

N-Channel MOSFET

Features:

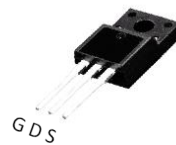
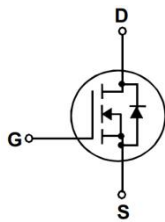
- RoHS Compliant
- Low RDS(on) & FOM
- Excellent stability and uniformity
- Extremely low switching loss
- Peak Current vs Pulse Width Curve

Applications:

- Adaptor
- Charger
- Lighting
- Power Supply

$V_{DSS}(\text{Min.})$	500V
$R_{DS(ON)}(\text{Typ.})$	0.35Ω
I_D	13A

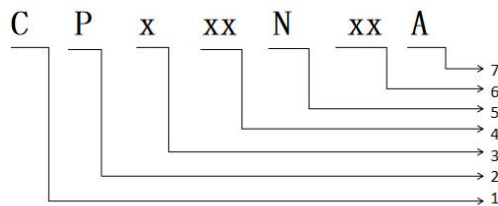
Schematic and Package Information:



TO-220F
CPF13N50A

Marking on the body:

VD MOSFET tube naming rules



- 1: CYS for short
- 2: P - plane MOS
- 3: Package
 - F: TO-220F P: TO-220 D: TO-252
 - U: TO-251 W: TO-247S/3P E: SOP-8
 - G: DFN5*6 K: DFN3.3*3.3
- 4: Current (above 200V)
- 5: N: N channel P: P channel
- 6: Maximum breakdown voltage (10% of BVdss)
- 7: Series no.

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

Parameter	Symbol	CPx13N50A	Units
		TO-220F	
Drain-to-Source Voltage	V_{DSS}	500	V
Continuous Drain Current	I_D	13	A
Pulsed Drain Current, $V_{GS}@10V$ (NOTE *1)	I_{DM}	52	A
Power Dissipation	P_D	48	W
Derating Factor above 25°C		0.38	W/ $^\circ\text{C}$
Gate-to-Source Voltage	V_{GS}	± 20	V
Single Pulse Avalanche Energy (L=10mH)	E_{AS}	1125	mJ
Peak Diode Recovery dv/dt	dv/dt	5	V/ns
Maximum Temperature for Soldering	T_L	300	$^\circ\text{C}$
Operating Junction and Storage Temperature Range (NOTE *2)	T_J and T_{STG}	150, -55 to 150	

Thermal Resistance

Parameter	Symbol	Typ.	Units
		TO-220F	
Junction to Case	$R_{\theta JC}$	2.6	$^{\circ}\text{C/W}$
Junction to Ambient	$R_{\theta JA}$	62.5	$^{\circ}\text{C/W}$

Electrical Characteristics $T_J=25^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Drain-to-Source Breakdown Voltage	BV_{DSS}	500	--	--	V	$V_{GS}=0V, I_D=250\mu A$
Gate Threshold Voltage	$V_{GS(TH)}$	3	3.2	4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	--	0.35	0.48	Ω	$V_{GS}=10V, I_D=6.5A$
Drain-to-Source Leakage Current	I_{DSS}	--	--	1	μA	$V_{DS}=500V, V_{GS}=0V$ $T_J=25^{\circ}\text{C}$
		--	--	100		$V_{DS}=400V, V_{GS}=0V$ $T_J=125^{\circ}\text{C}$
Gate-to-Source Forward Leakage	I_{GSS}	--	--	+100	nA	$V_{GS}=+30V$
Gate-to-Source Reverse Leakage		--	--	-100		$V_{GS}=-30V$
Forward Transconductance(NOTE *3)	g_{fs}	--	15	--	S	$V_{DS}=15V, I_D=6.5A$

Dynamic Characteristics Essentially independent of operating temperature

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input Capacitance	C_{iss}	--	1980	--	pF	$V_{GS}=0V, V_{DS}=25V$ $f=1.0\text{MHz}$
Output Capacitance	C_{oss}	--	191	--		
Reverse Transfer Capacitance	C_{rss}	--	11	--		
Total Gate Charge	Q_g	--	26.5	--	nC	$I_D=13A, V_{DD}=400V$ $V_{GS}=10V$
Gate-to-Source Charge	Q_{gs}	--	11	--		
Gate-to-Drain ("Miller") Charge	Q_{gd}	--	17	--		
Turn-on Delay Time	$t_{d(ON)}$	--	90	--	ns	$V_{DD}=250V, I_D=13A,$ $V_G=10V, R_G=25\Omega$
Rise Time	t_{rise}	--	160	--		
Turn-Off Delay Time	$t_{d(OFF)}$	--	150	--		
Fall Time	T_{fall}	--	60	--		

Source-Drain Diode Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Continuous Drain-Source Diode Forward Current	I_S	--	--	13	A	$T_C=25^{\circ}\text{C}$
Pulsed Drain-Source Diode Forward Current	I_{SM}	--	--	52		
Diode Forward Voltage	V_{SD}	--	--	1.4	V	$I_{SD}=6.5A, V_{GS}=0V$
Reverse Recovery Time	t_{rr}	--	410	--	ns	$I_F=I_S$ $di/dt=100A/\mu s$
Reverse Recovery Charge	Q_{rr}	--	4500	--	nC	

Notes:

- $T_J = +25^{\circ}\text{C}$ to $+150^{\circ}\text{C}$.
- Repetitive rating; pulse width limited by maximum junction temperature.
- Pulse width $< 380\mu s$; duty cycle $< 2\%$.

Typical Characteristics

Figure 1. Typical Output Characteristics

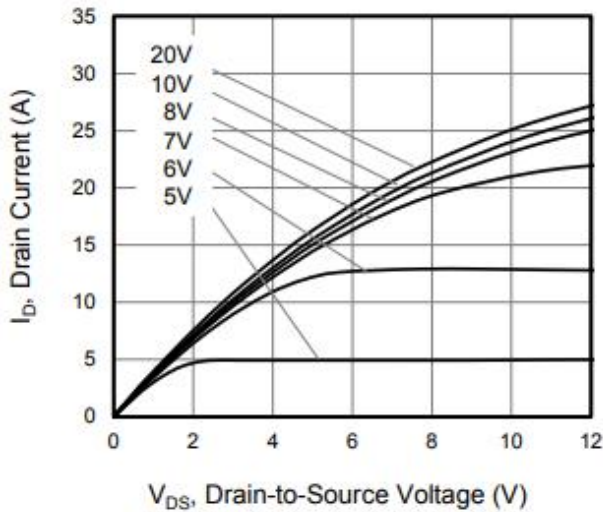


Figure 2. Body Diode Forward Voltage

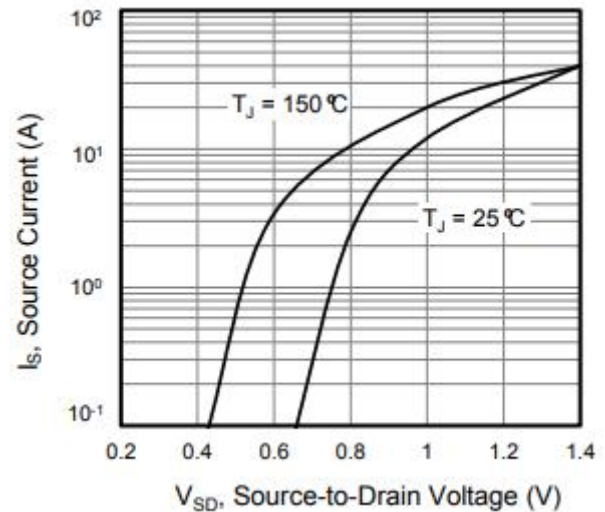


Figure 3. Drain Current vs. Temperature

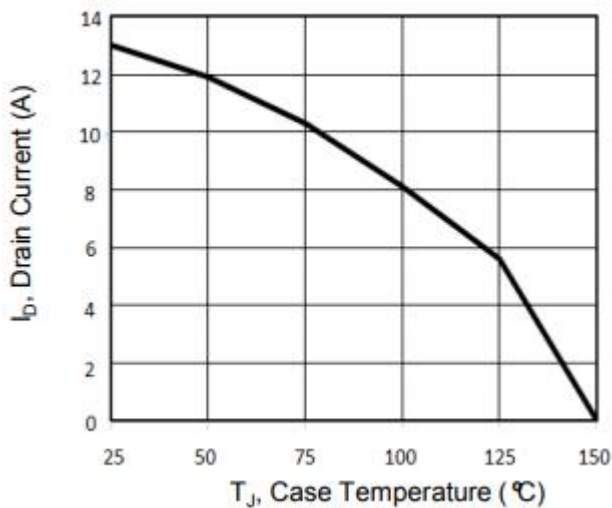


Figure 4. Power Dissipation vs. Temperature

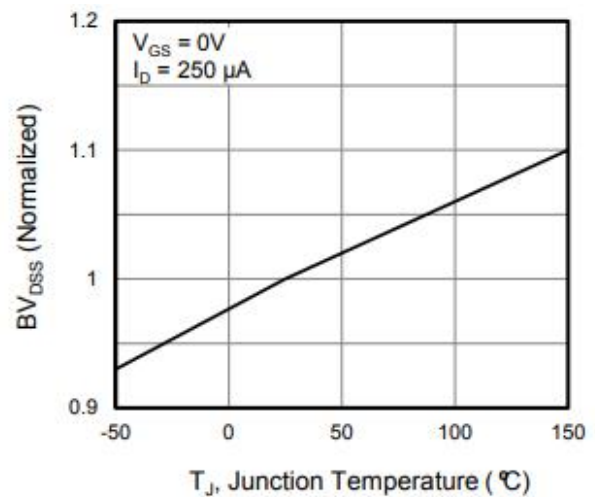


Figure 5. Transfer Characteristics

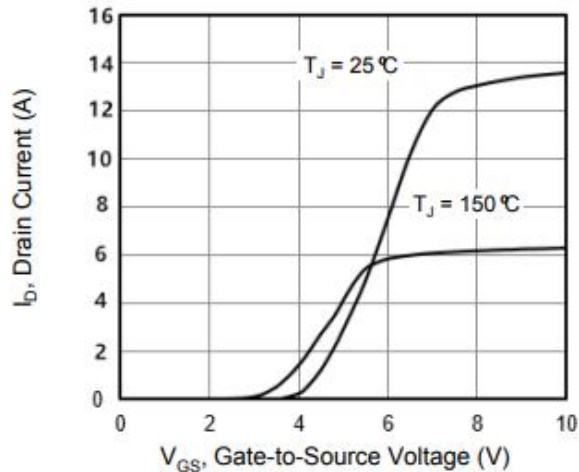


Figure 6. On-Resistance vs. Temperature

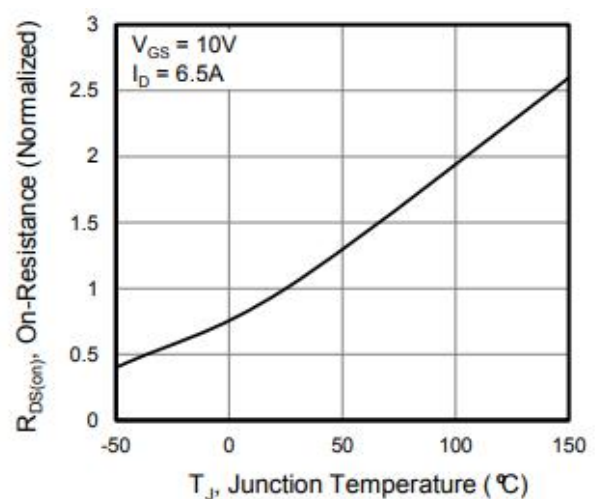


Figure 7. Capacitance

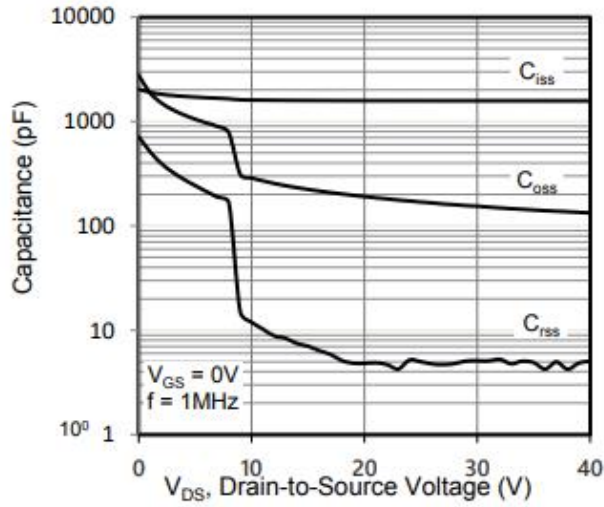


Figure 8. Gate Charge

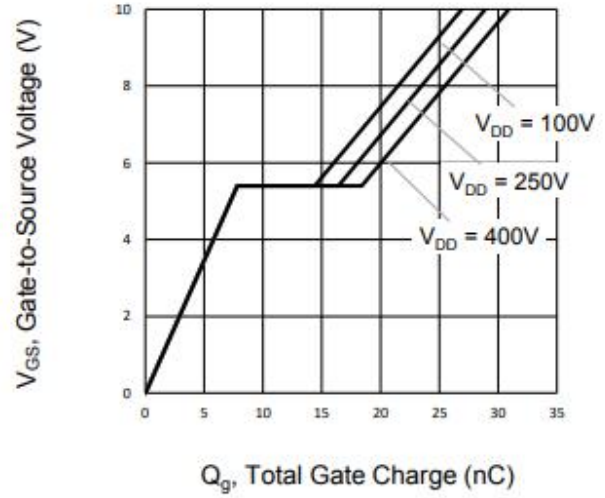
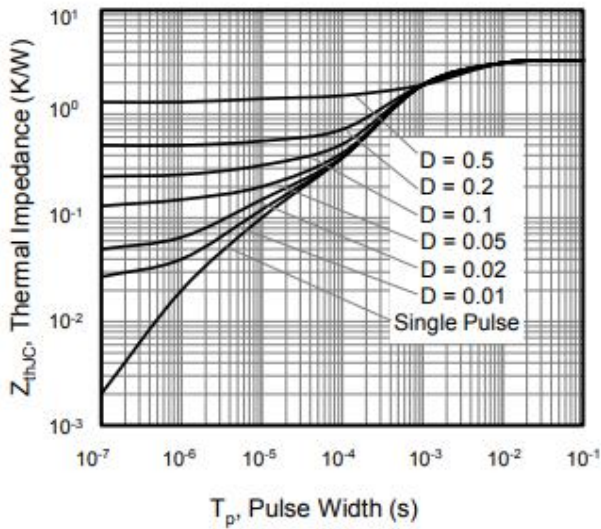
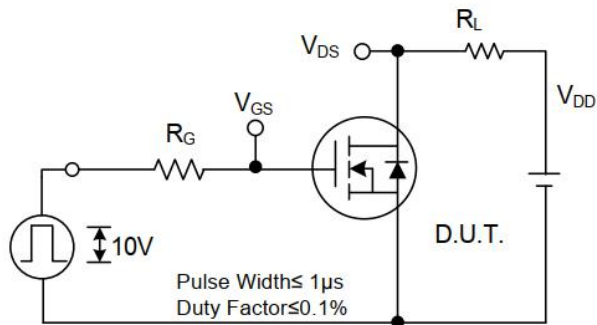


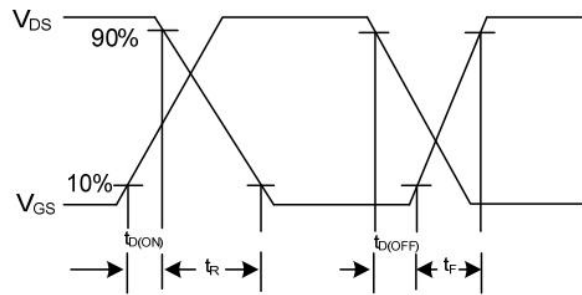
Figure 9. Transient Thermal Impedance
TO-220F



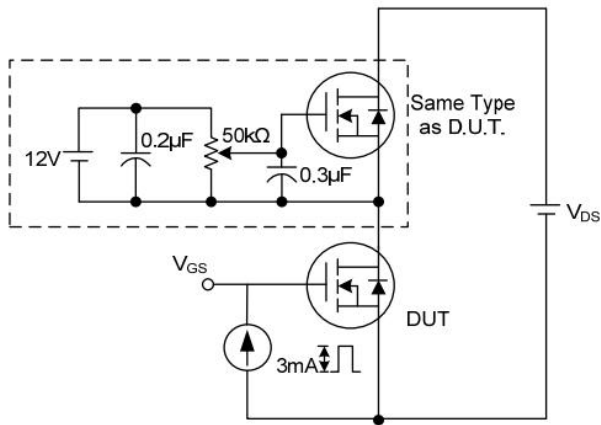
Test Circuits and Waveforms



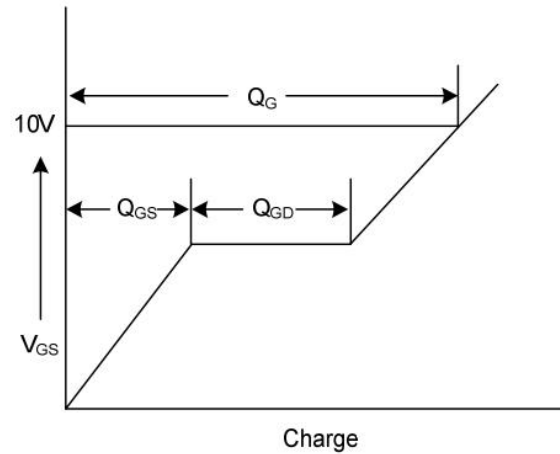
Switching Test Circuit



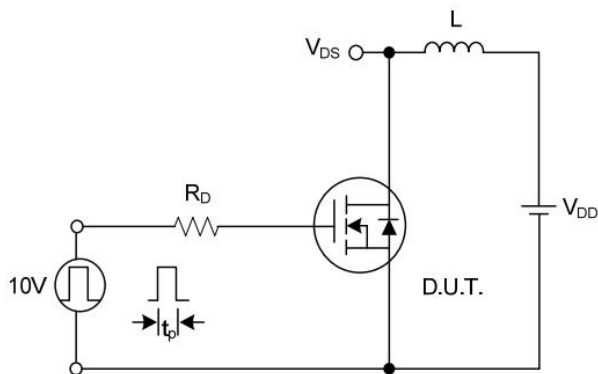
Switching Waveforms



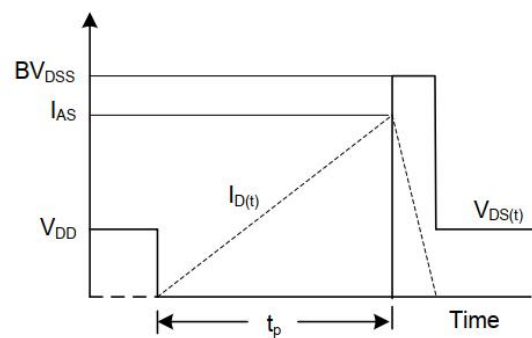
Gate Charge Test Circuit



Gate Charge Waveform



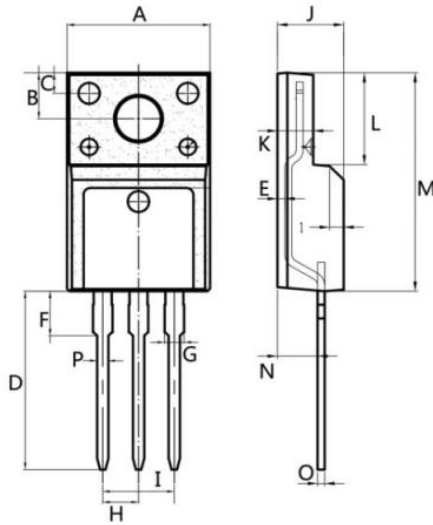
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

PACKAGE MECHANICAL DATA (Unit: mm):

TO-220F



DIM	Min.	Max.
A	9.9	10.3
B	2.9	3.5
C	1.15	1.45
D	12.75	13.45
E	0.55	0.75
F	3.1	3.5
G	1.25	1.45
H	Typ 2.54	
I	Typ 5.08	
J	4.55	4.75
K	2.4	2.7
L	6.35	6.75
M	15.0	16.0
N	2.75	3.15
O	0.45	0.60
P	0.7	0.9
All Dimensions in millimeter		

Statement:

- ◆ We reserve the right to change the manual without prior notice! Customers should obtain the latest version of the information before placing an order, and verify that the relevant information is complete and up-to-date.
- ◆ Any semiconductor product has the possibility of failure or failure under specific conditions. The buyer has the responsibility to comply with safety standards and take safety measures when using Silan product for system design and complete machine manufacturing, so as to avoid the occurrence of personal injury or property loss caused by potential failure risk!
- ◆ Product promotion will never end, our company will wholeheartedly provide customers with more excellent products!