



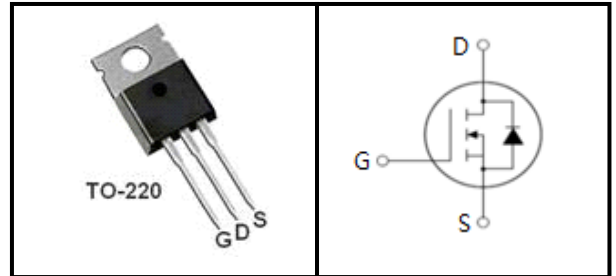
60V N-Channel DTMOS

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
TSP12N06AT	TO-220	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}	± 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.			
Static								
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	μA		
		$V_{DS} = 60V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	--	--	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	--	2.5	V		
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 20A$	--	6.5	9	m Ω		
		$V_{GS} = 4.5V, I_D = 20A$	--	10.7	13.5			
Forward Transconductance (Note3)	g_{fs}	$V_{DS} = 5V, I_D = 20A$	--	85	--	S		
Dynamic								
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	--			
Drain-Source Body Diode Characteristics								
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

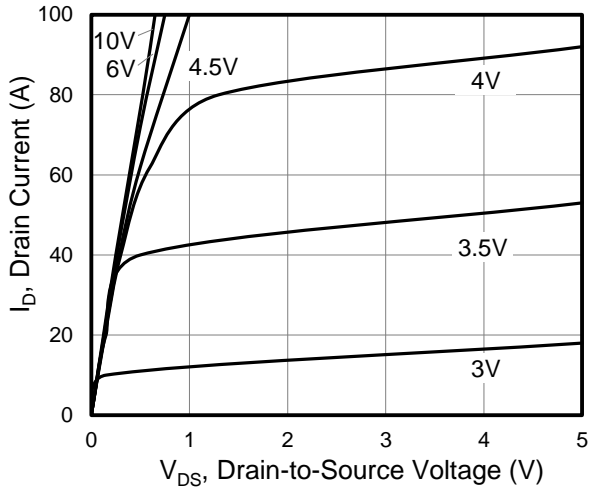


Figure 2. Transfer Characteristics

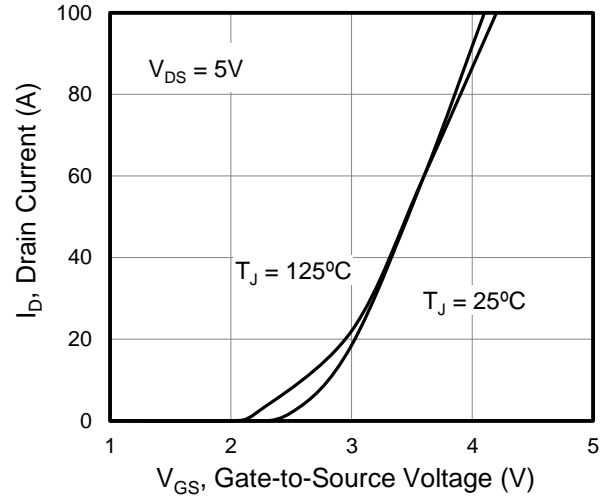


Figure 3. On-Resistance vs. Drain Current

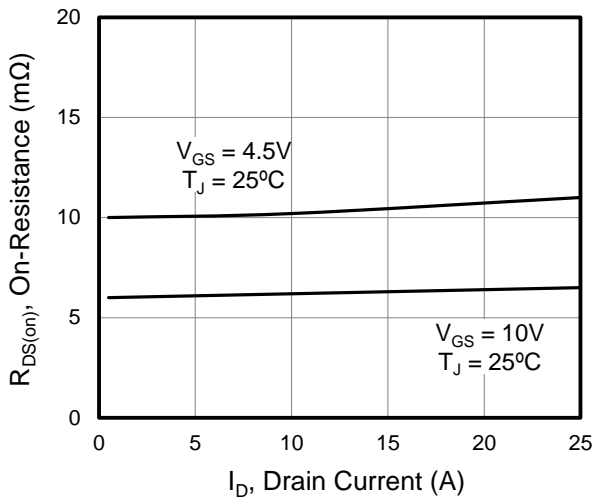


Figure 4. Capacitance

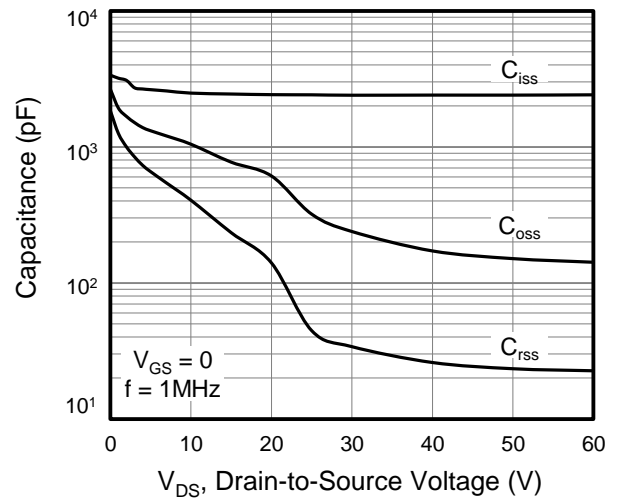


Figure 5. Gate Charge

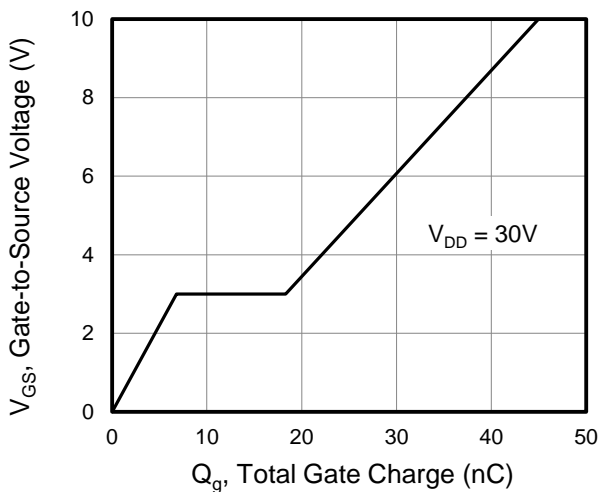
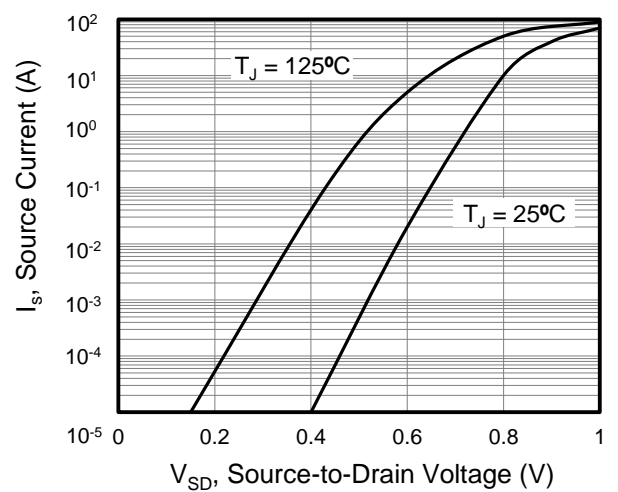


Figure 6. Body Diode Forward Voltage





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

Figure 7. On-Resistance vs. Junction Temperature

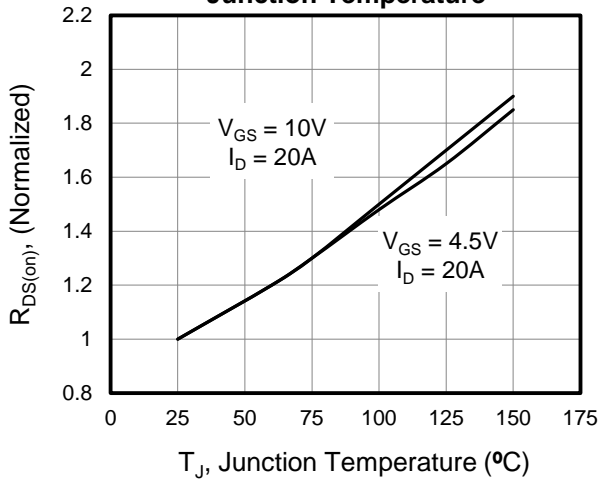


Figure 8. Threshold Voltage vs. Junction Temperature

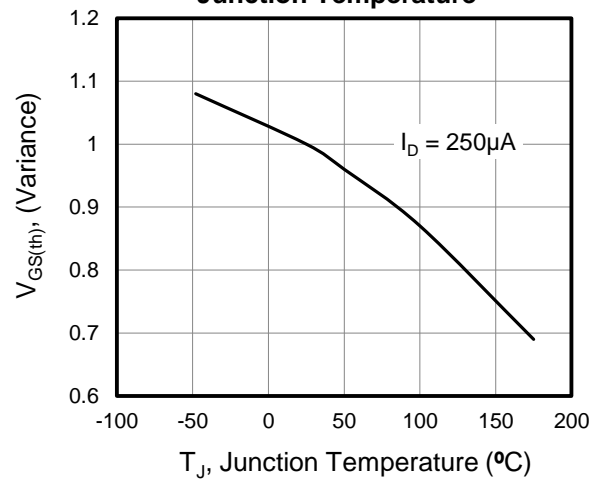


Figure 9. Transient Thermal Impedance

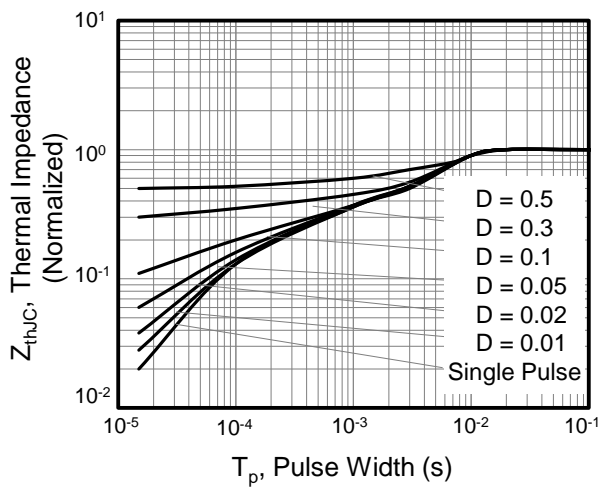




Figure A: Gate Charge Test Circuit and Waveform



Figure B: Resistive Switching Test Circuit and Waveform

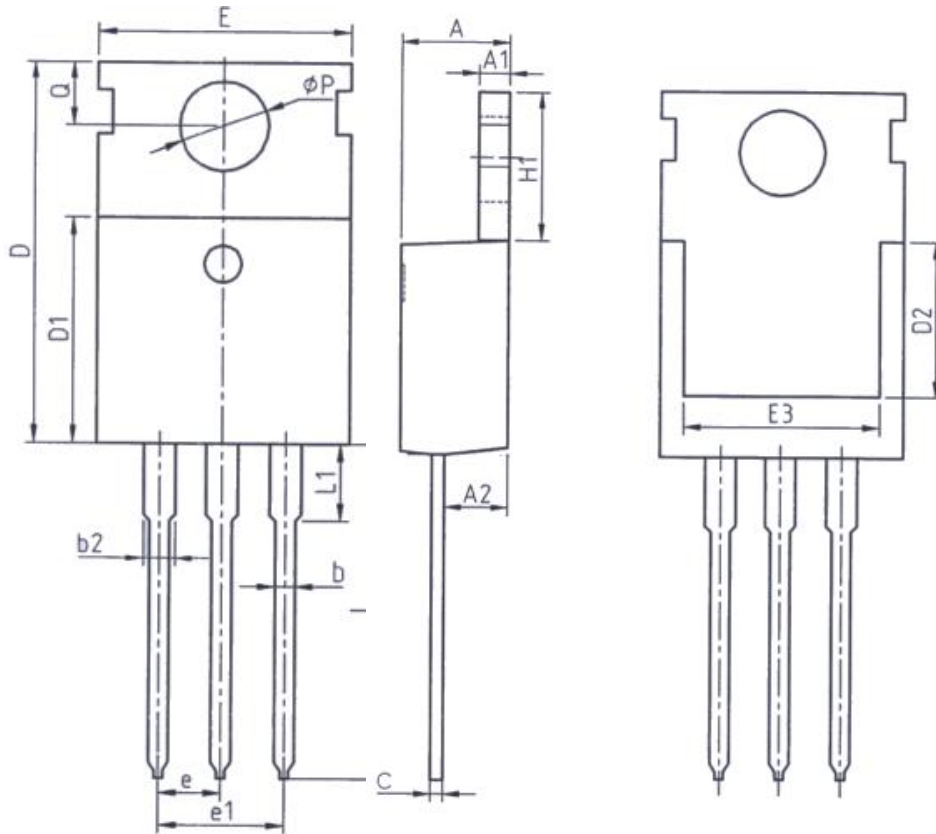


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





TO-220



Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.25	1.45
A2	2.20	2.60
b	0.70	0.95
b2	1.17	1.47
c	0.40	0.65
D	15.10	16.10
D1	8.80	9.40
D2	5.50	-

Unit: mm		
Symbol	Min.	Max.
E	9.70	10.30
E3	7.00	-
e	2.54BSC	
e1	5.08BSC	
H1	6.25	6.85
L	12.75	13.80
L1	-	3.40
P	3.40	3.80
Q	2.60	3.00



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