



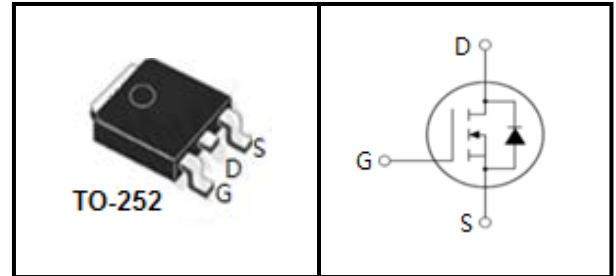
## 60V N-Channel DTMOS

### FEATURES

- Trench Power DTMOS 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
TSD12N06AT	TO-252	12N06AT

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , unless otherwise noted			
Parameter	Symbol	Value	Unit
Drain-Source Voltage ( $V_{GS} = 0\text{V}$ )	$V_{DSS}$	60	V
Continuous Drain Current	$I_D$	60	A
Pulsed Drain Current (note1)	$I_{DM}$	240	A
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Single Pulse Avalanche Energy (note2)	$E_{AS}$	65	mJ
Avalanche Current (note1)	$I_{AS}$	36	A
Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_D$	56.5	W
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55~+175	$^\circ\text{C}$

Thermal Resistance			
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{thJC}$	1.7	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{thJA}$	50	



Specifications $T_J = 25^\circ\text{C}$ , unless otherwise noted								
Parameter	Symbol	Test Conditions	Value			Unit		
			Min.	Typ.	Max.			
<b>Static</b>								
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	60	--	--	V		
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60V, V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	1	$\mu A$		
		$V_{DS} = 60V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	--	--	100			
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 20V$	--	--	$\pm 100$	nA		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.1	--	2.5	V		
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 20A$	--	6.5	9	m $\Omega$		
		$V_{GS} = 4.5V, I_D = 20A$	--	10.7	13.5			
Forward Transconductance (Note3)	$g_{fs}$	$V_{DS} = 5V, I_D = 20A$	--	85	--	S		
<b>Dynamic</b>								
Input Capacitance	$C_{iss}$	$V_{GS} = 0V,$ $V_{DS} = 30V,$ $f = 1.0\text{MHz}$	--	2455	--	pF		
Output Capacitance	$C_{oss}$		--	240	--			
Reverse Transfer Capacitance	$C_{rss}$		--	34	--			
Total Gate Charge	$Q_g(10V)$	$V_{DD} = 30V, I_D = 20A,$ $V_{GS} = 10V$	--	45	--	nC		
	$Q_g(4.5V)$		--	24	--			
Gate-Source Charge	$Q_{gs}$		--	6.8	--			
Gate-Drain Charge	$Q_{gd}$		--	11.5	--			
Turn-on Delay Time	$t_{d(on)}$		$V_{DD} = 30V, I_D = 20A,$ $R_G = 3\Omega$	--	8		--	ns
Turn-on Rise Time	$t_r$			--	3		--	
Turn-off Delay Time	$t_{d(off)}$	--		25	--			
Turn-off Fall Time	$t_f$	--		4	--			
<b>Drain-Source Body Diode Characteristics</b>								
Continuous Body Diode Current	$I_S$	$T_C = 25^\circ\text{C}$	--	--	46	A		
Pulsed Diode Forward Current	$I_{SM}$		--	--	138			
Body Diode Voltage	$V_{SD}$	$T_J = 25^\circ\text{C}, I_{SD} = 1A, V_{GS} = 0V$	--	0.72	1	V		
Reverse Recovery Time	$t_{rr}$	$I_F = 20A,$ $di_F/dt = 500A/\mu s$	--	25	--	ns		
Reverse Recovery Charge	$Q_{rr}$		--	110	--	nC		

**Notes**

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2.  $I_{AS} = 36A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse Width  $\leq 300\mu s, \text{Duty Cycle } \leq 1\%$



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

Figure 1. Output Characteristics

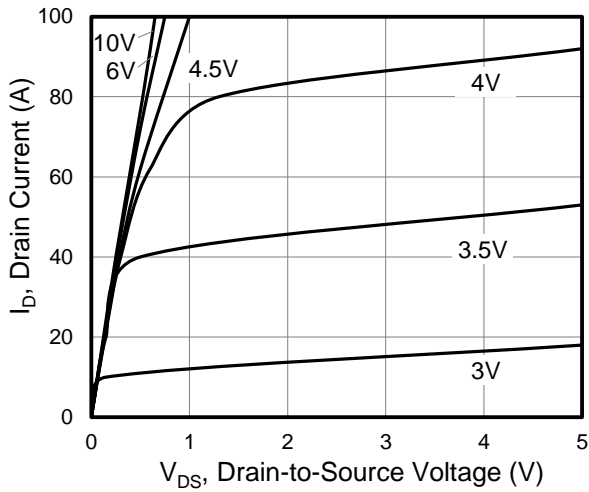


Figure 2. Transfer Characteristics

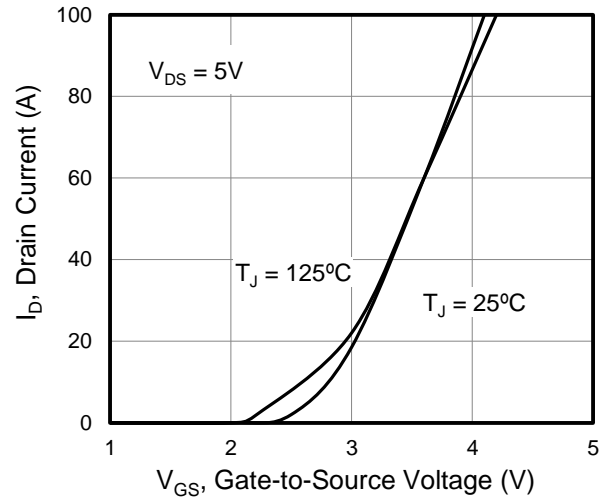


Figure 3. On-Resistance vs. Drain Current

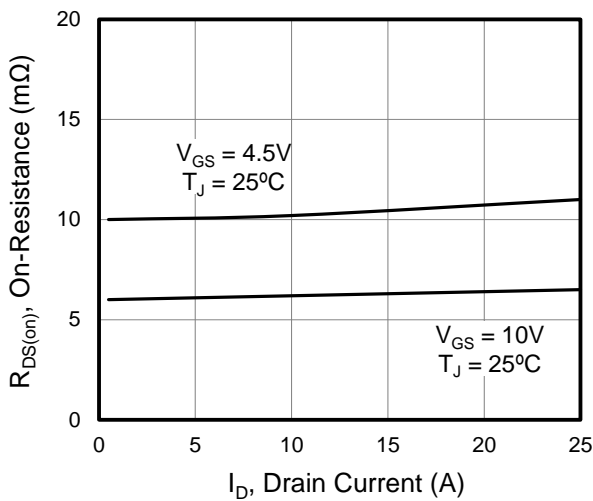


Figure 4. Capacitance

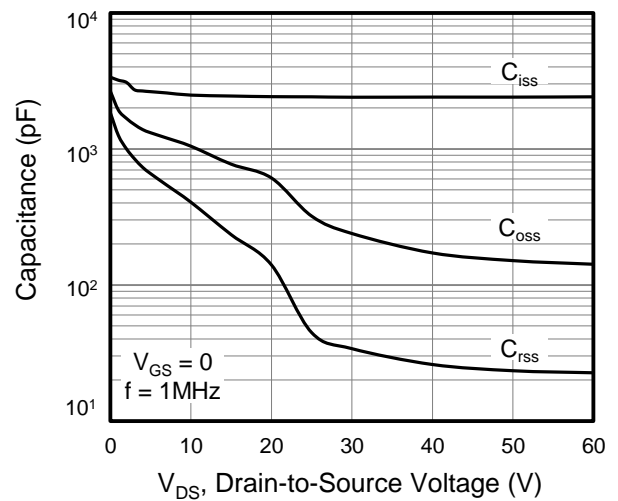


Figure 5. Gate Charge

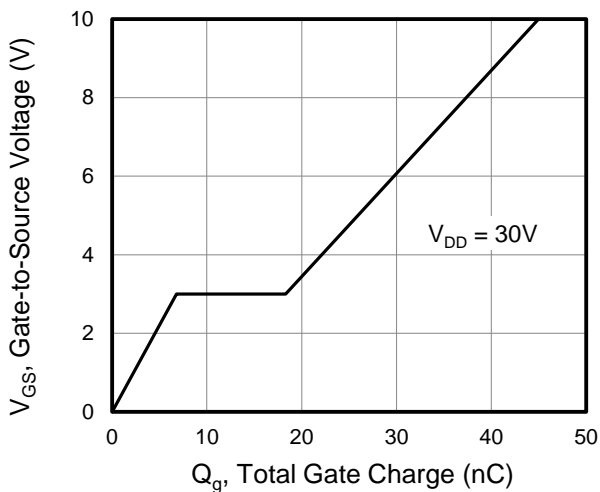
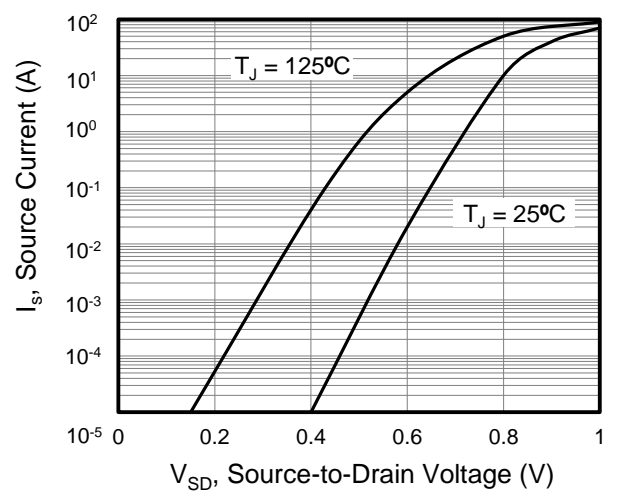


Figure 6. Body Diode Forward Voltage





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

Figure 7. On-Resistance vs. Junction Temperature

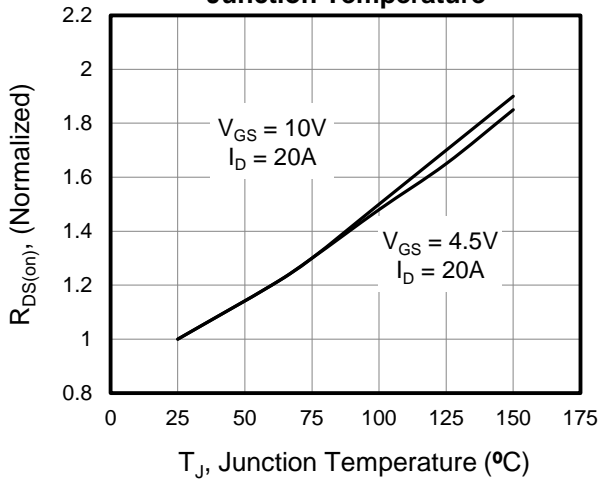


Figure 8. Threshold Voltage vs. Junction Temperature

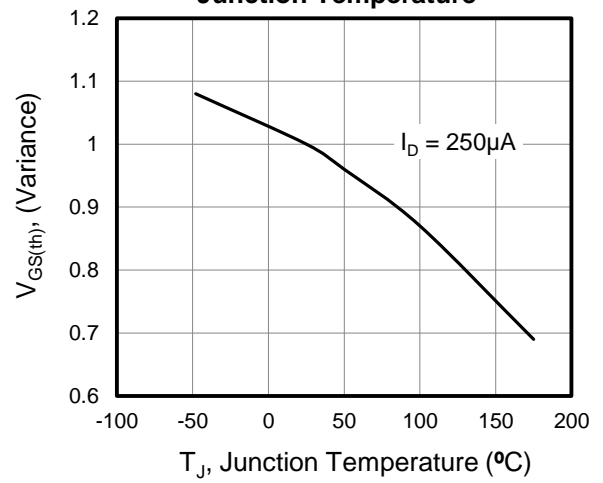


Figure 9. Transient Thermal Impedance

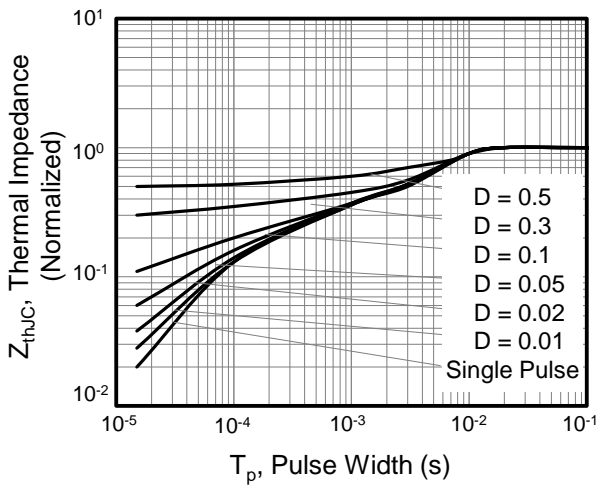




Figure A: Gate Charge Test Circuit and Waveform



Figure B: Resistive Switching Test Circuit and Waveform

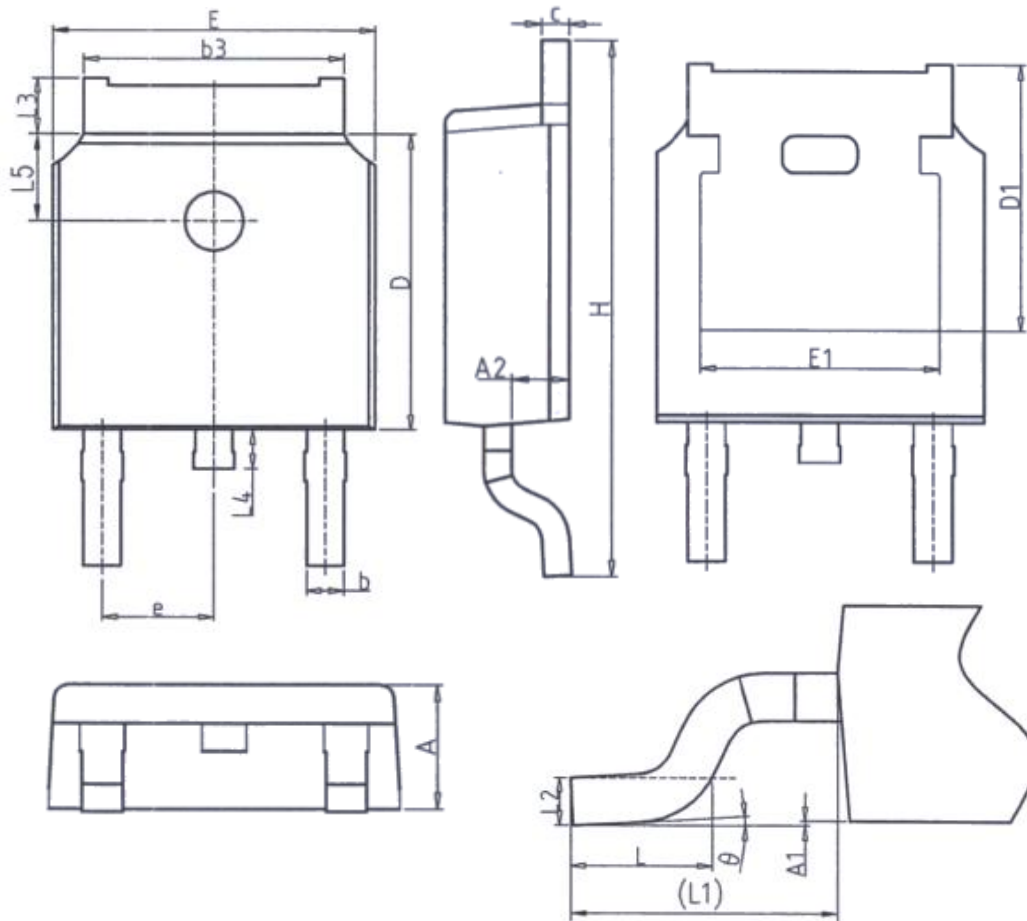


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





### TO-252



Unit: mm		
Symbol	Min.	Max.
A	2.20	2.40
A1	0.00	0.20
A2	0.97	1.17
b	0.68	0.90
b3	5.20	5.50
c	0.43	0.63
D	5.98	6.22
D1	5.30REF	
E	6.40	6.80
E1	4.63	-

Unit: mm		
Symbol	Min.	Max.
e	2.286BSC	
H	9.40	10.50
L	1.38	1.75
L1	2.90REF	
L2	0.51BSC	
L3	0.88	1.28
L4	-	1.00
L5	1.65	1.95
theta	0°	8°



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