



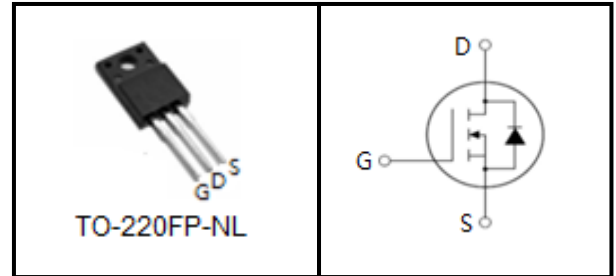
60V N-Channel DTMOS

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
TSR15N06A	TO-220FP-NL	15N06A

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 (Package Limited)	I_D	70	A
Pulsed Drain Current (note1)	I_{DM}	280	A
Gate-Source Voltage	V_{GSS}	± 20	V
Single Pulse Avalanche Energy (note2)	E_{AS}	609	mJ
Avalanche Current (note1)	I_{AS}	28	A
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	208	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	$^\circ\text{C}$

Thermal Resistance			
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}	3.8	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	R_{thJA}	60	



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	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2	--	4	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 50A$	--	2.5	3	m Ω
Forward Transconductance (Note3)	g_{fs}	$V_{DS} = 10V, I_D = 50A$	--	140	--	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0V,$ $V_{DS} = 30V,$ $f = 1.0\text{MHz}$	--	7710	--	pF
Output Capacitance	C_{oss}		--	667	--	
Reverse Transfer Capacitance	C_{rss}		--	66	--	
Total Gate Charge	Q_g	$V_{DD} = 30V, I_D = 50A,$ $V_{GS} = 10V$	--	138	--	nC
Gate-Source Charge	Q_{gs}		--	37	--	
Gate-Drain Charge	Q_{gd}		--	35.5	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 30V, I_D = 50A,$ $R_G = 25\Omega$	--	35	--	ns
Turn-on Rise Time	t_r		--	22	--	
Turn-off Delay Time	$t_{d(off)}$		--	105	--	
Turn-off Fall Time	t_f		--	45	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	$T_C = 25^{\circ}\text{C}$	--	--	50	A
Pulsed Diode Forward Current	I_{SM}		--	--	150	
Body Diode Voltage	V_{SD}	$T_J = 25^{\circ}\text{C}, I_{SD} = 50A, V_{GS} = 0V$	--	0.9	1.2	V
Reverse Recovery Time	t_{rr}	$I_F = 50A,$ $di_F/dt = 500A/\mu s$	--	50	--	ns
Reverse Recovery Charge	Q_{rr}		--	110	--	nC

Notes

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2. $I_{AS} = 28A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^{\circ}\text{C}$
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

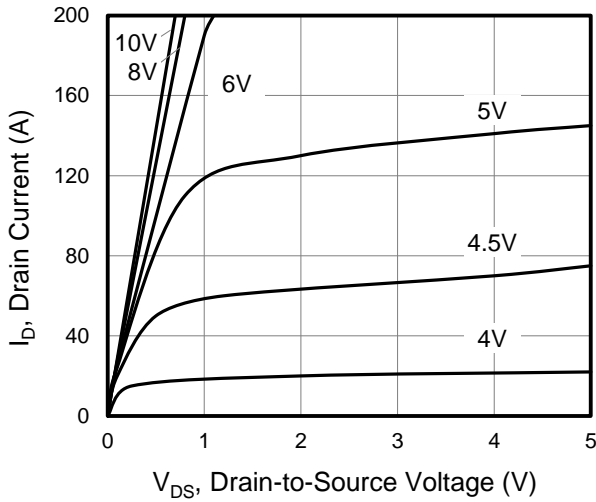


Figure 2. Transfer Characteristics

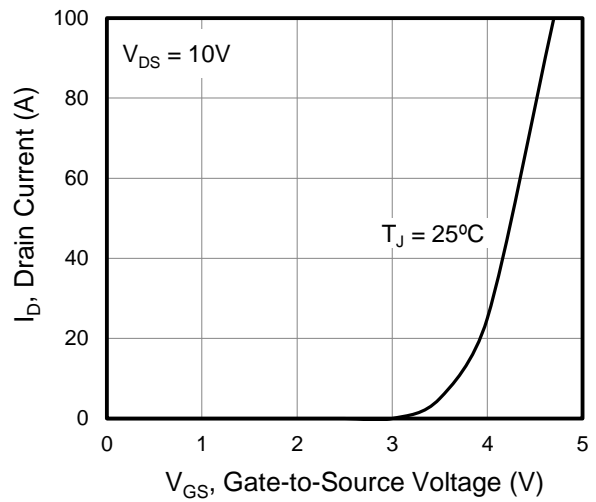


Figure 3. On-Resistance vs. Drain Current

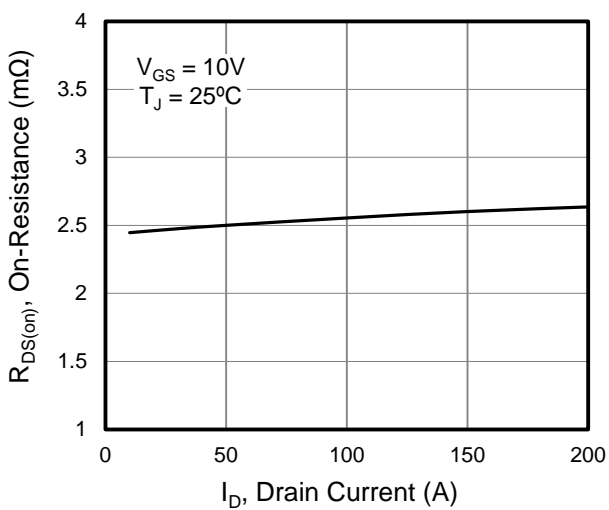


Figure 4. Capacitance

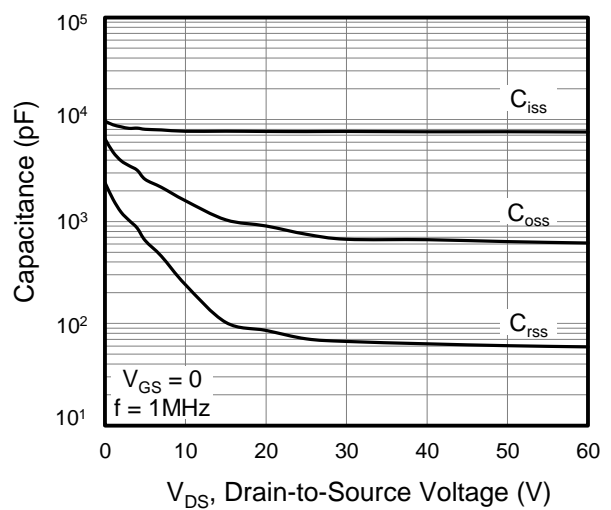


Figure 5. Gate Charge

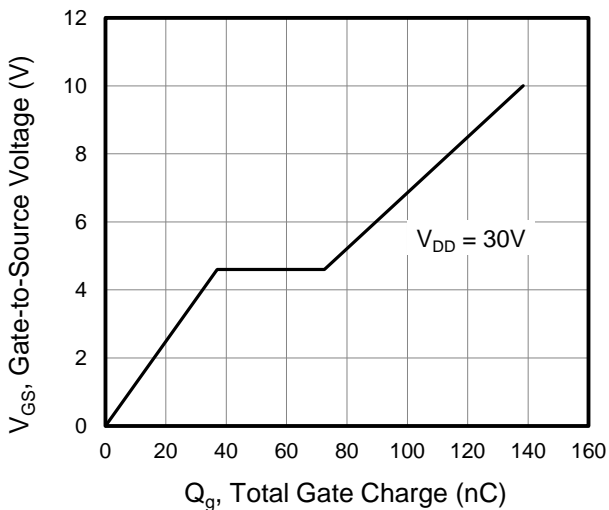
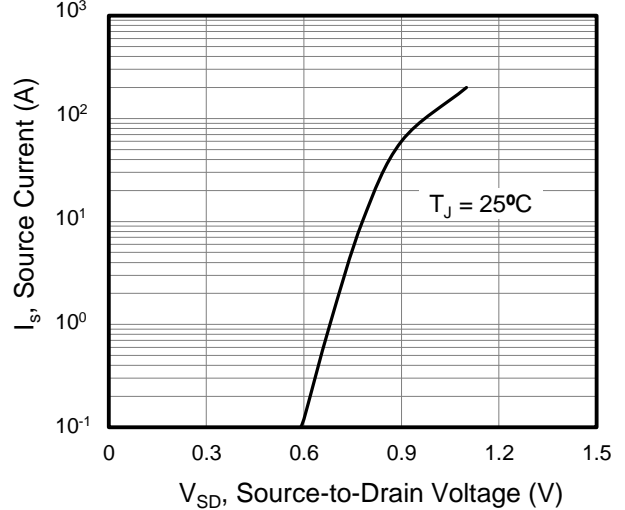


Figure 6. Body Diode Forward Voltage





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

Figure 7. On-Resistance vs. Junction Temperature

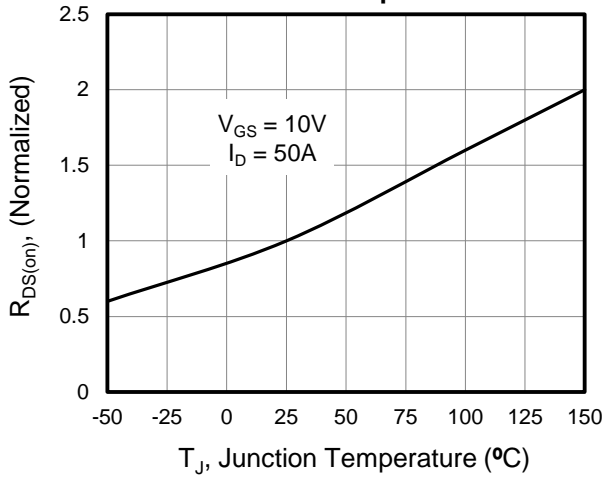


Figure 8. Threshold Voltage vs. Junction Temperature

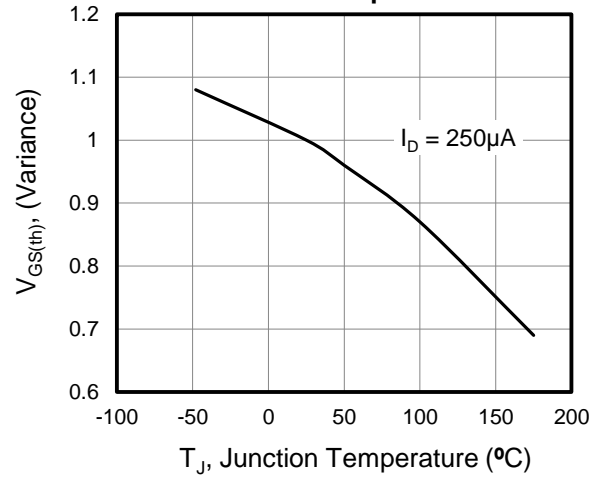


Figure 9. Transient Thermal Impedance

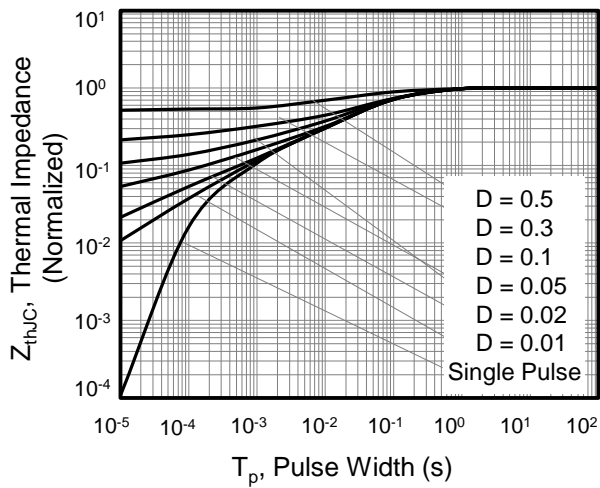




Figure A: Gate Charge Test Circuit and Waveform

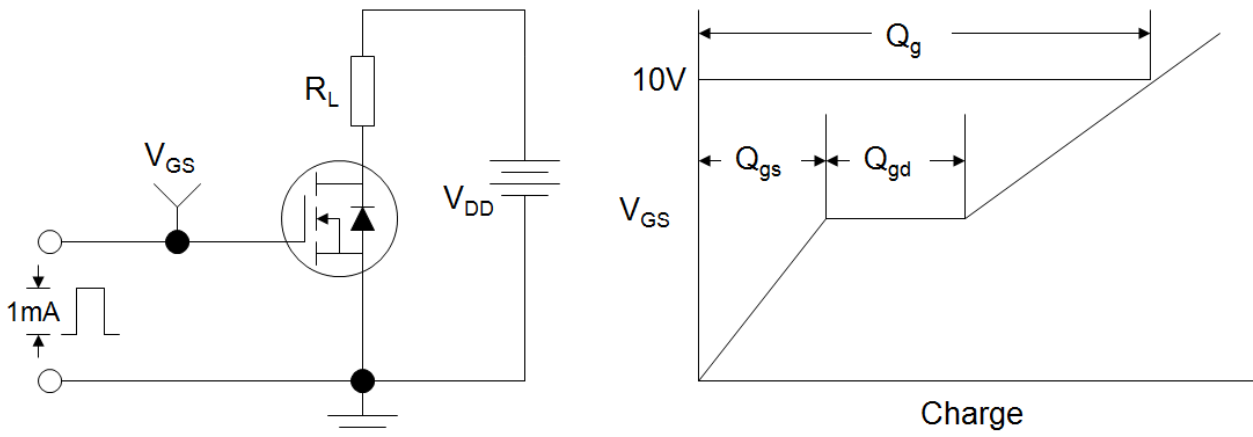
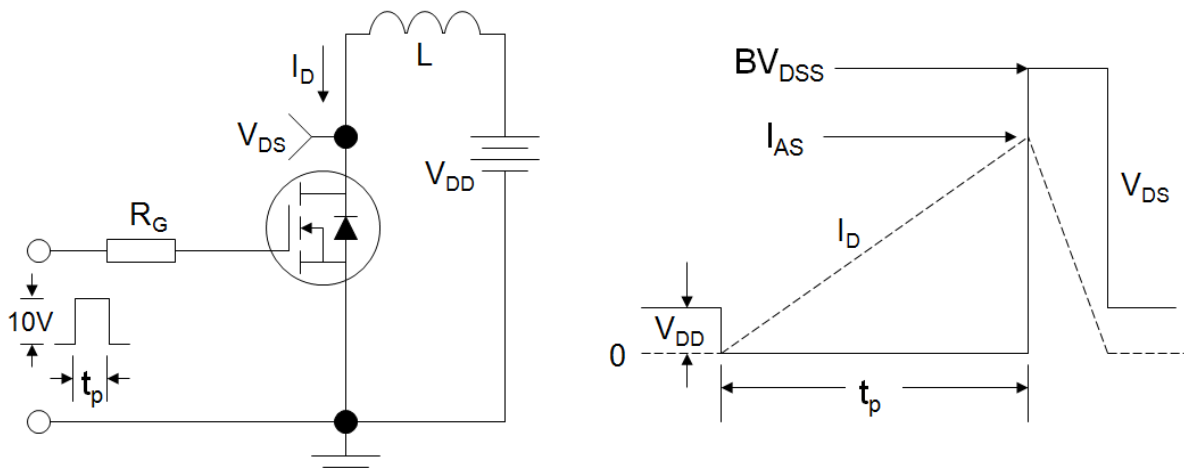


Figure B: Resistive Switching Test Circuit and Waveform

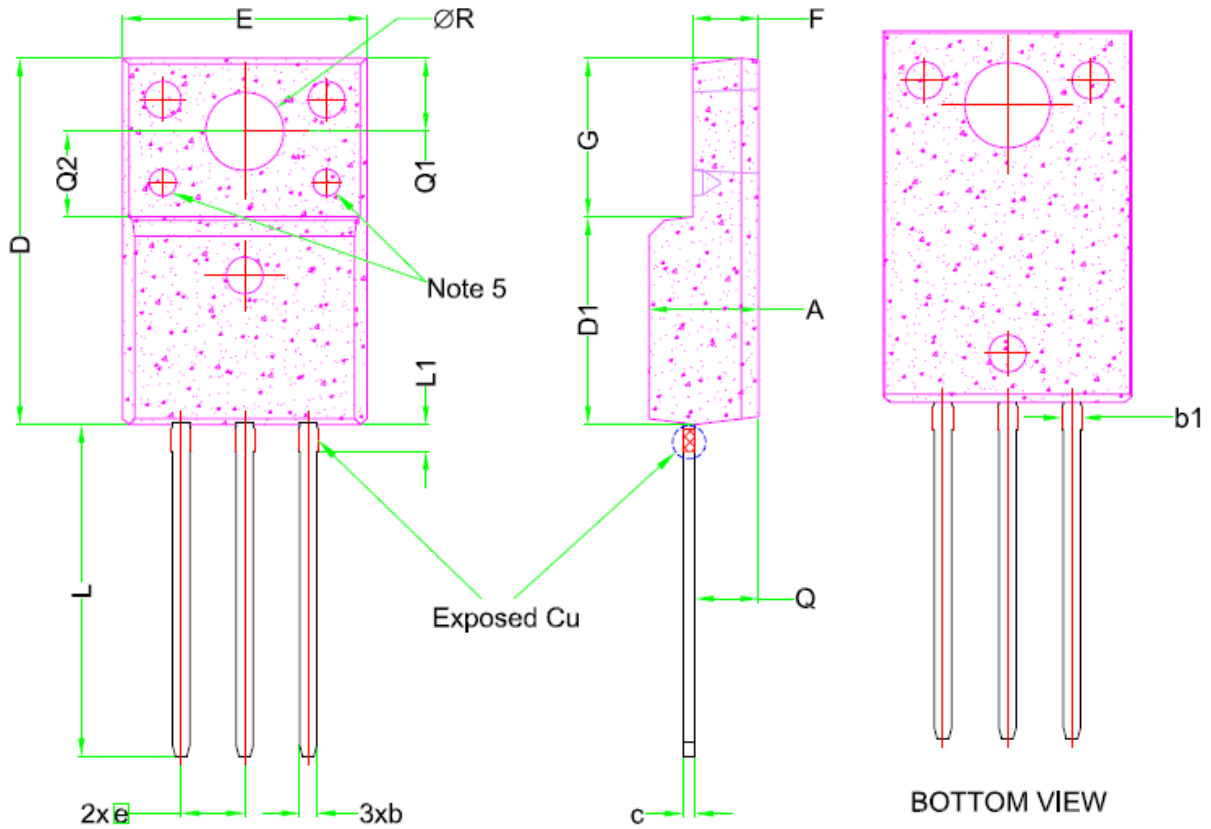


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





TO-220FP-NL



	Unit:mm	
Symbol	Min.	Max.
A	4.30	4.70
b	0.60	0.80
b1	0.60	0.90
c	0.45	0.60
D	14.70	15.30
D1	8.50REF	
e	2.60BSC	
E	9.70	10.30

	Unit:mm	
Symbol	Min.	Max.
F	2.50	2.90
G	6.30	6.70
L	13.40	13.80
L1	1.00	1.20
Q	2.50	2.70
Q1	2.90	3.10
Q2	3.50REF	
ϕR	3.00	3.40



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