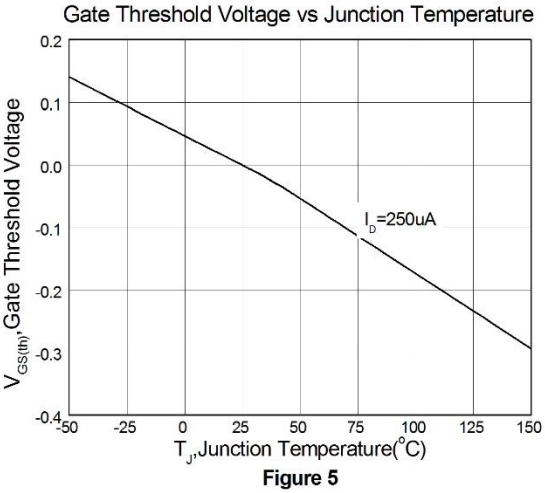
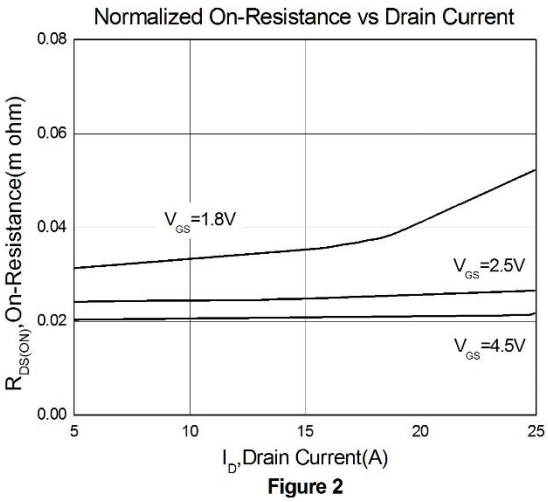


Figure 5



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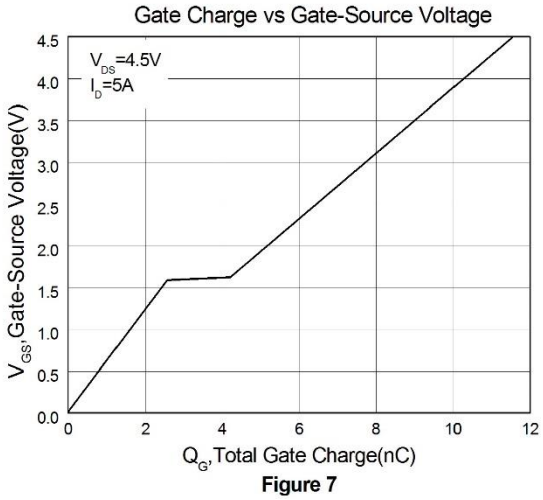


Figure 7

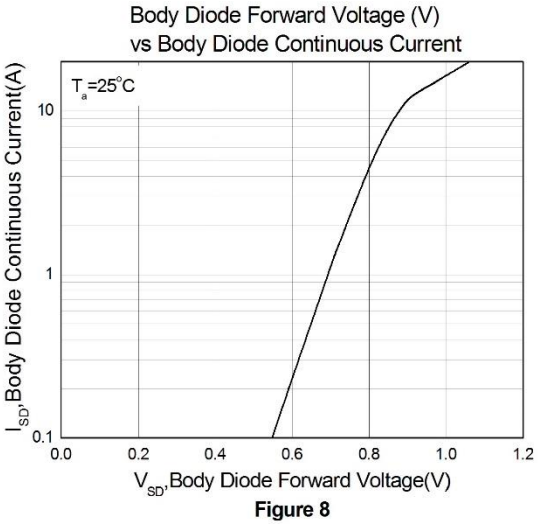


Figure 8

Test Circuits & Waveforms

Figure 9: Gate Charge Test Circuit

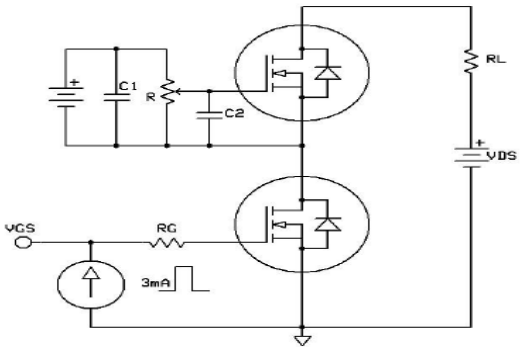


Figure 10: Gate Charge Waveform

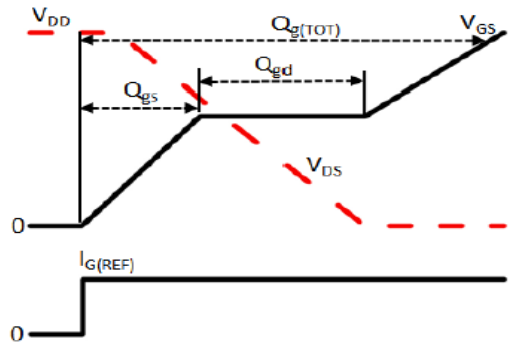


Figure 11: Switching Time Test Circuit

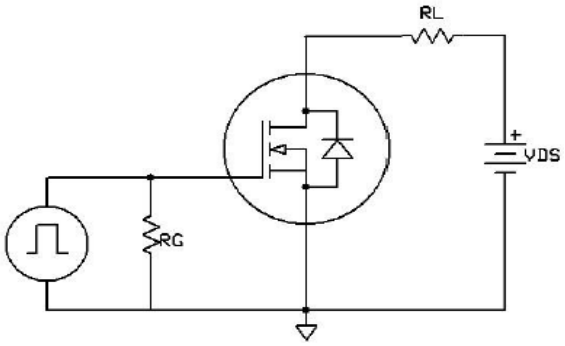
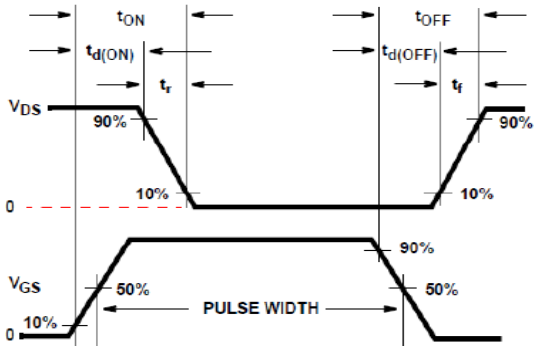
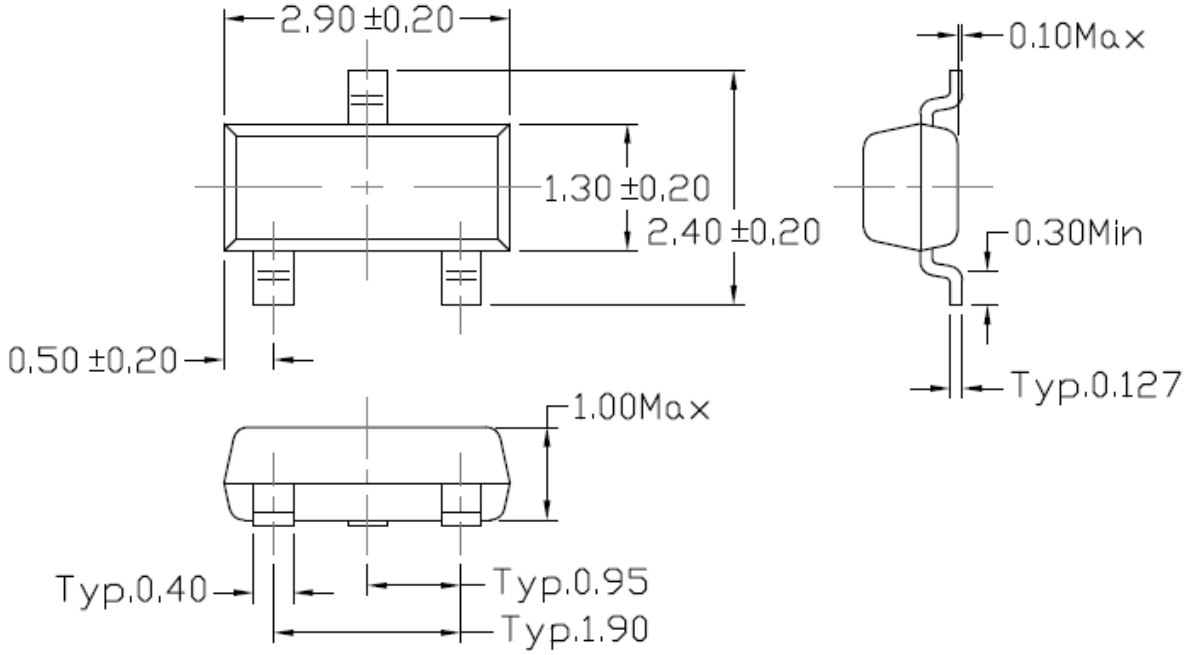


Figure 12: Switching Time Waveform

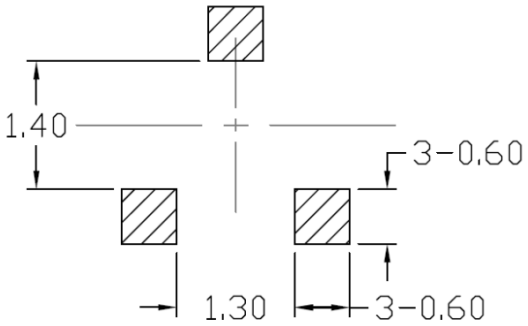


Package Dimension *Dimensions in mm unless otherwise stated*



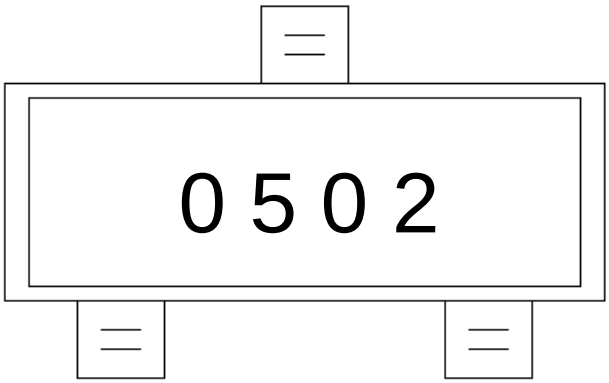
Note: Dimensions in mm

Recommended pad layout for surface mount leadform



Note: Dimensions in mm

Marking Information

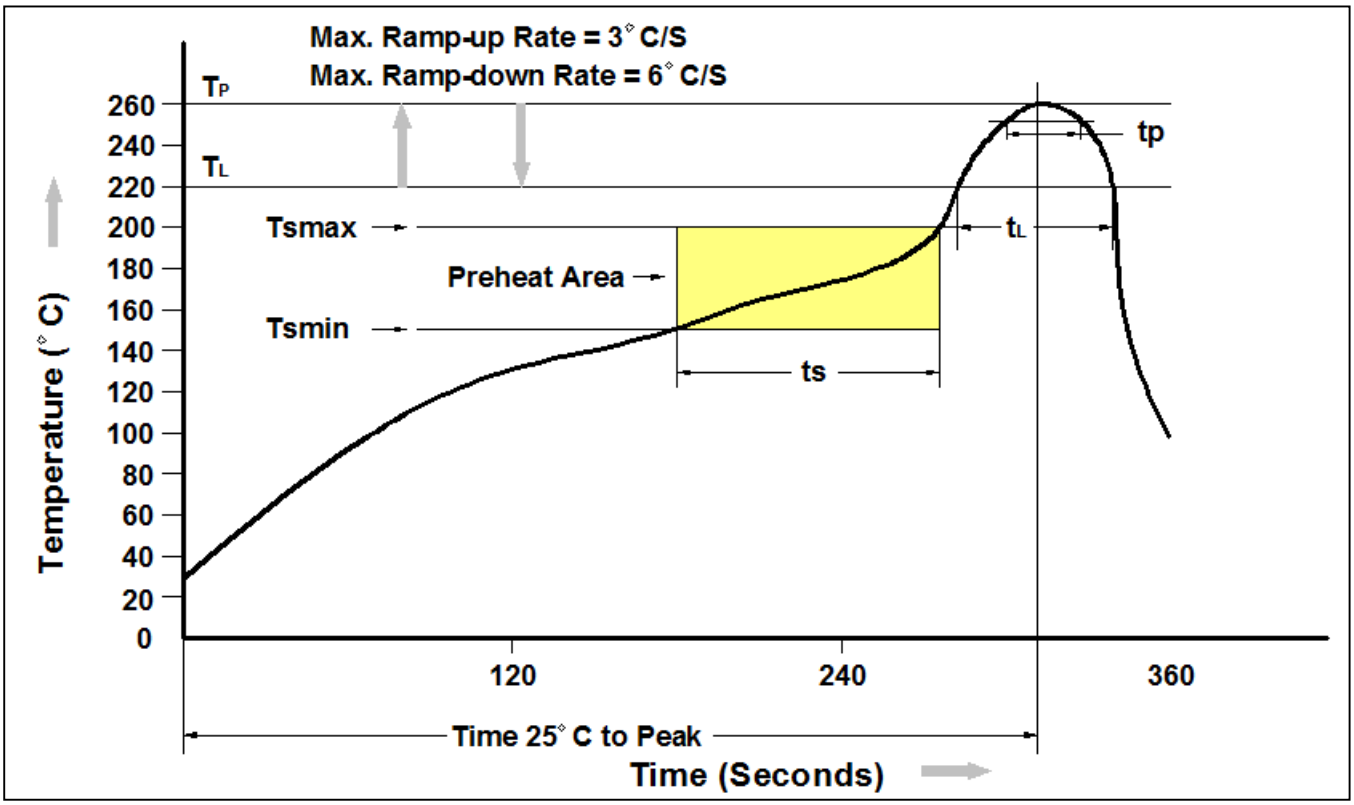


0502: Device Number

Ordering Information

Part Number	*Description*	*Quantity*
CTL0502NS	SOT-23 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 (t_L to t_P)	3°C/second max.
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60 – 150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (t_P) within 5°C of 260°C	30 seconds
Ramp-down Rate (T_P to T_L)	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.

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