



N-Channel Enhancement MOSFET

Features

- Drain-Source Breakdown Voltage V_{DS} 40 V
- Drain-Source On-Resistance
 $R_{DS(ON)}$ 32m Ω , at V_{GS} = 10V, I_D = 4.0A
 $R_{DS(ON)}$ 50m Ω , at V_{GS} = 4.5V, I_D = 3.0A
- Continuous Drain Current at $T_A=25^\circ\text{C}$ I_D =4.0A
- Advanced high cell density Trench Technology
- RoHS Compliance & Halogen Free

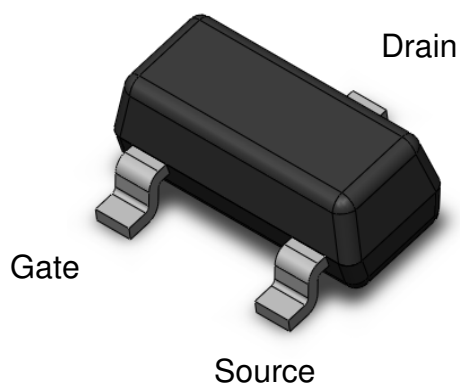
Description

The CTL0404NS-R3 is the N-Channel logic enhancement mode power field effect transistors are produced using high cell density, DMOS trench technology. This high density process is especially tailored to minimize on-state resistance.

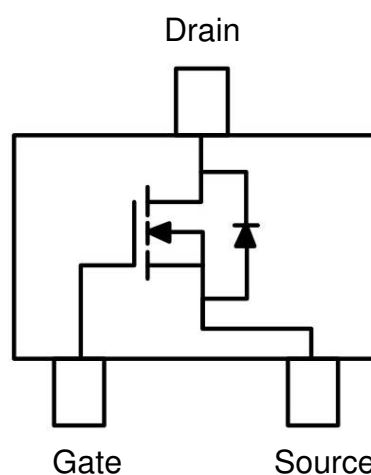
Applications

- Power Management
- Portable Equipment
- DC/DC Converter
- Load Switch

Package Outline



Schematic





CTL0404NS-R3

N-Channel Enhancement MOSFET

Absolute Maximum Rating at 25°C

Symbol	Parameters	Test Conditions	Min	Notes
V _{DS}	Drain-Source Voltage	40	V	
V _{GS}	Gate-Source Voltage	±20	V	
I _D	Continuous Drain Current @T _A =25°C	4	A	1
I _{DM}	Pulsed Drain Current	16	A	1
P _D	Total Power Dissipation @T _A =25°C	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 _{θJA4}	Thermal Resistance Junction-Ambient (t=10s)		--	120	--	°C /W	1,4



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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	$V_{GS} = 0V, I_D = 250\mu A$	40	-	-	V	
I_{DSS}	Drain-Source Leakage Current	$V_{DS} = 40V, V_{GS} = 0V$	-	-	1	μA	
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	± 100	nA	

On Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
$R_{DS(ON)}$	Drain-Source On-Resistance	$V_{GS} = 10V, I_D = 4.0A$	-	32	40	$m\Omega$	3
		$V_{GS} = 4.5V, I_D = 3.0A$	-	50	65	$m\Omega$	
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu A$	1.0	---	3.0	V	3

Dynamic Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
C_{ISS}	Input Capacitance	$V_{GS} = 0V,$ $V_{DS} = 20V$ $f = 1MHz$	-	560	-	pF	
C_{OSS}	Output Capacitance		-	70	-		
C_{RSS}	Reverse Transfer Capacitance		-	22	-		

Switching Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
$T_{D(ON)}$	Turn-On Delay Time	$V_{DS} = 20V,$ $V_{GS} = 10V,$ $R_G = 1\Omega,$ $R_L = 20\Omega,$	-	12	-	ns	
T_R	Rise Time		-	12	-		
$T_{D(OFF)}$	Turn-Off Delay Time		-	37	-		
T_F	Fall Time		-	4	-		
Q_G	Total Gate Charge	$V_{DS} = 20V,$ $V_{GS} = 4.5V,$ $I_D = 4.0A$	-	8.2	-	nC	
Q_{GS}	Gate-Source Charge		-	3.6	-		
Q_{GD}	Gate-Drain Charge		-	3.9	-		

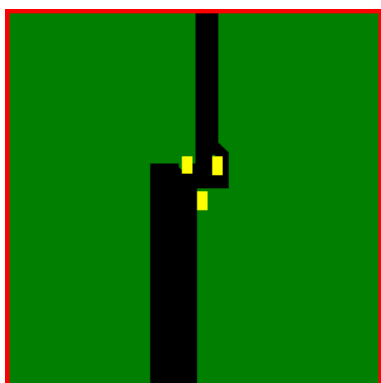


Drain-Source Diode Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
V _{SD}	Body Diode Forward Voltage	V _{GS} = 0V, I _D = 1A	-	0.8	1.2	V	
I _{SD}	Body Diode Continuous Current		-	-	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

Actual Size

- 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

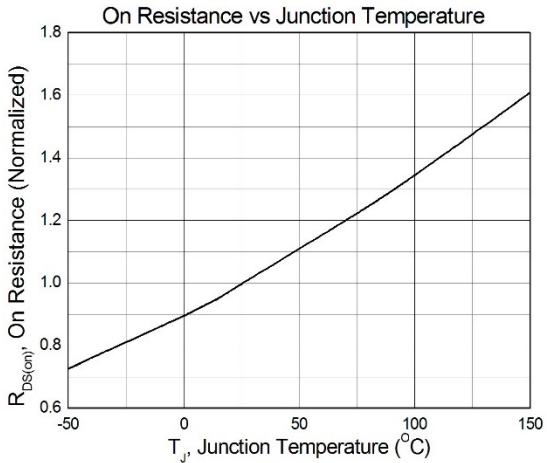


Figure 1

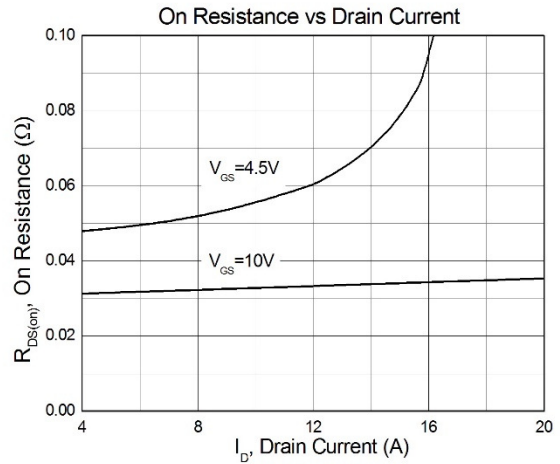


Figure 2

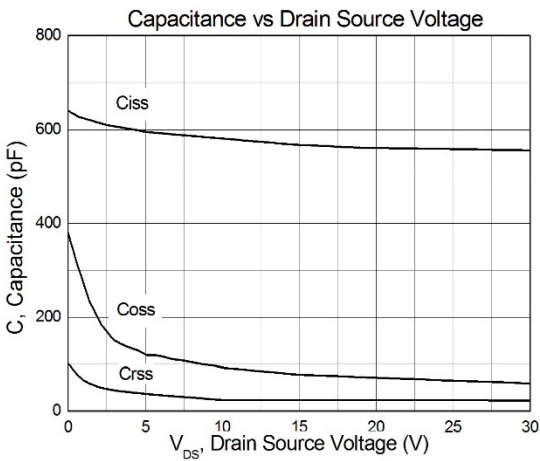


Figure 3

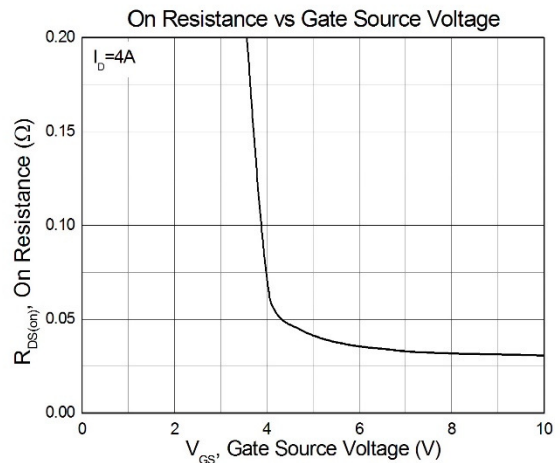


Figure 4

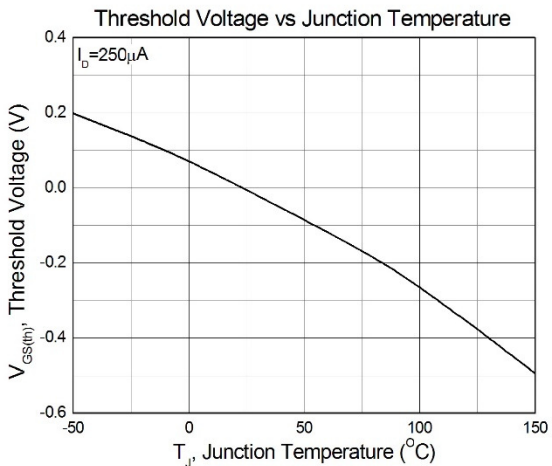


Figure 5

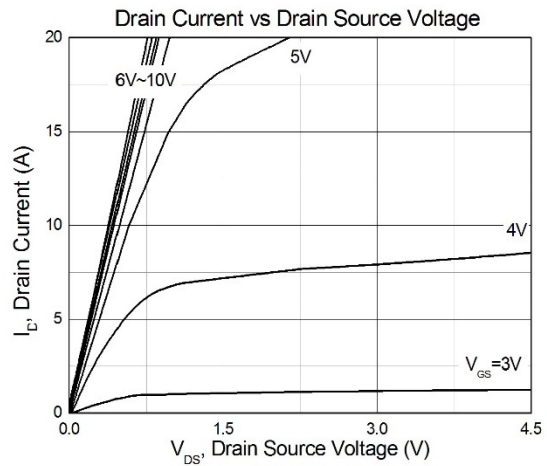
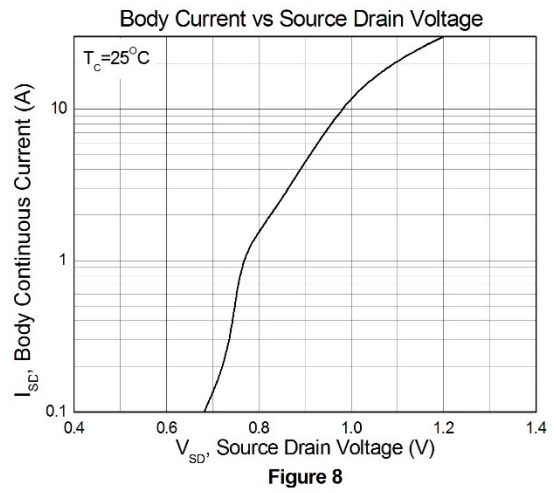
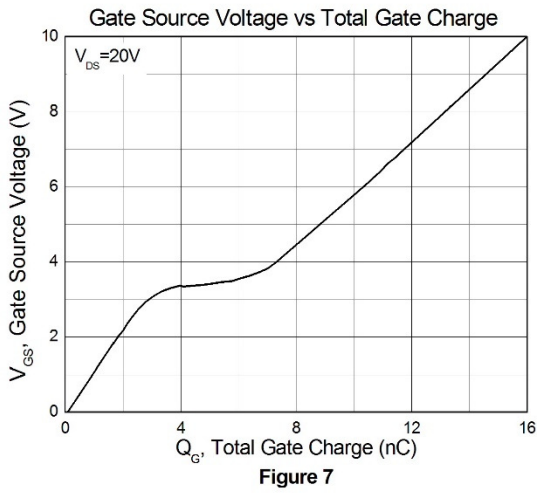


Figure 6





Test Circuits & Waveforms

Figure 9: Gate Charge Test Circuit

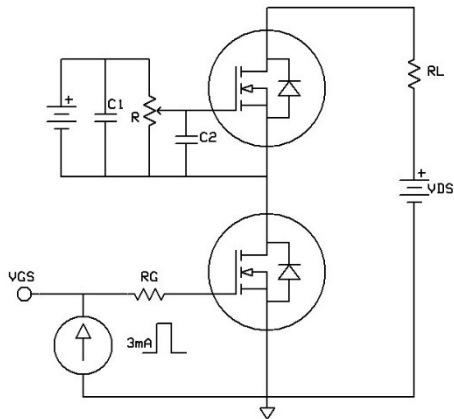


Figure 10: Gate Charge Waveform

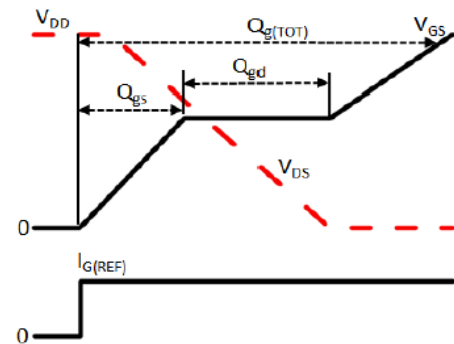


Figure 11: Switching Time Test Circuit

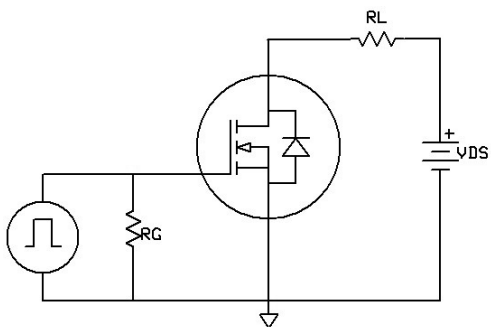
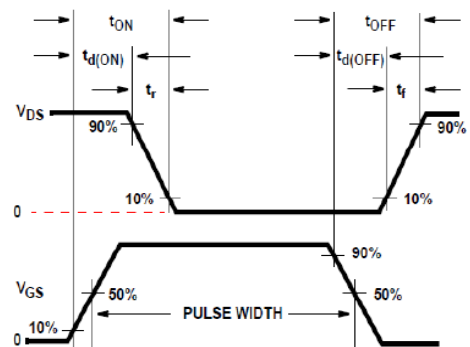
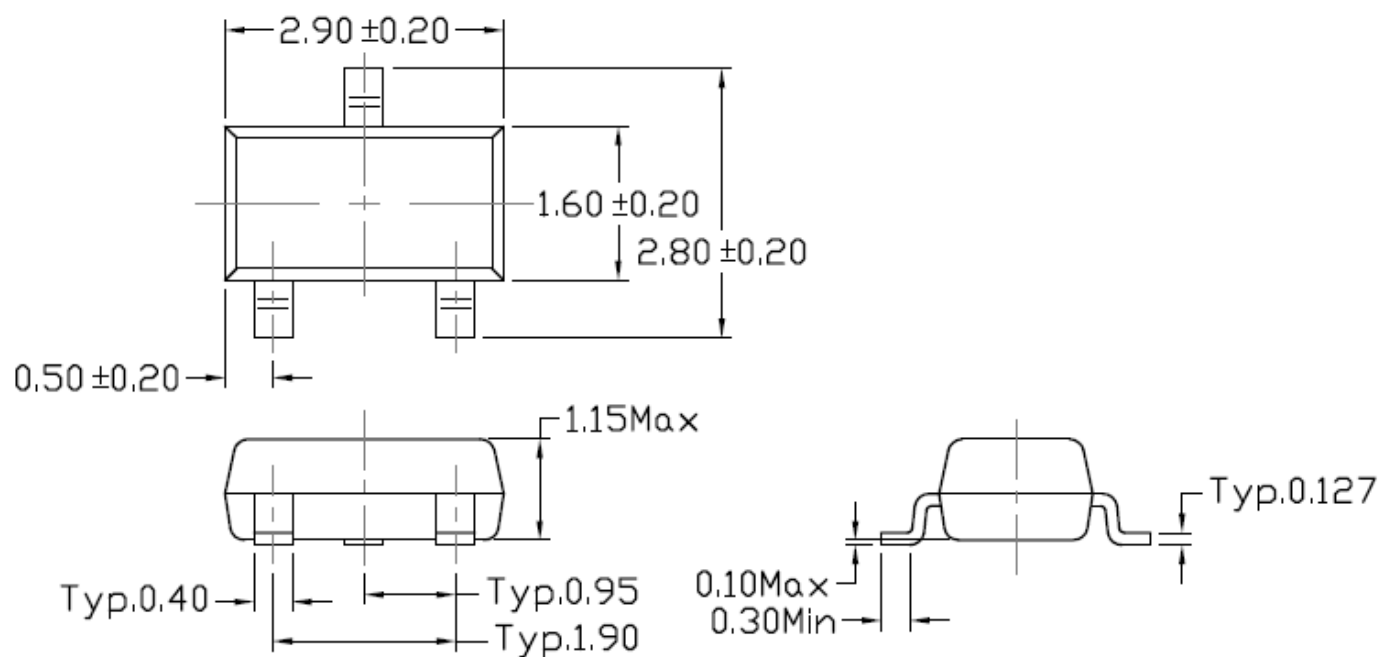


Figure 12: Switching Time Waveform



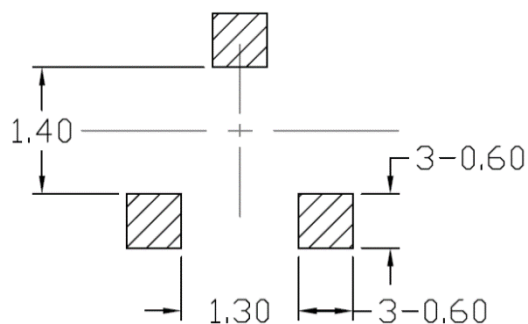


Package Dimension (SC-59)



Note: Dimensions in mm

Recommended pad layout for surface mount leadform



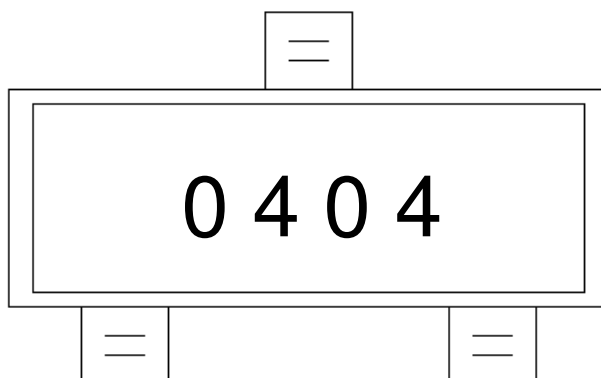
Note: Dimensions in mm



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Marking Information



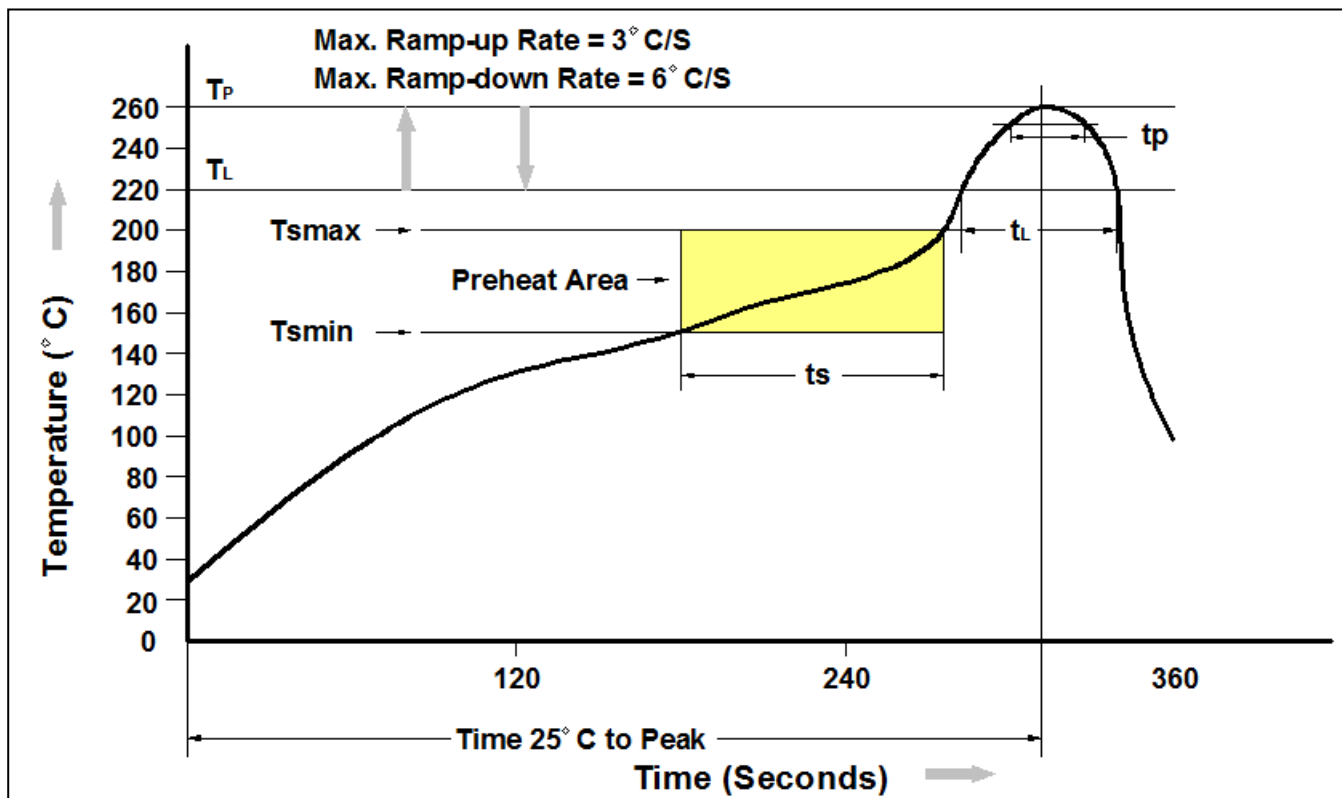
0404: Device Number

Ordering Information

Part Number	Description	Quantity
CTL0404NS-R3	SC-59 Reel	3000 pcs



Reflow Profile



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T _{smin})	150 °C
Temperature Max. (T _{smax})	200 °C
Time (t _s) from (T _{smin} to T _{smax})	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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