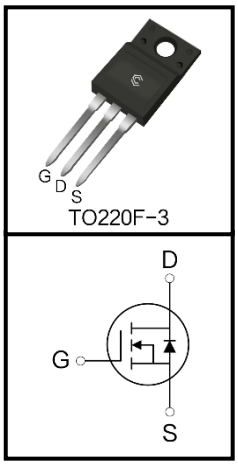
500V N-Channel MOSFET



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	TO220F-3	CS13N50FF

Absolute Maximum Ratings T_C = 25℃, unless otherwise noted

Parameter		Symbol	Value	Unit
Drain-Source Voltage (V_{GS} = 0V)		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}	304.2	mJ
Avalanche Current	(note1)	I_{AS}	7.8	A
Repetitive Avalanche Energy	(note1)	E_{AR}	1.2	mJ
Power Dissipation (T_C = 25℃)		P_D	41.9	W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55~+150	℃

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}	2.98	℃/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62.5	

Specifications T_J = 25℃, 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 = 250μA	500	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 500V, V_{GS} = 0V, T_J = 25℃	--	--	1	μ A
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 30V	--	--	± 100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	3.0	--	4.0	V
Drain-SourceOn-Resistance (Note3)	$R_{DS(on)}$	V_{GS} = 10V, I_D = 6.5A	--	0.39	0.46	Ω
Dynamic						
Input Capacitance	C_{iss}	VGS = 0V, VDS = 25V, f = 200kHz	--	1219	--	pF
Output Capacitance	C_{oss}		--	118	--	
Reverse Transfer Capacitance	C_{rss}		--	25	--	
Internal Gate Resistance	Rg		--	3	--	Ω
Total Gate Charge	Q_g	V_{DD} = 400V, I_D = 13A, V_{GS} = 10V	--	48.5	--	nC
Gate-Source Charge	Q_{gs}		--	6.5	--	
Gate-Drain Charge	Q_{gd}		--	29	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 250V, I_D =13A, R_G = 25 Ω	--	38.5	--	ns
Turn-on Rise Time	t_r		--	7	--	
Turn-off Delay Time	$t_{d(off)}$		--	69	--	
Turn-off Fall Time	t_f		--	32	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25 ℃	--	--	13	A
Pulsed Diode Forward Current	I_{SM}		--	--	52	
Body Diode Voltage	V_{SD}	T_J = 25℃, 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 / μ s	--	323	--	ns
Reverse Recovery Charge	Q_{rr}		--	3.88	--	μ C

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 10.0mH, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25 ℃
3. Pulse Test: Pulse width ≤ 300 μ s, Duty Cycle ≤ 1%

Typical Characteristics T_J = 25℃, unless otherwise noted

Figure 1. Output Characteristics (T_J = 25℃)

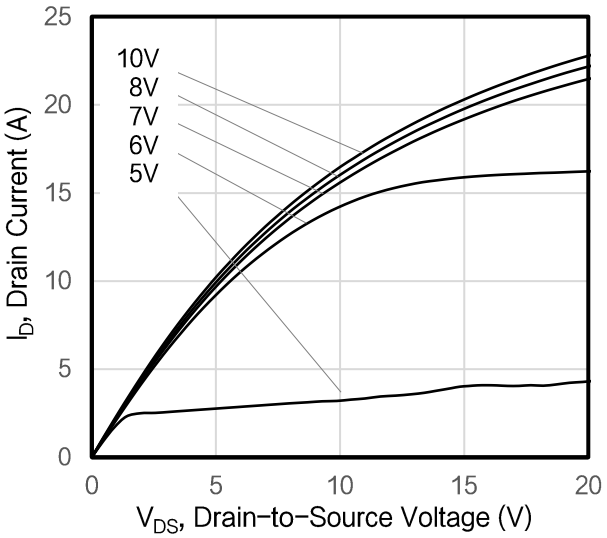


Figure 2. Body Diode Forward Voltage

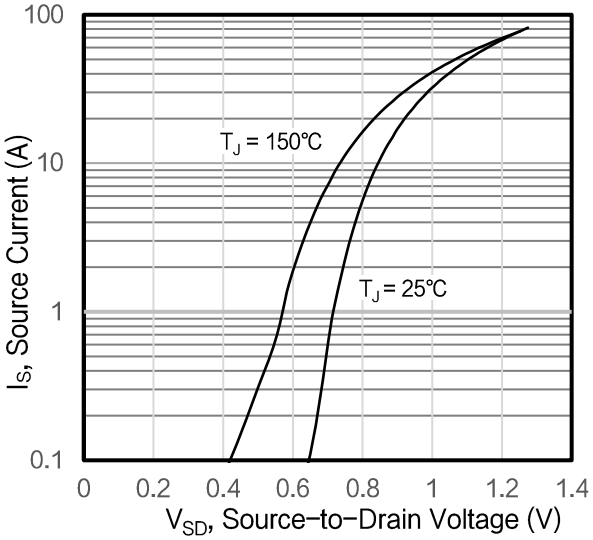


Figure 3. Drain Current vs. Temperature

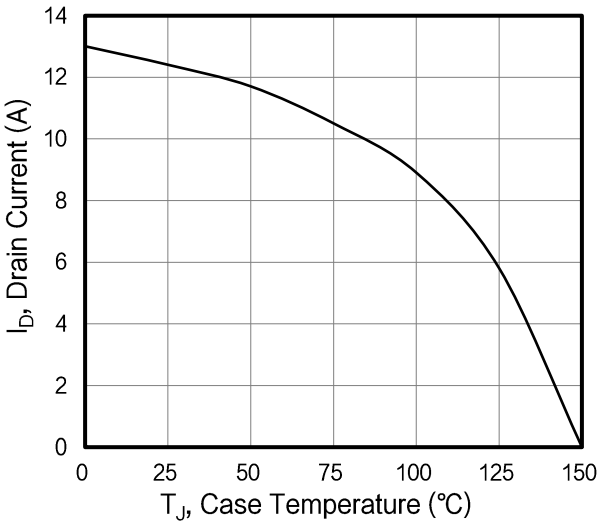


Figure 4. BV_{DSS} Variation vs. Temperature

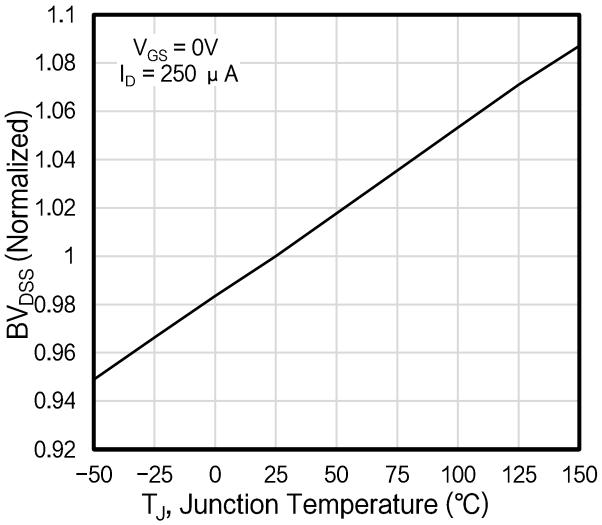


Figure 5. Transfer Characteristics

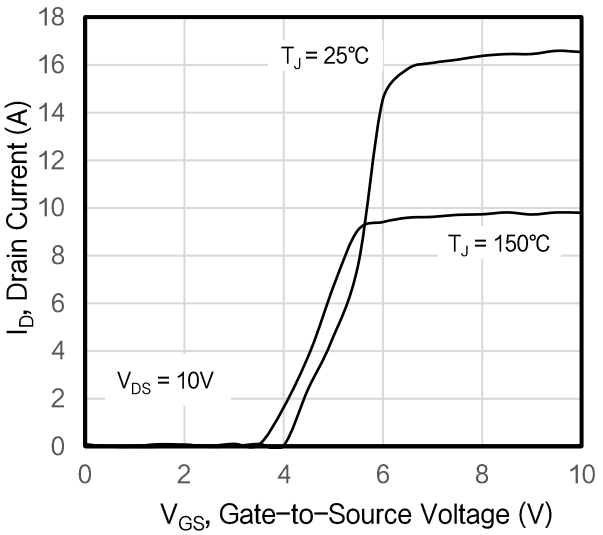
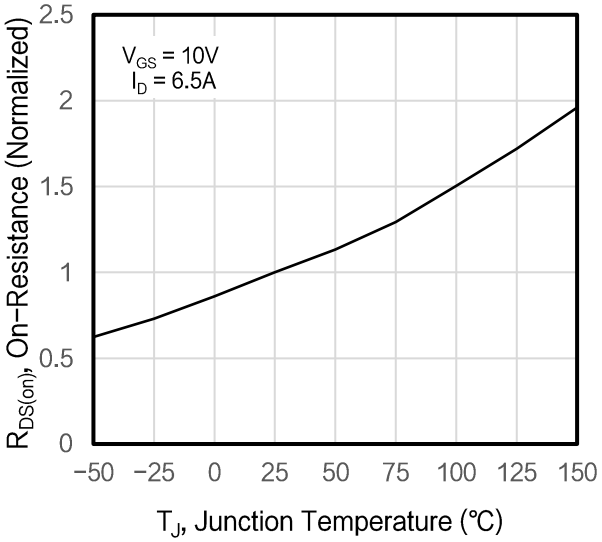


Figure 6. On-Resistance vs. Temperature



Typical Characteristics T_J = 25℃, unless otherwise noted

Figure 7. Capacitance

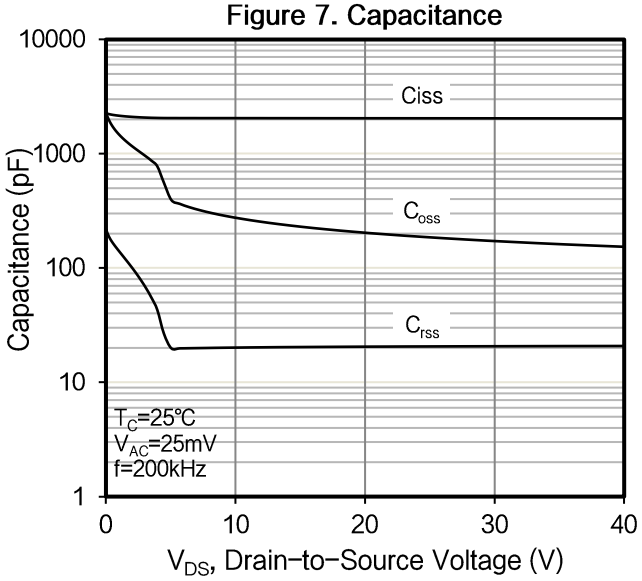


Figure 8. Gate Charge

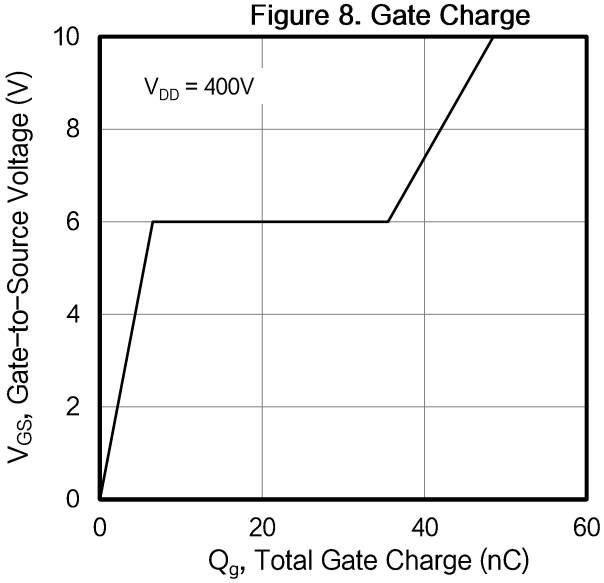


Figure 9. Transient Thermal Impedance

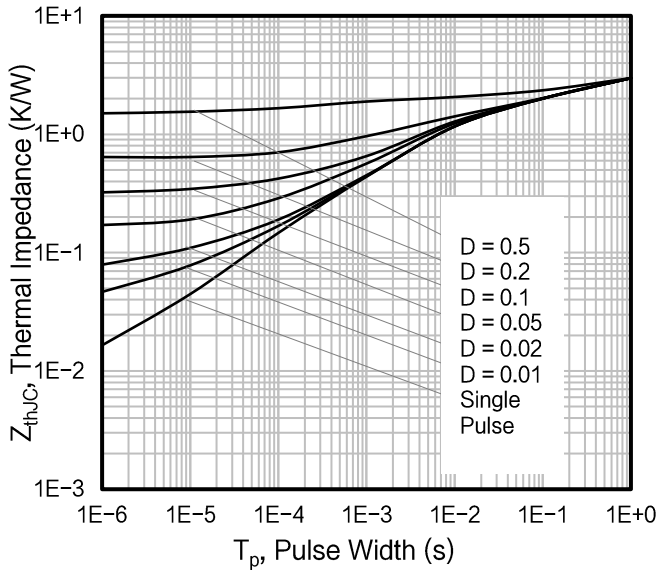


Figure A：Gate Charge Test Circuit and Waveform

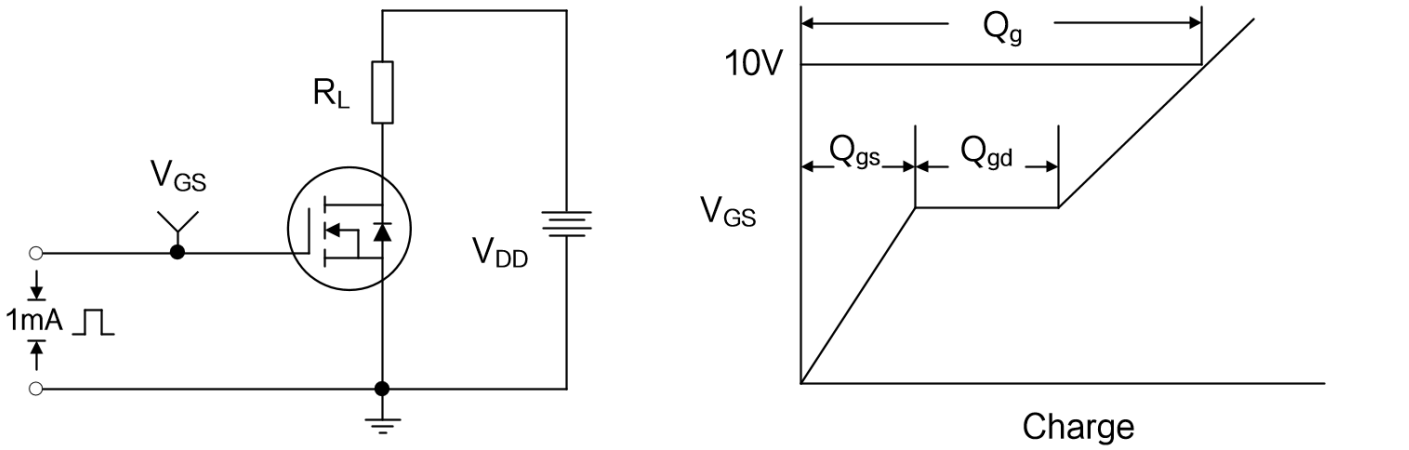


Figure B：Resistive Switching Test Circuit and Waveform

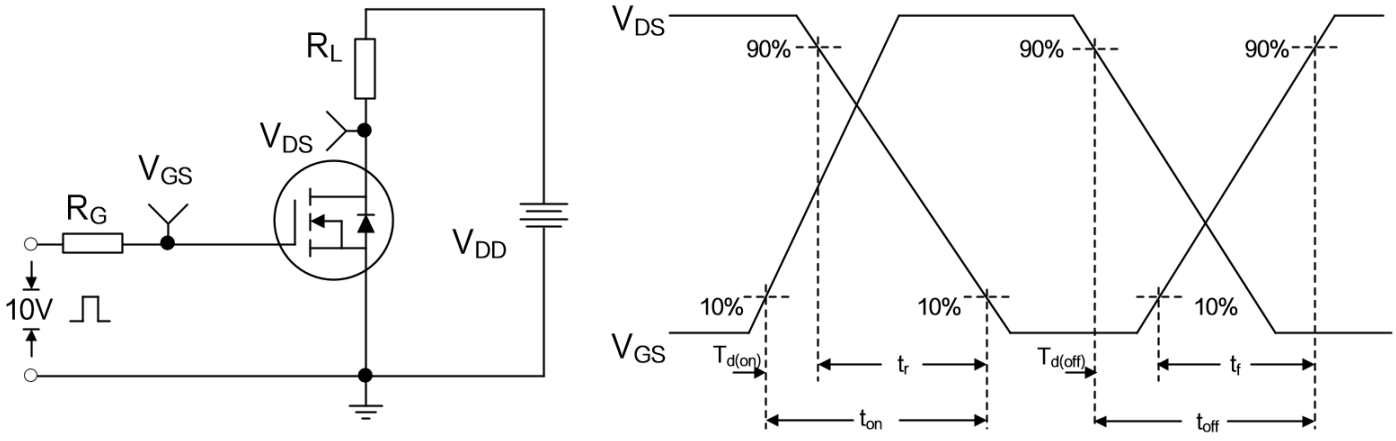
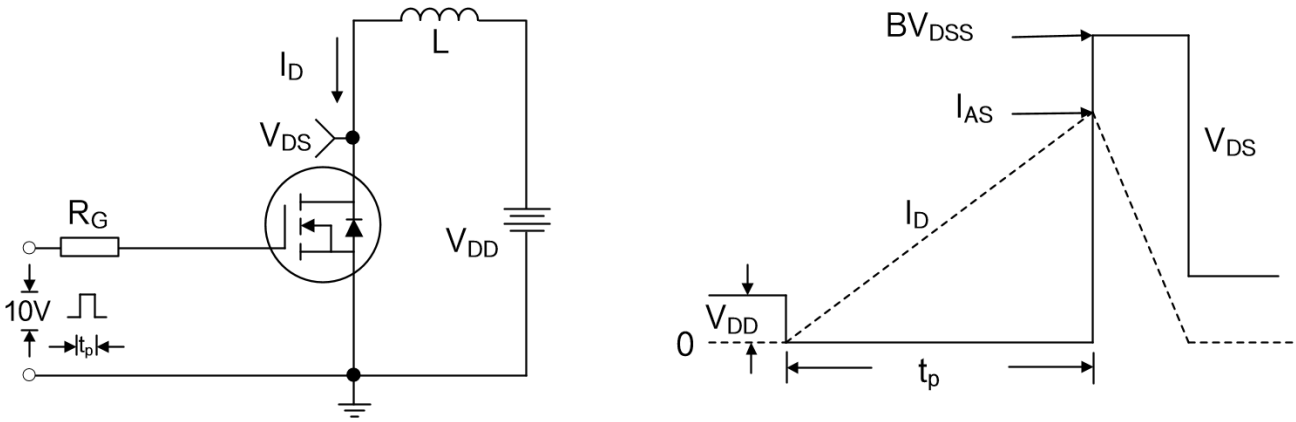
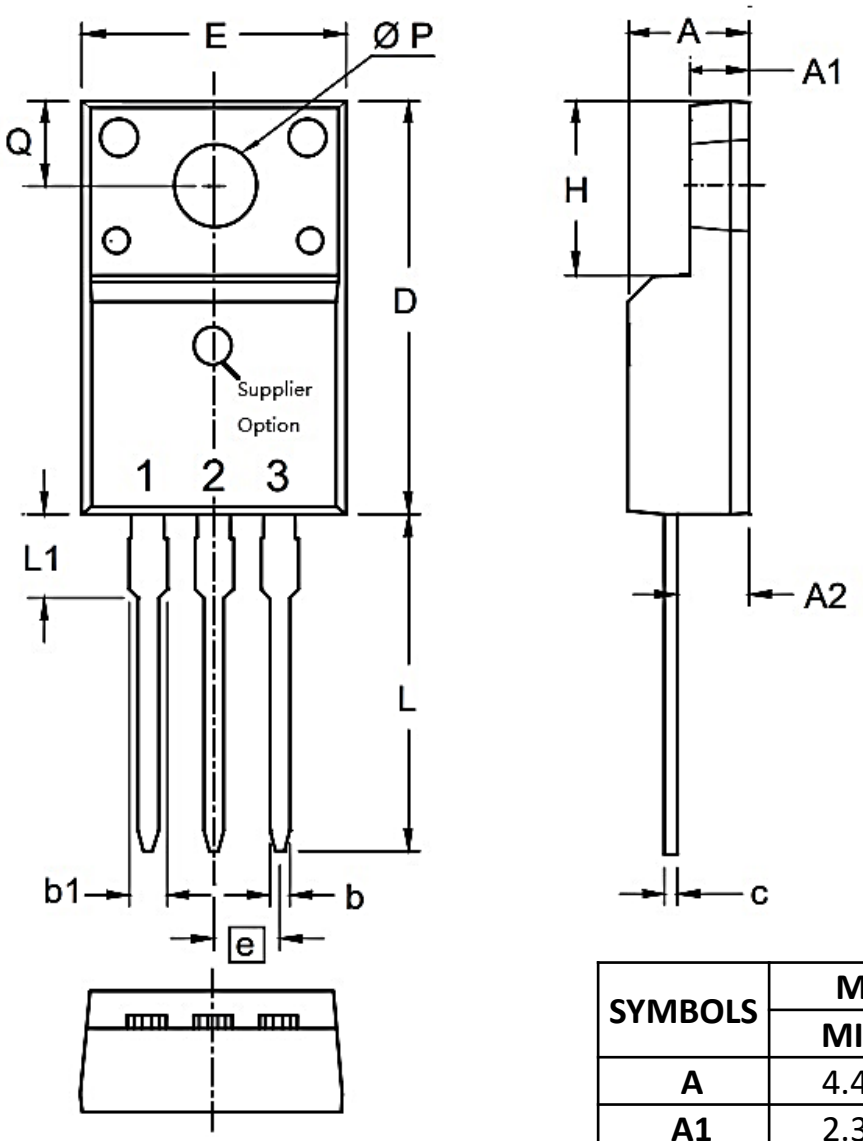


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



TO220F-3



SYMBOLS	MILLIMETERS	
	MIN	MAX
A	4.40	4.90
A1	2.34	2.90
A2	2.56	2.96
A3	9.30	9.80
b	0.70	0.95
b1	1.08	1.55
c	0.40	0.65
D	15.50	16.17
E	9.70	10.46
e	2.54REF	
H	6.28	7.08
L	12.32	14.02
L1	2.63	3.50
ΦP	2.90	3.50
Q	3.10	3.50

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