



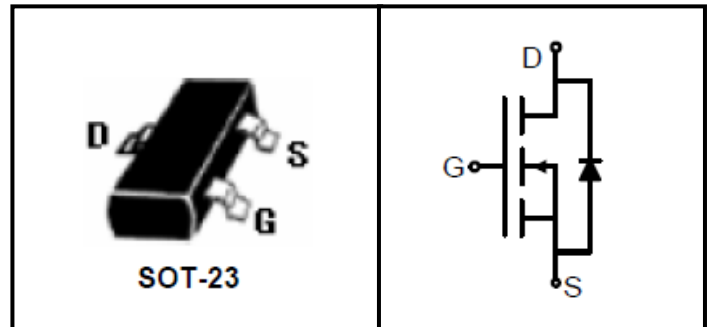
40V N-Channel Trench MOSFET

FEATURES

- Trench Power MOSFET Technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- Optimized For Fast-switching Applications

APPLICATIONS

- Synchronous Rectification in DC/DC and AC/DC Converters
- Isolated DC/DC Converters in Telecom and Industrial



Device Marking and Package Information		
Device	Package	Marking
TTX04N04AT	SOT-23	04N04AT

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted			
Parameter	Symbol	Value	Unit
		SOT-23	
Drain-Source Voltage ($V_{GS} = 0\text{V}$)	V_{DSS}	40	V
Continuous Drain Current	I_D	4	A
Pulsed Drain Current (note1)	I_{DM}	16	A
Gate-Source Voltage	V_{GSS}	± 20	V
Single Pulse Avalanche Energy (note2)	E_{AS}	3.3	mJ
Avalanche Current	I_{AS}	4.7	A
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	1.4	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	$^\circ\text{C}$

Thermal Resistance			
Parameter	Symbol	Value	Unit
		SOT-23	
Thermal Resistance, Junction-to-Ambient	R_{thJA}	89	$^\circ\text{C}/\text{W}$



Specifications $T_J = 25^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	40	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40V, V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	1	μA
		$V_{DS} = 40V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	--	--	100	
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20V$	--	--	± 100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1	1.7	2.4	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 2A$	--	29	34	$m\Omega$
		$V_{GS} = 4.5V, I_D = 2A$	--	38	46	$m\Omega$
Forward Transconductance (Note3)	g_{fs}	$V_{DS} = 5V, I_D = 10A$	--	3.8	--	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0V,$ $V_{DS} = 20V,$ $f = 1.0\text{MHz}$	--	659	--	pF
Output Capacitance	C_{oss}		--	49	--	
Reverse Transfer Capacitance	C_{rss}		--	30	--	
Total Gate Charge	Q_g	$V_{DD} = 20V, I_D = 4A,$ $V_{GS} = 10V$	--	10	--	nC
Gate-Source Charge	Q_{gs}		--	1.6	--	
Gate-Drain Charge	Q_{gd}		--	2.4	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 20V, I_D = 4A,$ $R_G = 2.5\Omega$	--	5	--	ns
Turn-on Rise Time	t_r		--	4	--	
Turn-off Delay Time	$t_{d(off)}$		--	15	--	
Turn-off Fall Time	t_f		--	4	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	$T_C = 25^\circ\text{C}$	--	--	4	A
Pulsed Diode Forward Current	I_{SM}		--	--	16	
Body Diode Voltage	V_{SD}	$T_J = 25^\circ\text{C}, I_{SD} = 2A, V_{GS} = 0V$	--	--	1.2	V

Notes

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2. $V_{DD} = 40V, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 1\%$



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 1. Output Characteristics

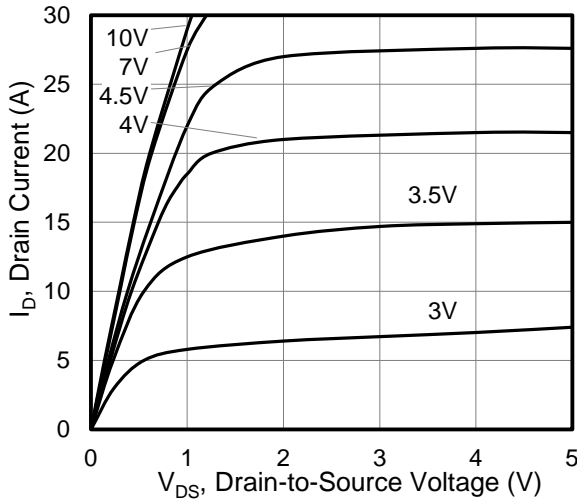


Figure 2. Transfer Characteristics

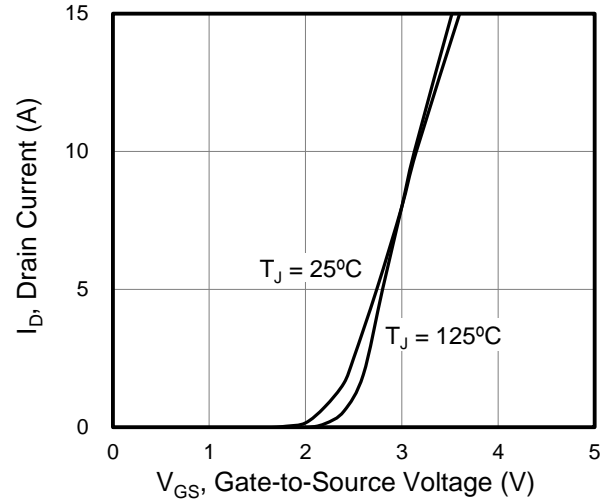


Figure 3. On-Resistance vs. Drain Current

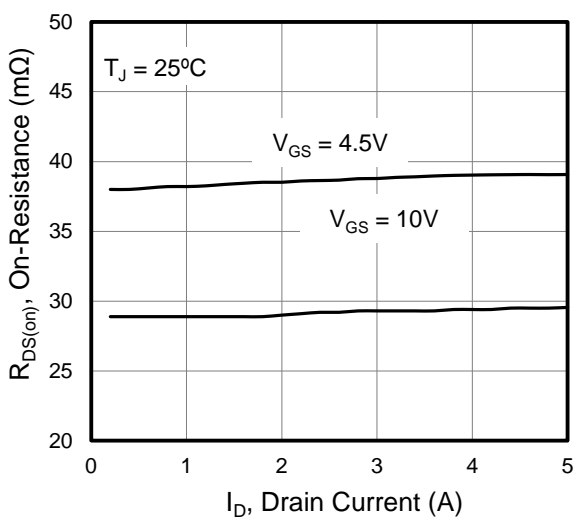


Figure 4. Capacitance

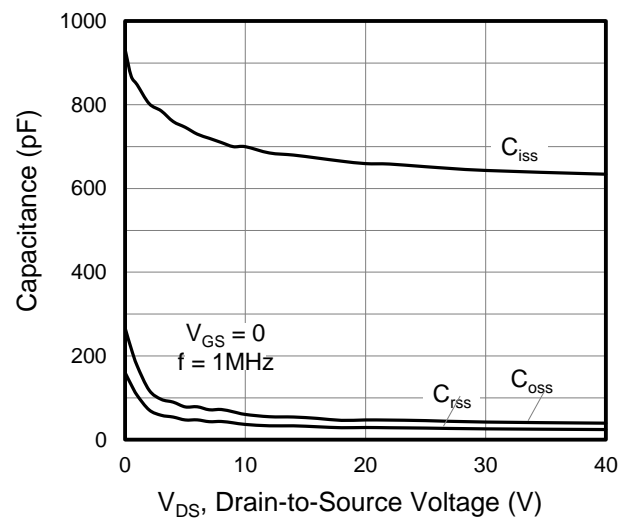


Figure 5. Gate Charge

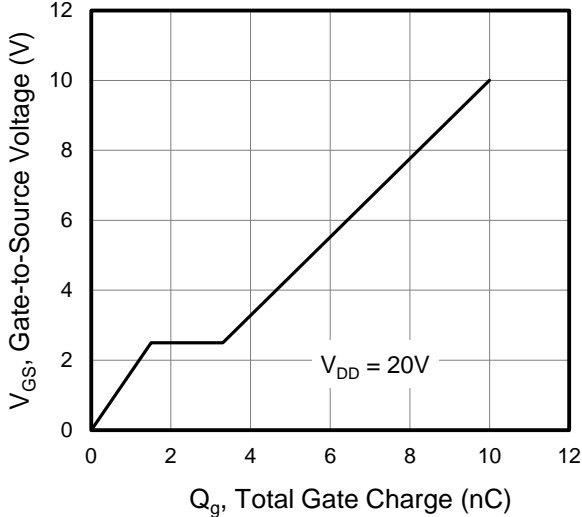
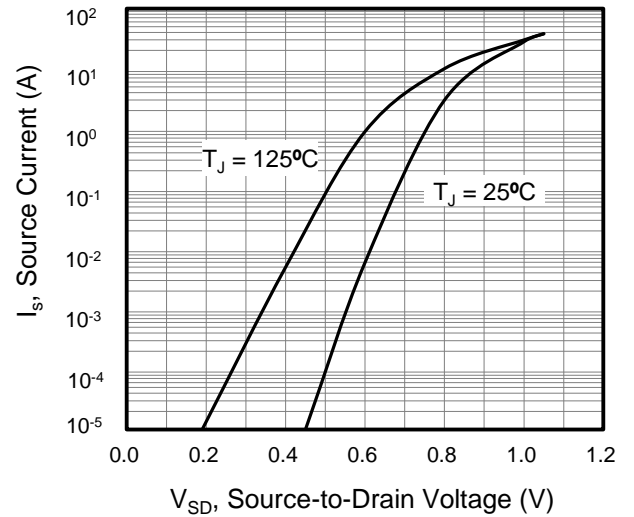


Figure 6. Body Diode Forward Voltage





Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 7. On-Resistance vs. Junction Temperature

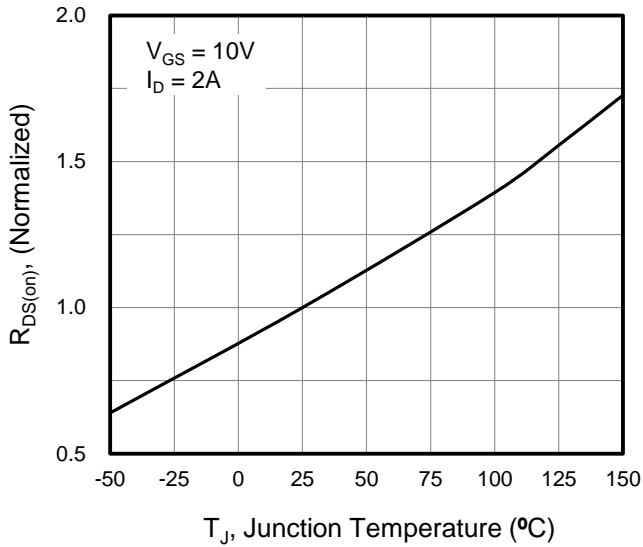


Figure 8. Threshold Voltage vs. Junction Temperature

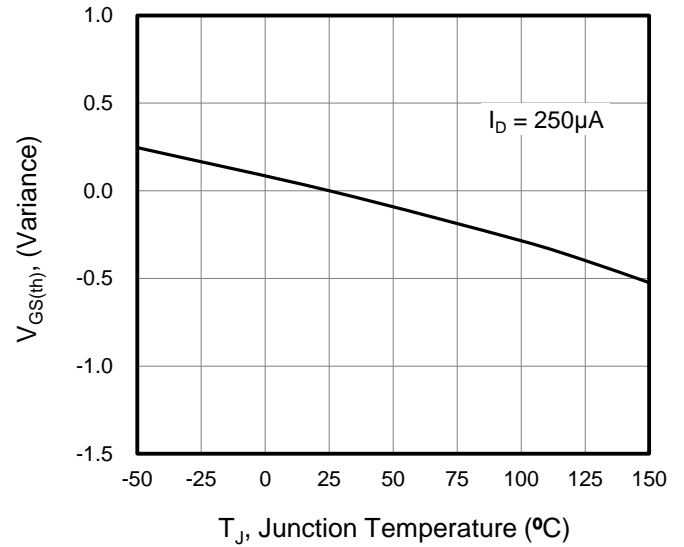


Figure 9. Breakdown voltage vs. Junction Temperature

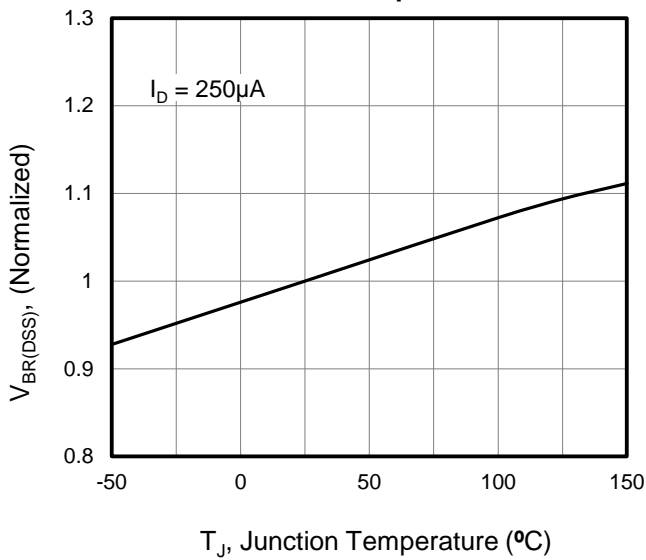


Figure 10. Transient Thermal Impedance

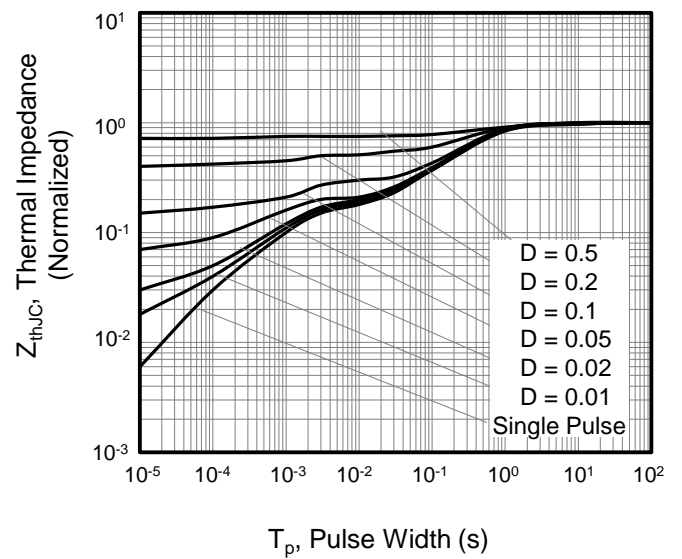


Figure 11. Safe operation area for

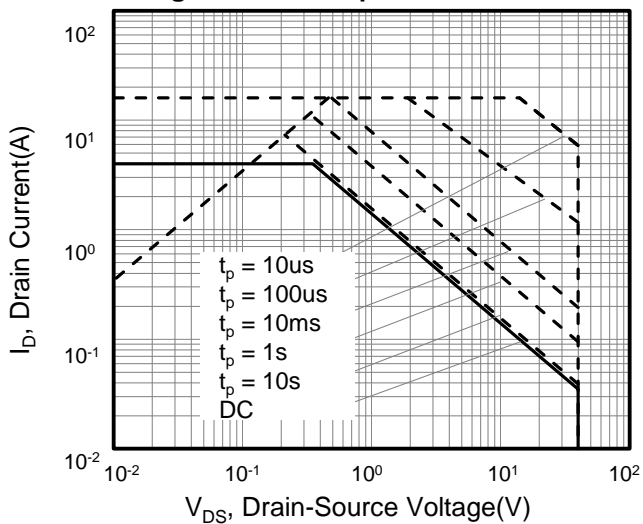




Figure A: Gate Charge Test Circuit and Waveform



Figure B: Resistive Switching Test Circuit and Waveform

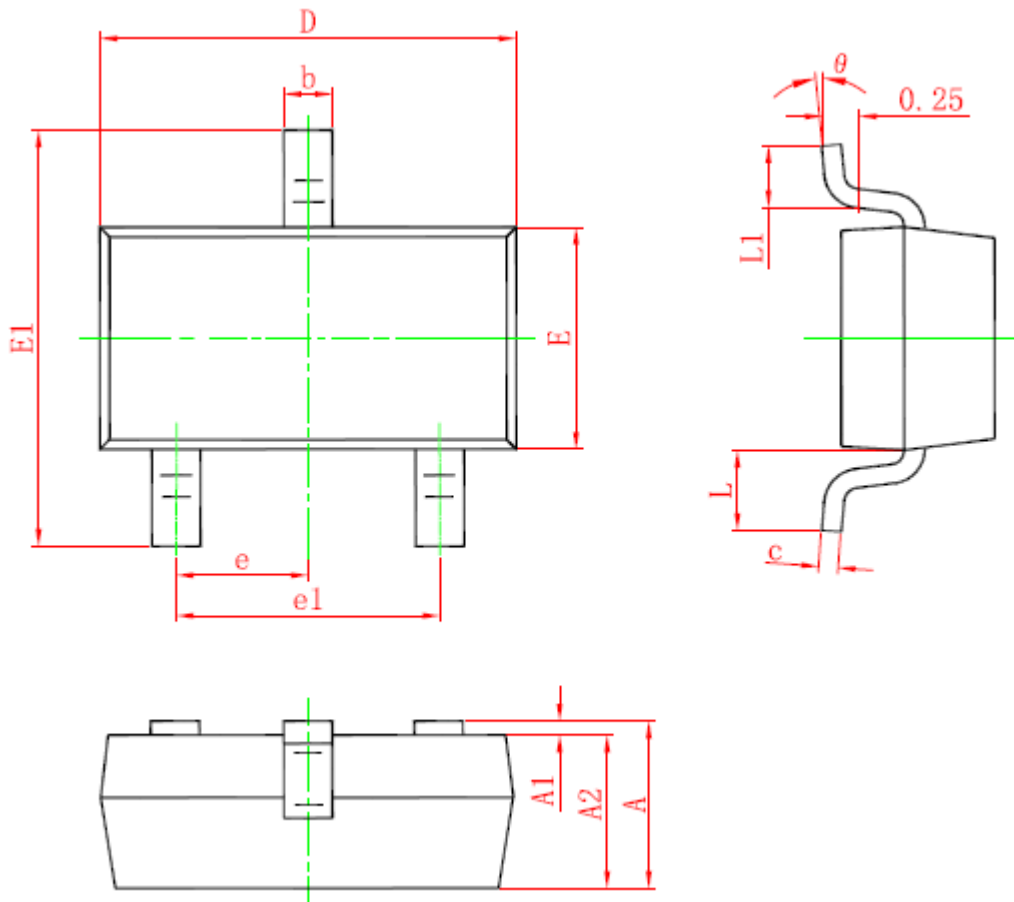


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





SOT-23



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°



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