

N-Channel MOSFET

Features:

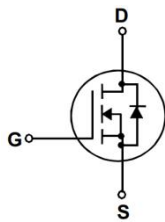
- RoHS Compliant
- Low RDS(on) & FOM
- Excellent stability and uniformity
- Extremely low switching loss
- Peak Current vs Pulse Width Curve

Applications:

- Adaptor
- Charger
- Lighting
- Power Supply

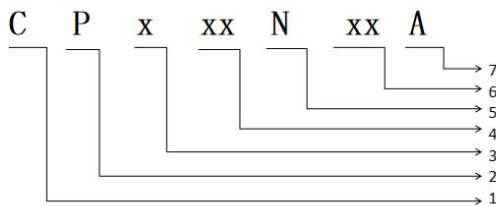
$V_{DSS}(\text{Min.})$	650V
$R_{DS(ON)}(\text{Typ.})$	2.3 Ω
I_D	4A

Schematic and Package Information:



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	CPx04N65B		Units
		TO-220F	TO-251/252	
Drain-to-Source Voltage	V _{DSS}	650		V
Continuous Drain Current	I _D	4		A
Pulsed Drain Current, V _{GS} @10V (NOTE *1)	I _{DM}	16		A
Power Dissipation	P _D	30	77	W
Derating Factor above 25℃		0.24	0.62	W/℃
Gate-to-Source Voltage	V _{GS}	±20		V
Single Pulse Avalanche Energy (L=10mH)	E _{AS}	200		mJ
Peak Diode Recovery dv/dt	dv/dt	5		V/ns
Maximum Temperature for Soldering	T _L	300		℃
Operating Junction and Storage Temperature Range (NOTE *2)	T _J and T _{STG}	150, -55 to150		

Thermal Resistance

Parameter	Symbol	Typ.		Units
		TO-220F	TO-251/TO-252	
Junction to Case	$R_{\theta JC}$	4.17	1.62	$^{\circ}\text{C/W}$
Junction to Ambient	$R_{\theta JA}$	62.5	62	$^{\circ}\text{C/W}$

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}	650	--	--	V	$V_{GS}=0V, I_D=250\mu A$
Gate Threshold Voltage	$V_{GS(TH)}$	2	3.1	4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	--	2.3	2.7	Ω	$V_{GS}=10V, I_D=2A$
Drain-to-Source Leakage Current	I_{DSS}	--	--	1	μA	$V_{DS}=650V, V_{GS}=0V$ $T_J=25^{\circ}\text{C}$
		--	--	100		$V_{DS}=520V, V_{GS}=0V$ $T_J=125^{\circ}\text{C}$
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}	--	3.5	--	S	$V_{DS}=15V, I_D=2A$

Dynamic Characteristics Essentially independent of operating temperature

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input Capacitance	C_{iss}	--	591	--	pF	$V_{GS}=0V, V_{DS}=25V$ $f=1.0\text{MHz}$
Output Capacitance	C_{oss}	--	51	--		
Reverse Transfer Capacitance	C_{rss}	--	2.92	--		
Total Gate Charge	Q_g	--	12.8	--	nC	$I_D=4A, V_{DD}=520V$ $V_{GS}=10V$
Gate-to-Source Charge	Q_{gs}	--	2.79	--		
Gate-to-Drain ("Miller") Charge	Q_{gd}	--	6.37	--		
Turn-on Delay Time	$t_{d(ON)}$	--	14	--	ns	$V_{DD}=325V, I_D=4A,$ $V_G=10V, R_G=10\Omega$
Rise Time	t_{rise}	--	16	--		
Turn-Off Delay Time	$t_{d(OFF)}$	--	32	--		
Fall Time	T_{fall}	--	11	--		

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	--	--	4	A	$T_C=25^{\circ}\text{C}$
Pulsed Drain-Source Diode Forward Current	I_{SM}	--	--	16		
Diode Forward Voltage	V_{SD}	--	--	1.5	V	$I_{SD}=2A, V_{GS}=0V$
Reverse Recovery Time	t_{rr}	--	256	--	ns	$I_F=I_S$ $di/dt=100A/\mu s$
Reverse Recovery Charge	Q_{rr}	--	1200	--	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

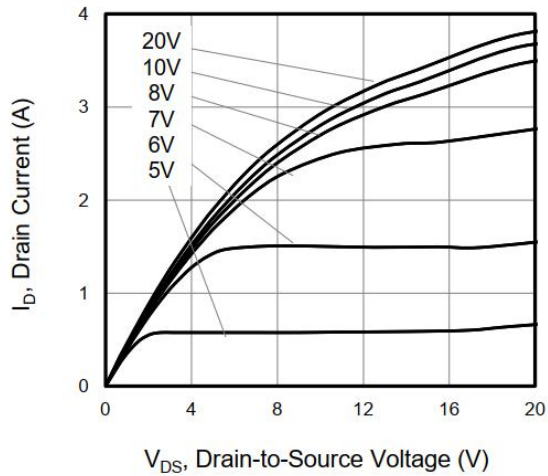


Figure 2. Body Diode Forward Voltage

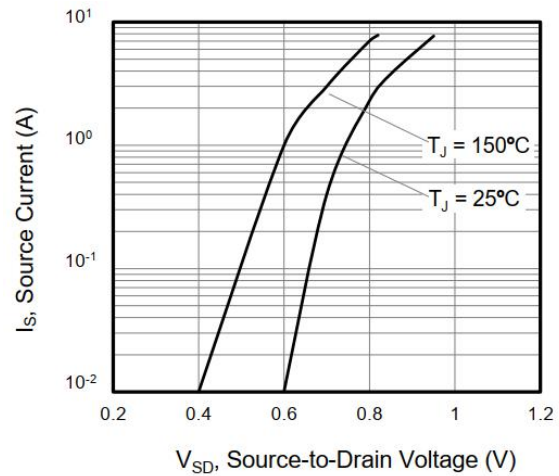


Figure 3. Drain Current vs. Temperature

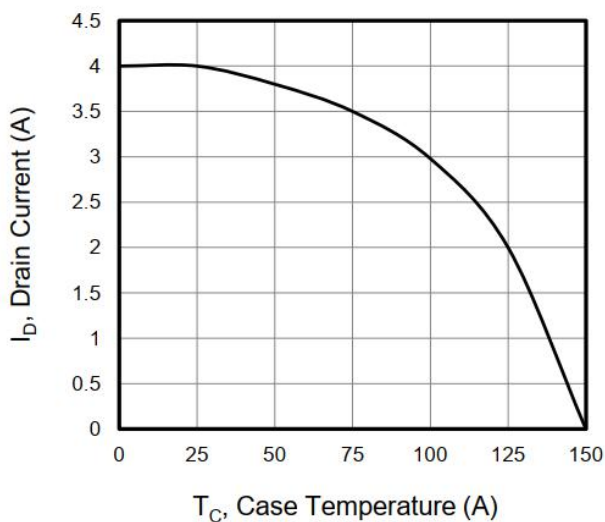


Figure 4. Power Dissipation vs. Temperature

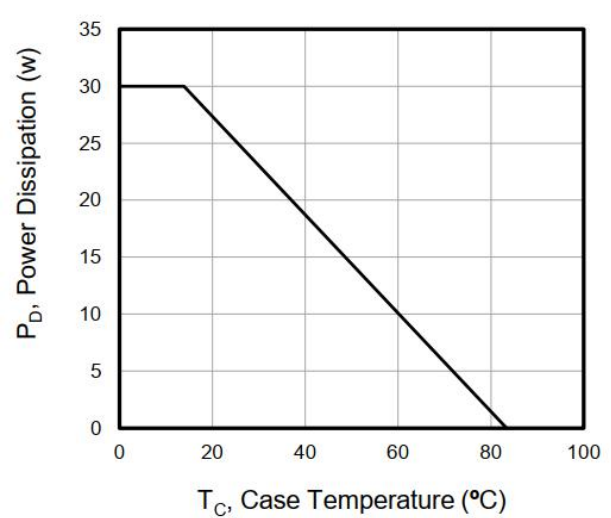


Figure 5. Transfer Characteristics

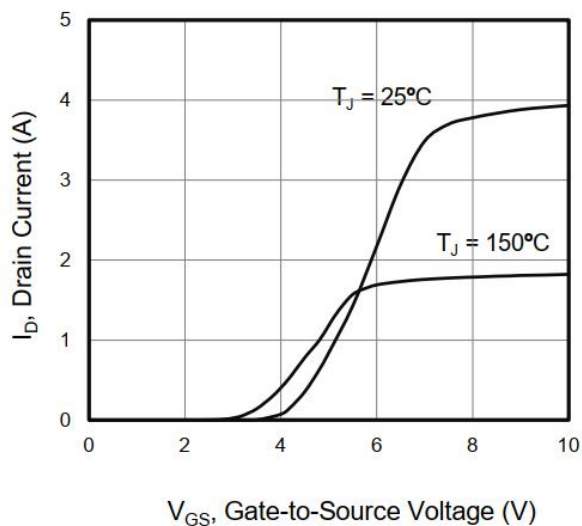


Figure 6. On-Resistance vs. Temperature

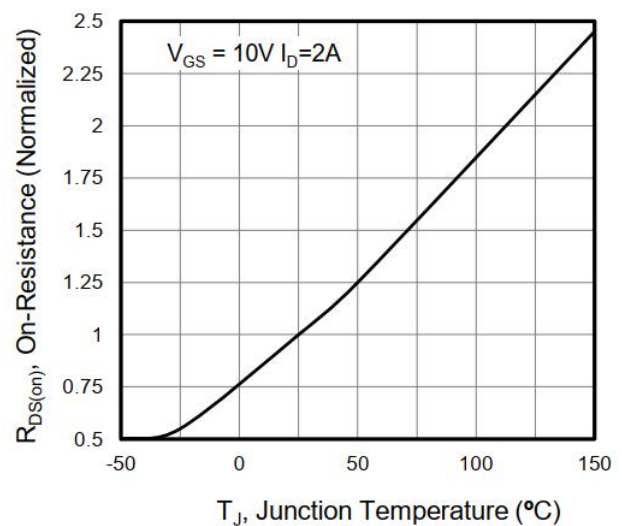


Figure 7. Capacitance

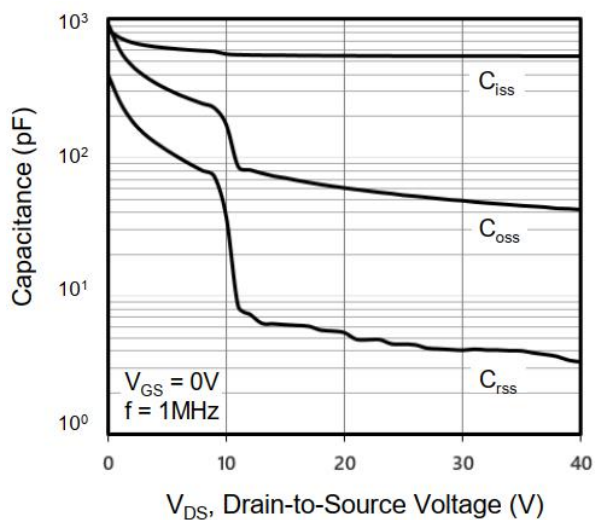


Figure 8. Gate Charge

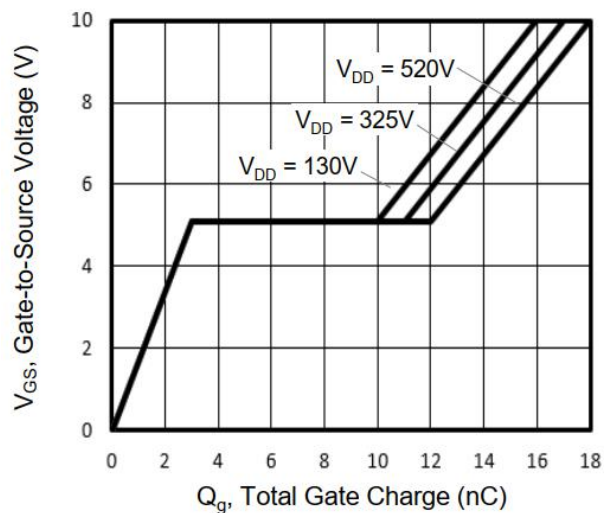


Figure 9. Transient Thermal Impedance
TO-251, TO-252

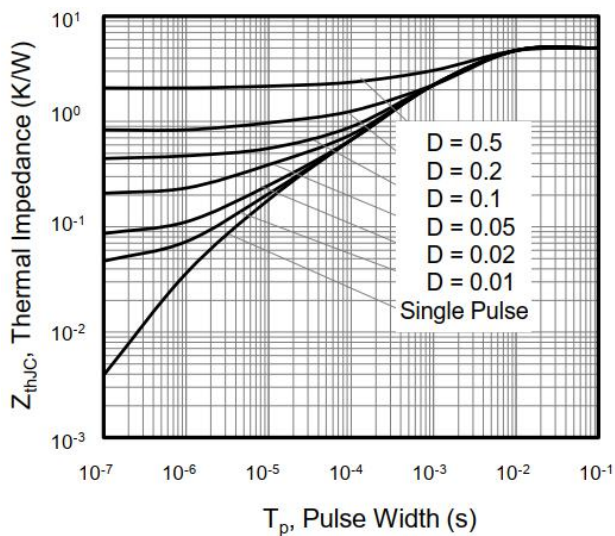
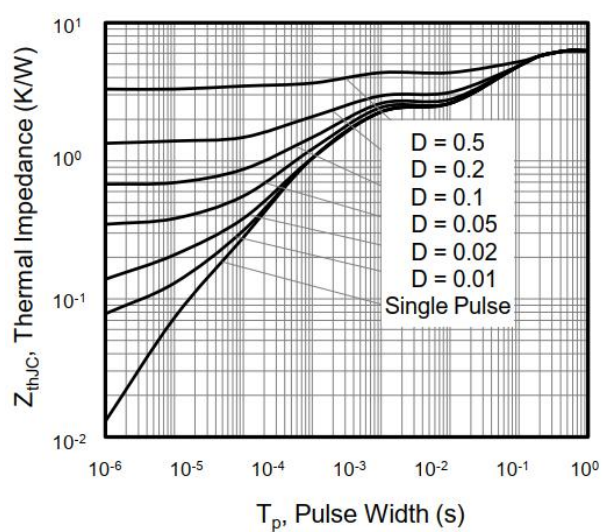
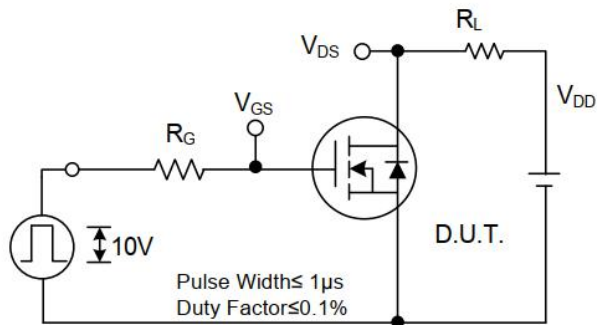


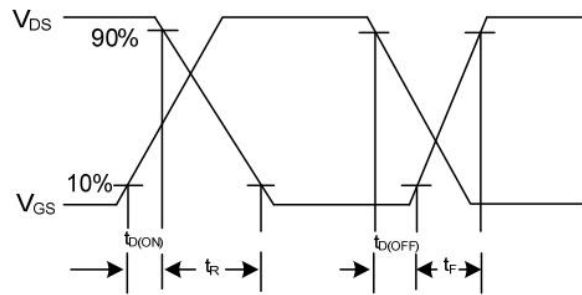
Figure 10. Transient Thermal Impedance
TO-220F



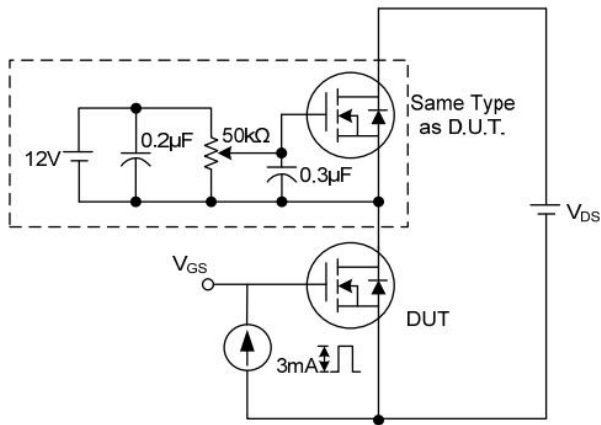
Test Circuits and Waveforms



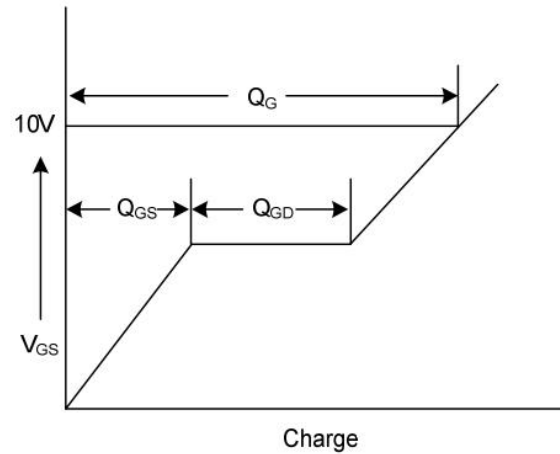
Switching Test Circuit



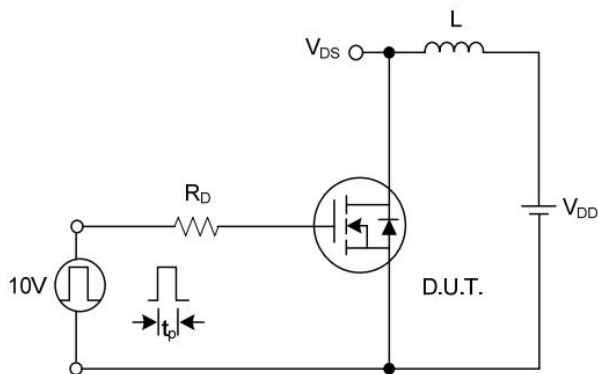
Switching Waveforms



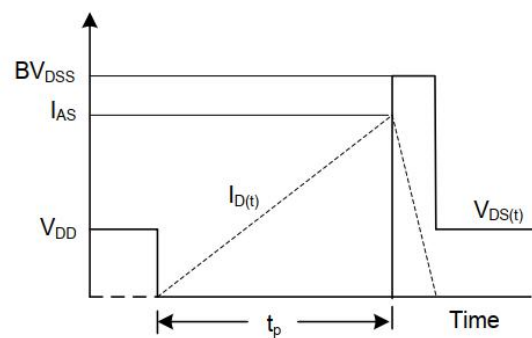
Gate Charge Test Circuit



Gate Charge Waveform



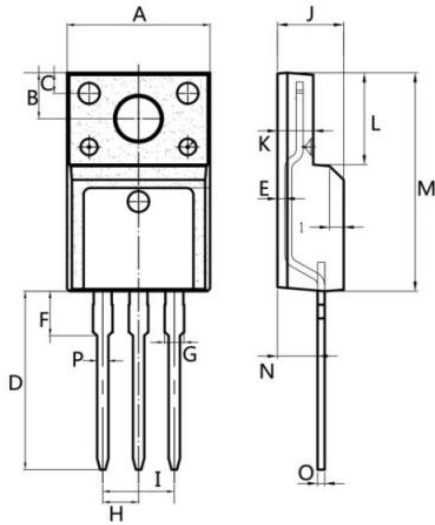
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

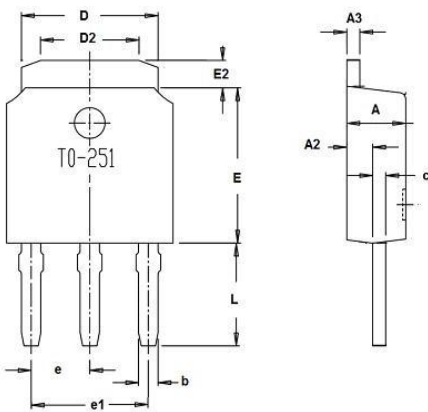
PACKAGE MECHANICAL DATA (Unit: mm):

TO-220F



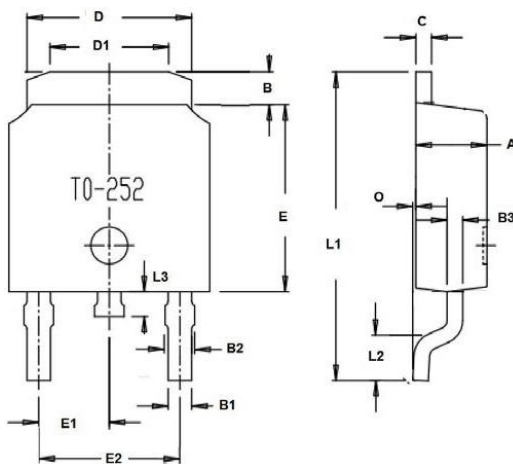
DIM	Min.	Max.
A	9.9	10.3
B	2.9	3.5
C	1.15	1.45
D	12.75	13.45
E	0.55	0.75
F	3.1	3.5
G	1.25	1.45
H	Typ 2.54	
I	Typ 5.08	
J	4.55	4.75
K	2.4	2.7
L	6.35	6.75
M	15.0	16.0
N	2.75	3.15
O	0.45	0.60
P	0.7	0.9
All Dimensions in millimeter		

TO-251



DIM	Min.	Max.
A	2.1	2.5
A2	0.9	1.1
A3	Typ 0.5	
b	0.74	0.86
c	0.9	1.1
D	5.33	5.53
D2	3.65	4.05
E	6.0	6.2
E2	0.91	1.36
e	Typ 2.3	
e1	Typ 4.6	
L	3.7	4.3
All Dimensions in millimeter		

TO-252



DIM	Min.	Max.
A	2.1	2.5
B	0.95	1.55
C	0.4	0.6
D	6.4	6.7
D1	5.1	5.8
E	5.8	6.4
E1	Typ 2.3	
E2	Typ 4.6	
B1	0.6	0.8
B2	0.75	0.95
O	--	0.15
L1	9.0	11.0
L2	1.3	1.7
L3	0.7	0.95
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!
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