

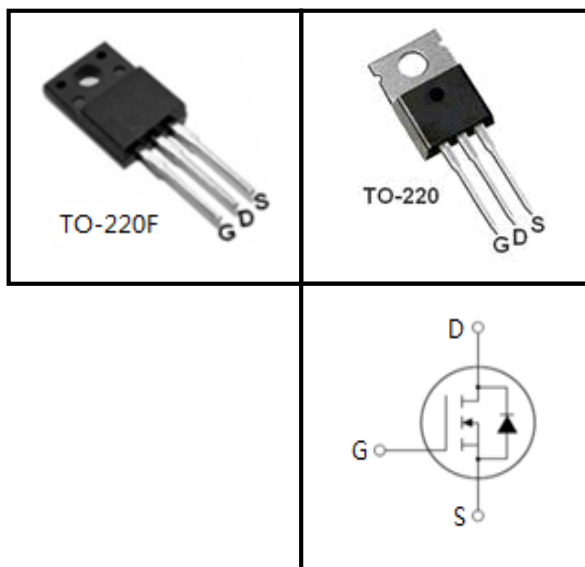
650V N-Channel MOSFET

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
CS13N65F	TO-220F	CS13N65F
CS13N65P	TO-220P	CS13N65P

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Value		Unit
		TO-220F	TO-220	
Drain-Source Voltage ($V_{GS} = 0V$)	V_{DSS}	650		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}	387		mJ
Avalanche Current (note1)	I_{AS}	8.8		A
Repetitive Avalanche Energy (note1)	E_{AR}	232		mJ
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	70	65	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	$-55 \sim +150$		$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Value		Unit
		TO-220F	TO-220	
Thermal Resistance, Junction-to-Case	R_{thJC}	1.78	0.89	K/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62.5	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 = 250μA	650	--	--	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 650V, V _{GS} = 0V, T _J = 25°C	--	--	1	μA
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-Source On-Resistance (Note3)	R _{DS(on)}	V _{GS} = 10V, I _D = 6.5A	--	0.52	0.65	Ω
Dynamic						
Input Capacitance	C _{iss}	V _{GS} = 0V, V _{DS} = 25V, f = 1.0MHz	--	1779	--	pF
Output Capacitance	C _{oss}		--	183	--	
Reverse Transfer Capacitance	C _{rss}		--	25	--	
Total Gate Charge	Q _g	V _{DD} = 520V, I _D = 13A, V _{GS} = 10V	--	62	--	nC
Gate-Source Charge	Q _{gs}		--	9	--	
Gate-Drain Charge	Q _{gd}		--	32	--	
Turn-on Delay Time	t _{d(on)}	V _{DD} = 325V, I _D =13A, R _G = 25 Ω	--	49	--	ns
Turn-on Rise Time	t _r		--	38	--	
Turn-off Delay Time	t _{d(off)}		--	245	--	
Turn-off Fall Time	t _f		--	114	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I _S	T _C = 25 °C	--	--	13	A
Pulsed Diode Forward Current	I _{SM}		--	--	52	
Body Diode Voltage	V _{SD}	T _J = 25°C, I _{SD} = 6.5A, V _{GS} = 0V	--	--	1.4	V
Reverse Recovery Time	t _{rr}	V _{GS} = 0V, I _S = 13A, di _F /dt =100A /μs	--	582	--	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 ($T_J = 25^\circ\text{C}$)

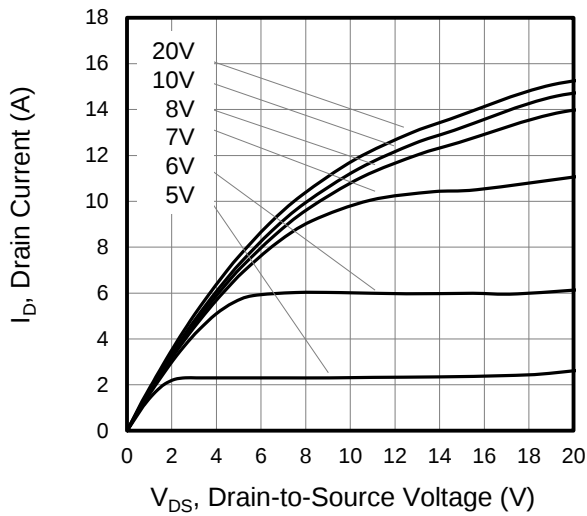


Figure 2. Body Diode Forward Voltage

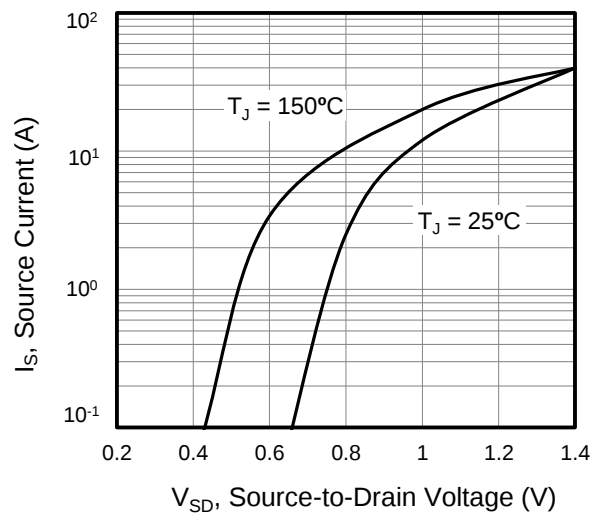


Figure 3. Drain Current vs. Temperature

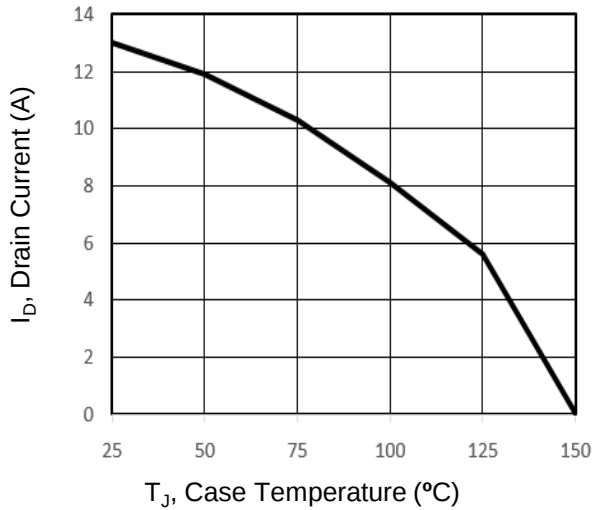


Figure 4. BV_{DSS} Variation vs. Temperature

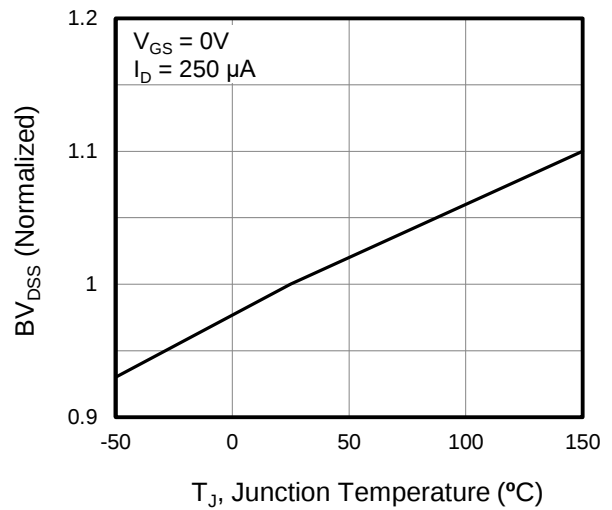


Figure 5. Transfer Characteristics

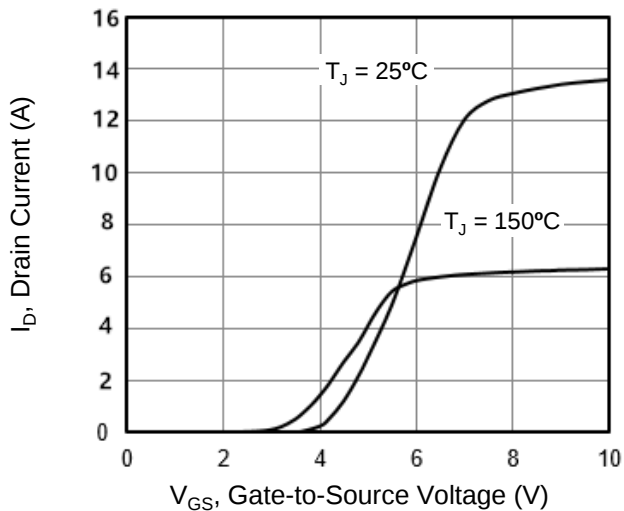
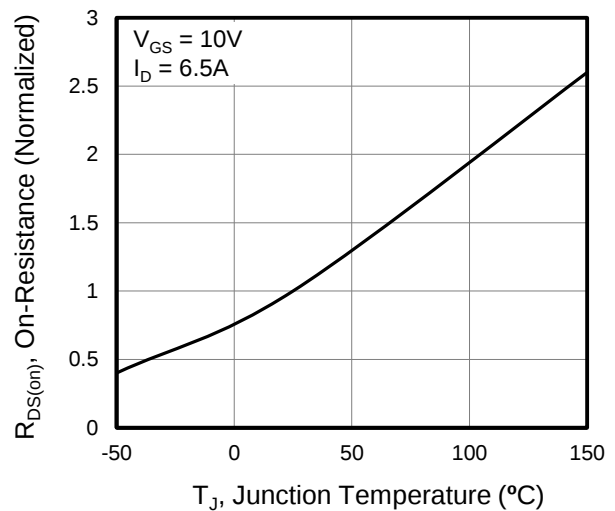


Figure 6. On-Resistance vs. Temperature



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

Figure 7. Capacitance

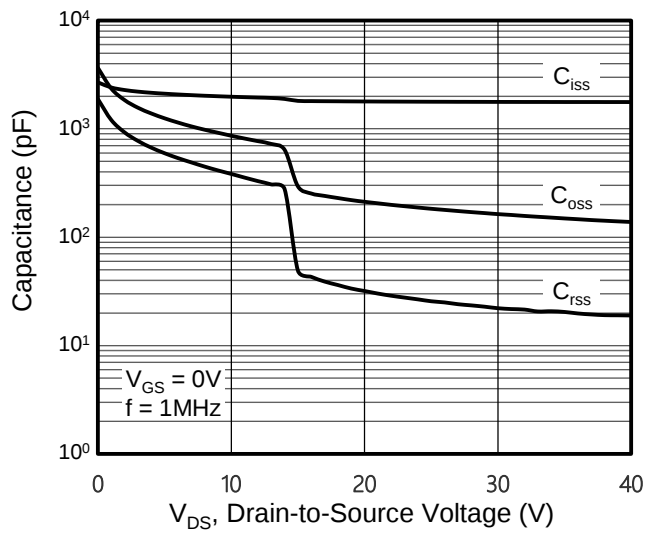


Figure 8. Gate Charge

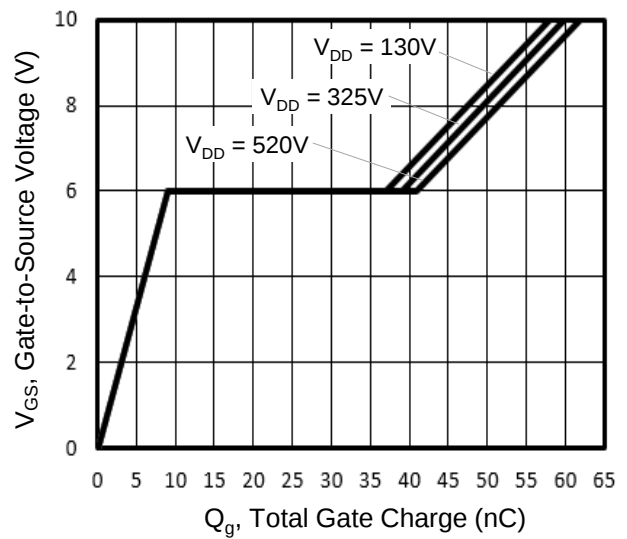


Figure 9. Transient Thermal Impedance
TO-220F

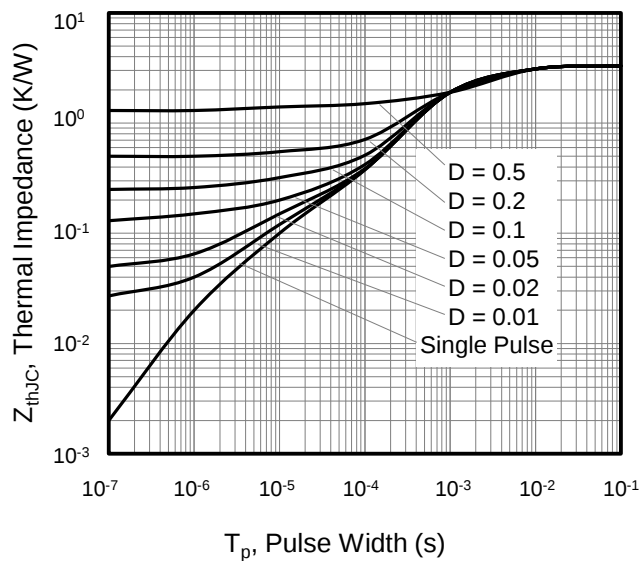


Figure 10. Transient Thermal Impedance
TO-220

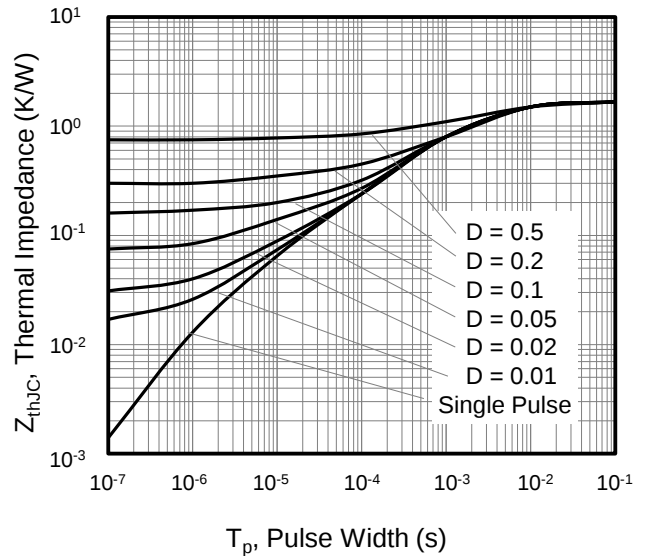


Figure A: Gate Charge Test Circuit and Waveform



Figure B: Resistive Switching Test Circuit and Waveform

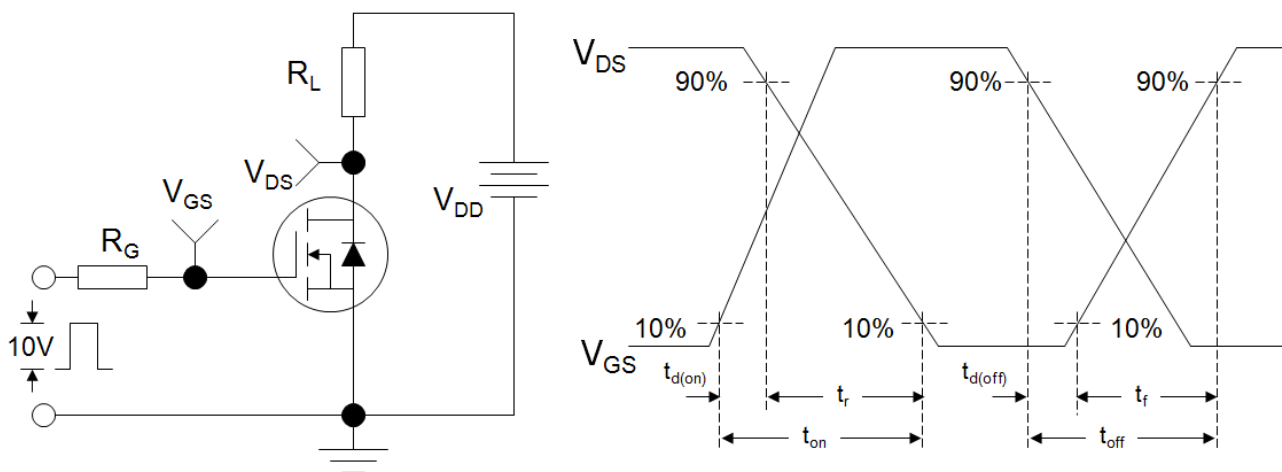


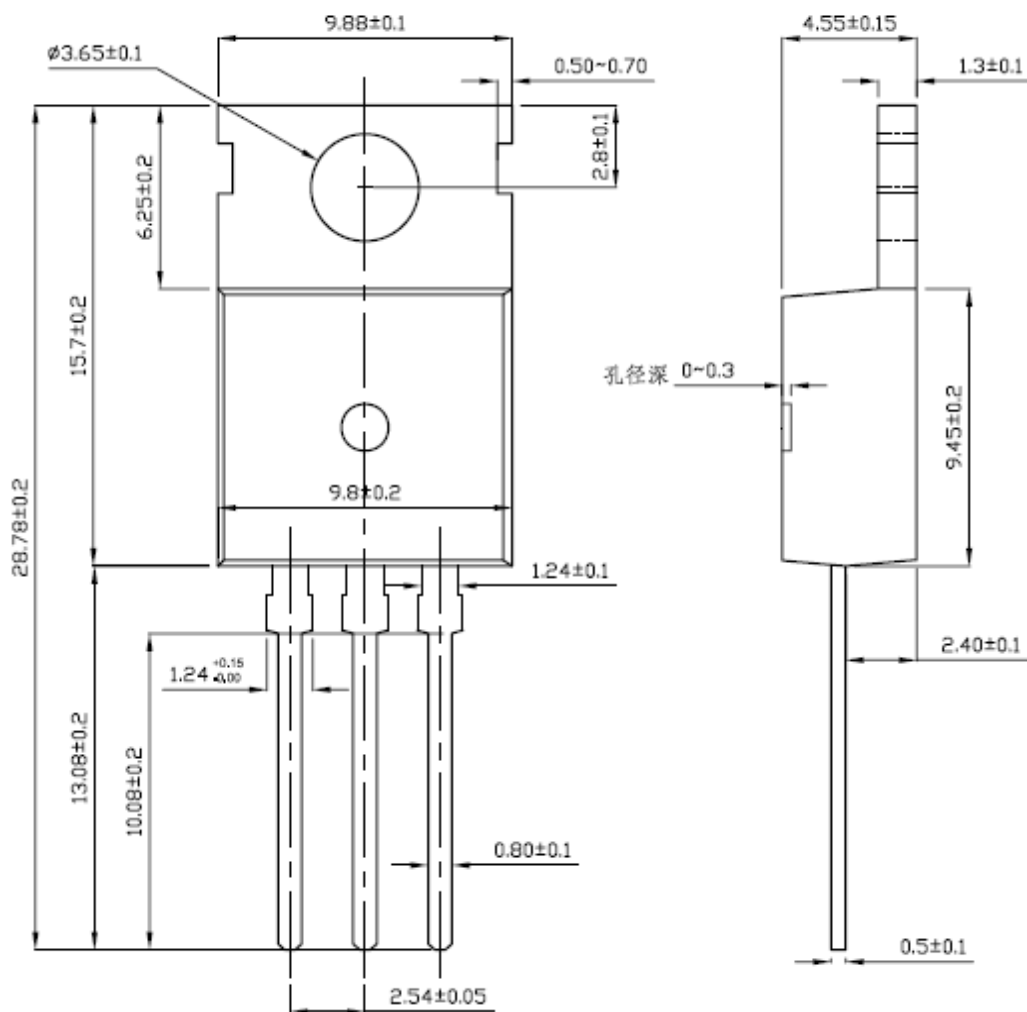
Figure C: Unclamped Inductive Switching Test Circuit and Waveform



TO-220F



TO-220



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