

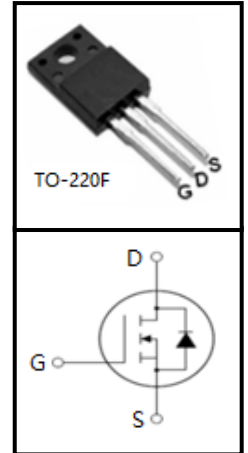
500V N-Channel MOSFET

FEATURES

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)



Device Marking and Package Information		
Device	Package	Marking
CS13N50FF	TO-220F	CS13N50FF

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}	500	V
Continuous Drain Current	I_D	13	A
Pulsed Drain Current (note1)	I_{DM}	52	A
Gate-Source Voltage	V_{GSS}	± 30	V
Single Pulse Avalanche Energy (note2)	E_{AS}	352.8	mJ
Avalanche Current (note1)	I_{AS}	8.4	A
Repetitive Avalanche Energy (note1)	E_{AR}	1.4	mJ
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	49	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}	2.55	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62.5	

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

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	500	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 500V, V_{GS} = 0V, T_J = 25^{\circ}C$	--	--	1	μA
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30V$	--	--	± 100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0	--	4.0	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 6.5A$	--	0.39	0.46	Ω
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0V,$ $V_{DS} = 25V,$ $f = 1.0MHz$	--	1569	--	pF
Output Capacitance	C_{oss}		--	171	--	
Reverse Transfer Capacitance	C_{rss}		--	5	--	
Internal Gate Resistance	R_g		--	3.1	--	Ω
Total Gate Charge	Q_g	$V_{DD} = 400V, I_D = 13A,$ $V_{GS} = 10V$	--	30.9	--	nC
Gate-Source Charge	Q_{gs}		--	7.8	--	
Gate-Drain Charge	Q_{gd}		--	10.6	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 250V, I_D = 13A,$ $R_G = 25\Omega$	--	43.2	--	ns
Turn-on Rise Time	t_r		--	24.8	--	
Turn-off Delay Time	$t_{d(off)}$		--	131.8	--	
Turn-off Fall Time	t_f		--	42.6	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	$T_C = 25^{\circ}C$	--	--	13	A
Pulsed Diode Forward Current	I_{SM}		--	--	52	
Body Diode Voltage	V_{SD}	$T_J = 25^{\circ}C, I_{SD} = 6.5A, V_{GS} = 0V$	--	--	1.4	V
Reverse Recovery Time	t_{rr}	$V_R = 250V, I_S = 13A,$ $di_F/dt = 100A/\mu s$	--	307	--	ns
Reverse Recovery Charge	Q_{rr}		--	3.5	--	μC

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 10.0mH, V_{DD} = 50V, R_G = 25 \Omega$, 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 ($T_J = 25^\circ\text{C}$)

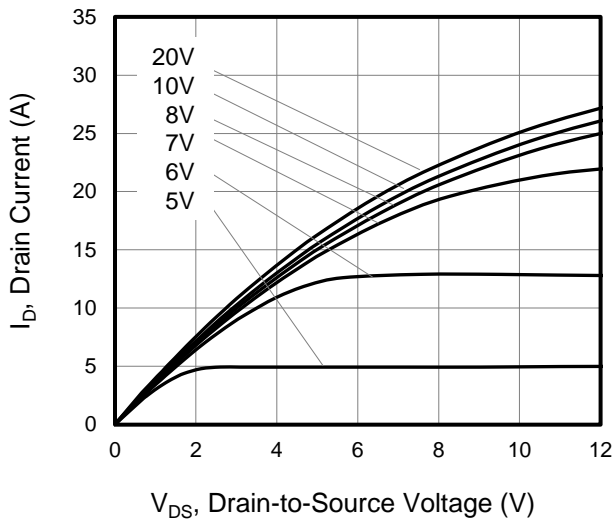


Figure 2. Body Diode Forward Voltage

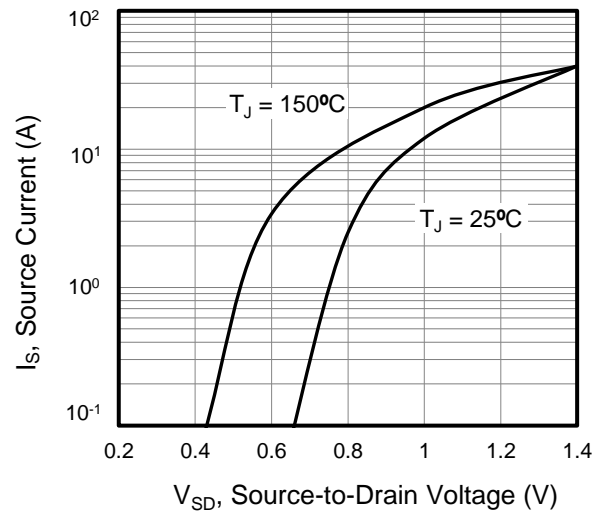


Figure 3. Drain Current vs. Temperature

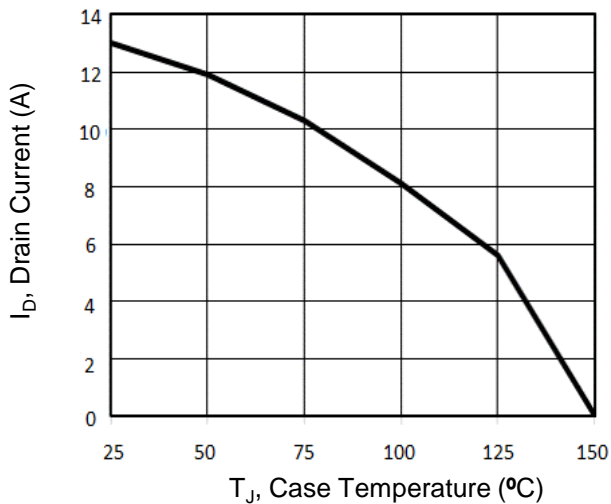


Figure 4. BV_{DSS} Variation vs. Temperature

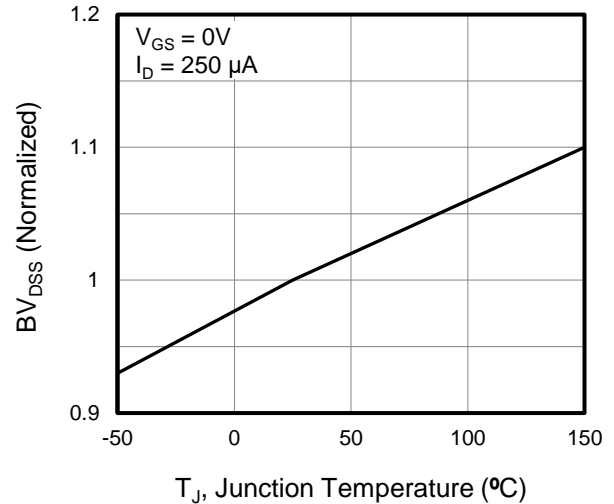


Figure 5. Transfer Characteristics

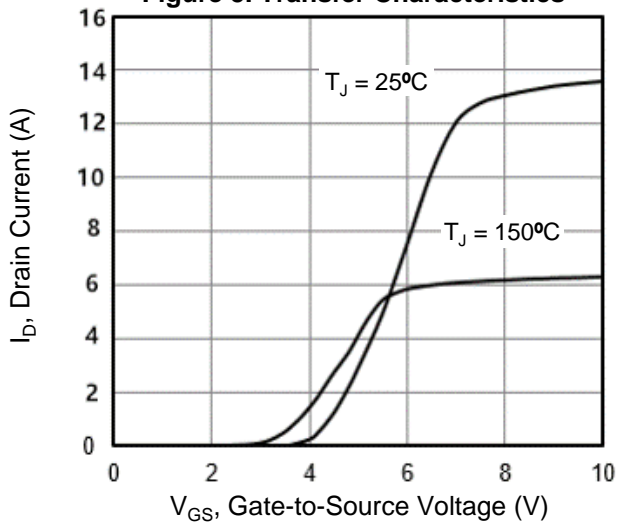
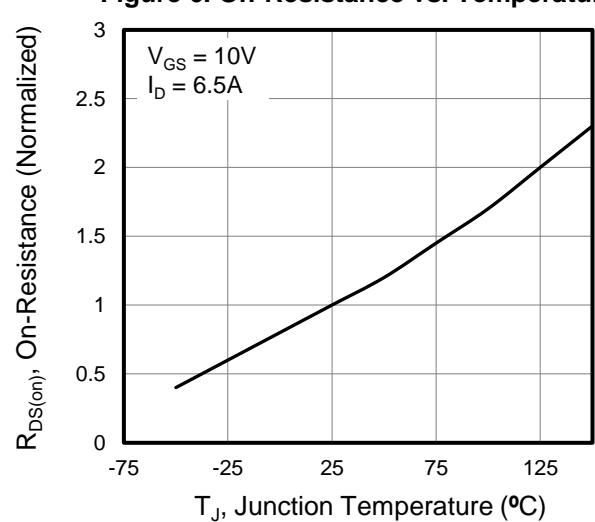


Figure 6. On-Resistance vs. Temperature



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

Figure 7. Capacitance

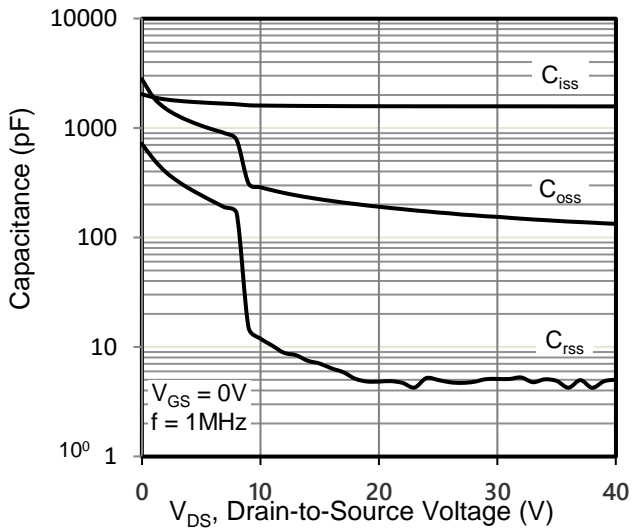


Figure 8. Gate Charge

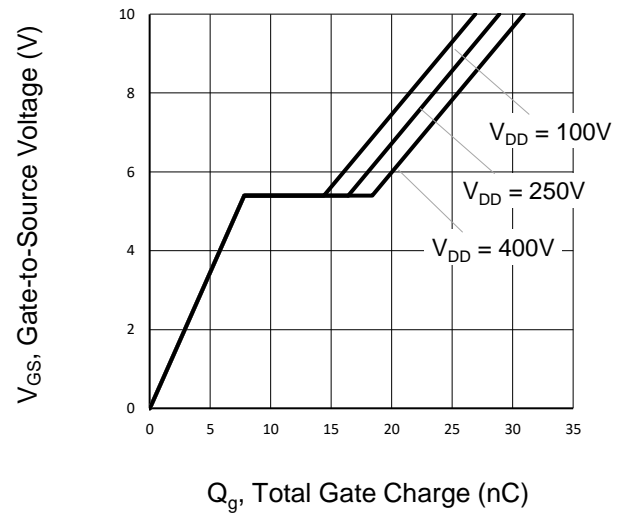


Figure 9. Transient Thermal Impedance

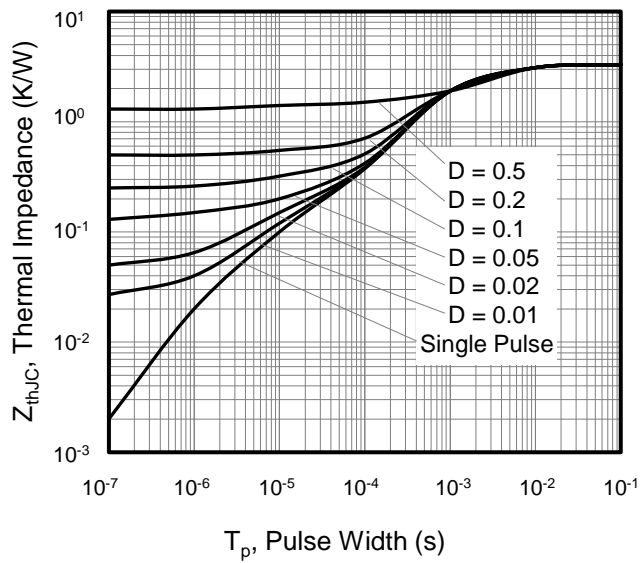
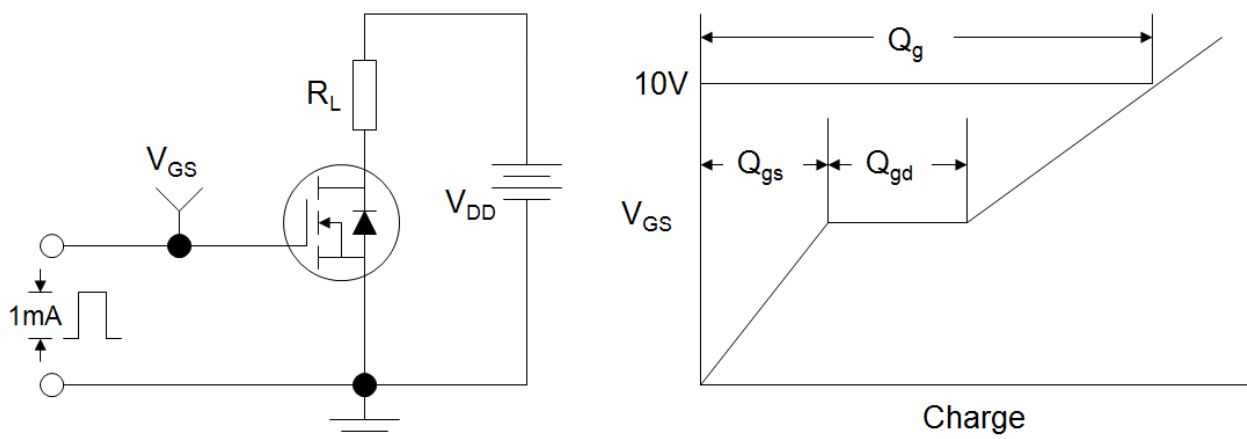
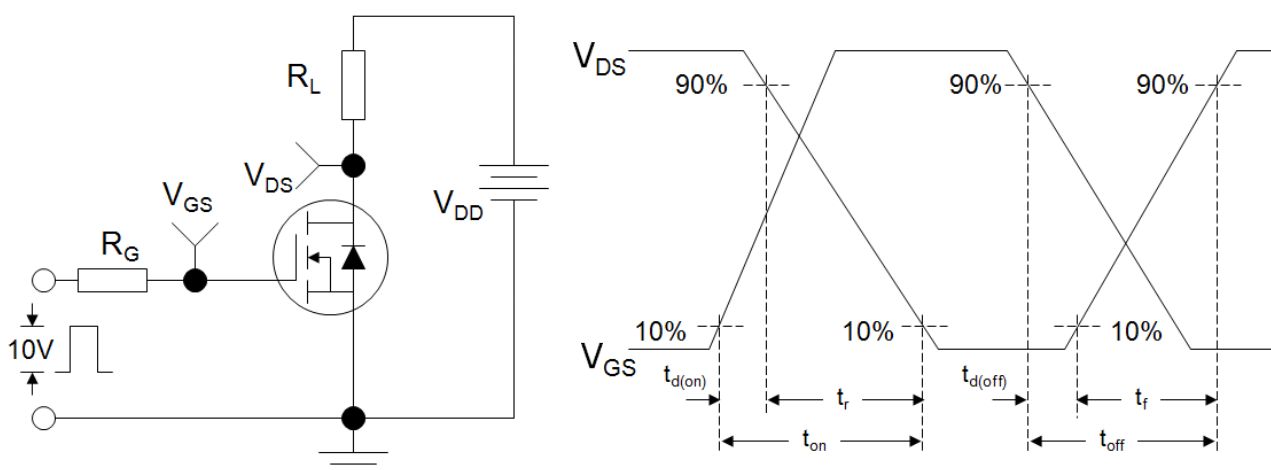
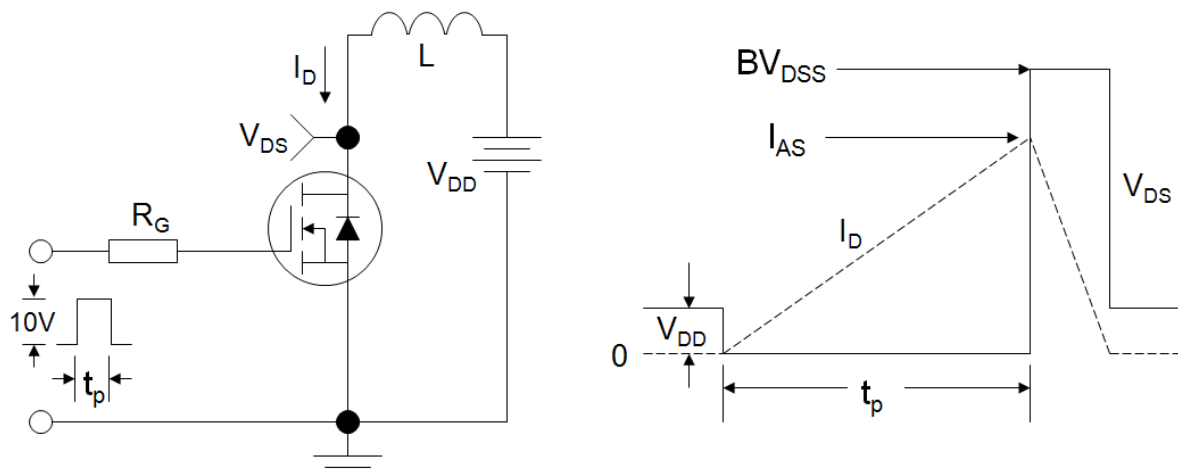
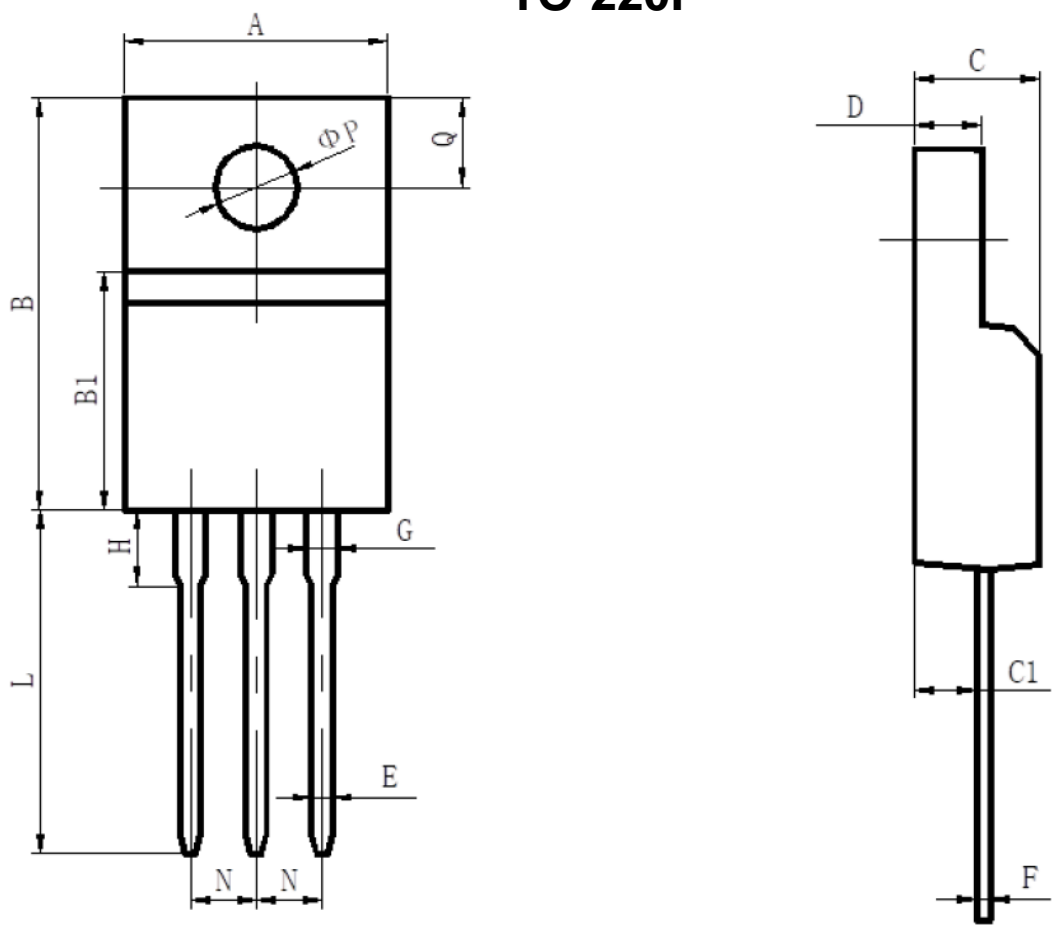


Figure A: Gate Charge Test Circuit and Waveform

Figure B: Resistive Switching Test Circuit and Waveform

Figure C: Unclamped Inductive Switching Test Circuit and Waveform


TO-220F



SYMBOLS	MILLIMETERS	
	MIN	MAX
A	9.70	10.30
B	15.50	16.10
B1	8.99	9.39
C	4.40	4.80
C1	2.15	2.55
D	2.50	2.90
E	0.70	0.90
F	0.40	0.60
G	1.12	1.42
H	3.40	3.80
L	12.60	13.60
N	2.34	2.74
Q	3.15	3.55
ΦP	3.00	3.30

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