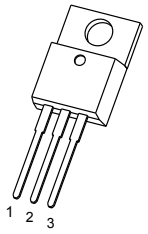
TO-220-3L lastic-Encapsulate MOSFETS

CJP04N50M1 N-Channel Power MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$TYP	I_D
500V	1.2Ω@10V	4A

TO-220-3L



1. GATE
2. DRAIN
3. SOURCE

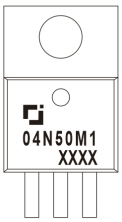
GENERAL DESCRIPTION

This advanced high voltage MOSFET is designed to stand high energy in the avalanche mode and switch efficiently. This new high energy device also offers a drain-to-source diode fast recovery time. Desighed for high voltage, high speed switching applications such as power supplies, converters, power motor controls and bridge circuits.

FEATURE

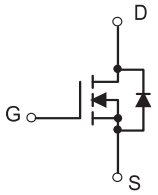
- High Current Rating
- Lower $R_{DS(on)}$
- Lower Capacitance
- Lower Total Gate Charge
- Tighter V_{SD} Specifications
- Avalanche Energy Specified
- Fast Switching Capability

MARKING



04N50M1 = Device code.
Solid dot = Green molding compound device, if none, the normal device
XXXX=Code

EQUIVALENT CIRCUIT



MAXIMUM RATINGS (T_A=25℃ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current	I_D ①	4	A
Pulsed Drain Current	I_{DM} ①②	16	A
Single Pulsed Avalanche Energy	E_{AS} ③	315	mJ
Power Dissipation	P_D ①	139	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$ ⑥	77	℃/W
Thermal Resistance from Junction to Case	$R_{\theta JC}$ ①	0.9	℃/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 ~+150	℃

MOSFET ELECTRICAL CHARACTERISTICS

T_J=25℃ unless otherwise specified

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Off characteristics							
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =1mA		500	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS}=500V, V_{GS}=0V	T_J=25℃	-	-	1.0	μA
			T_J=125℃	-	-	100	
Gate-body leakage current	I_{GSS}	V_{DS} =0V, V_{GS} =±30V		-	-	±100	nA
On characteristics④							
Gate-threshold voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =250μA		2.0	3.0	4.0	V
Static drain-source on-resistance	$R_{DS(on)}$	V_{GS} =10V, I_D =2A		-	1.2	1.5	Ω
Dynamic characteristics ⑤							
Input capacitance	C_{iss}	V_{DS} =50V,V_{GS} =0V,f =1MHz		-	639	-	pF
Output capacitance	C_{oss}			-	41	-	
Reverse transfer capacitance	C_{rss}			-	2	-	
Gate resistance	R_g	f =1MHz		-	2.8	-	Ω
Switching characteristics ⑤							
Total gate charge	Q_g	V_{DS} =50V,V_{GS} =10V,I_D =4A		-	10	-	nC
Gate-source charge	Q_{gs}			-	3	-	
Gate-drain charge	Q_{gd}			-	2	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=250V, V_{GS}=10V, R_G=10Ω, I_D =10A		-	7	-	ns
Turn-on rise time	t_r			-	5	-	
Turn-off delay time	$t_{d(off)}$			-	13	-	
Turn-off fall time	t_f			-	5	-	
Drain-Source Diode Characteristics							
Drain-source diode forward voltage	V_{SD} ④	V_{GS} =0V,I_S =4A		-	-	1.2	V
Maximum continuous drain-source diode forward current	I_S ①			-	-	4	A
Maximum pulsed drain-source diode forward current	I_{SM} ①②			-	-	16	A
Reverse recovery time	trr	dIF/dt = 100A/μs, I_S =10A, V_{DD} = 50V		-	196	-	ns
Reverse recovery charge	Qrr			-	1131	-	nC

Notes :

1.T_C=25℃ Limited only by maximum temperature allowed.

2.P_W≤10μs, Duty cycle≤1%.

3.EAS condition: VDD=50V,VGS=10V, L=10mH, Rg=25Ω,Starting T_J = 25℃.

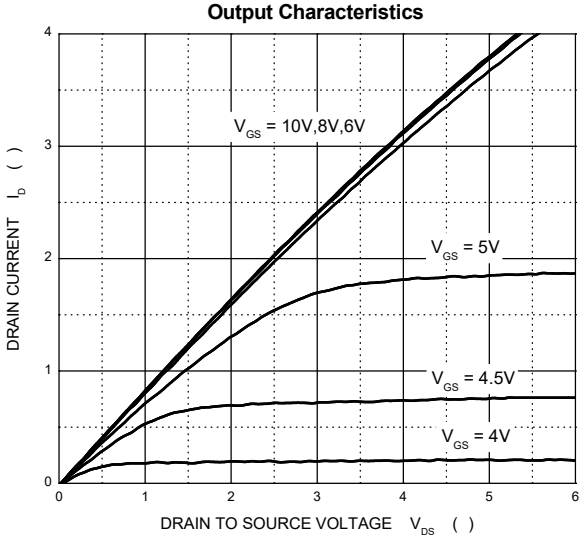
4.Pulse Test : Pulse Width≤300μs, duty cycle ≤2%.

5.Guaranteed by design, not subject to production.

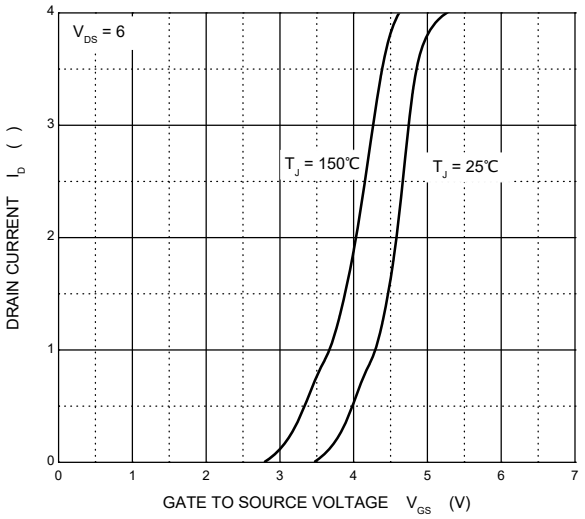
6.The value of $R_{\theta JA}$ is measured with the device in a still air environment with T_a=25℃

Typical Characteristics (T_J = 25℃, unless otherwise specified)

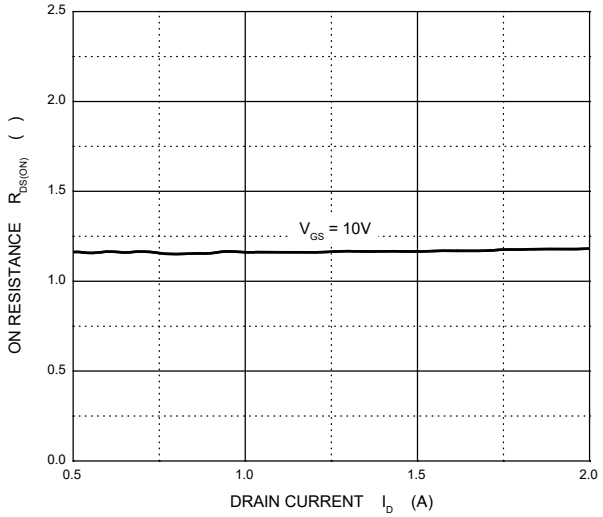
Output Characteristics



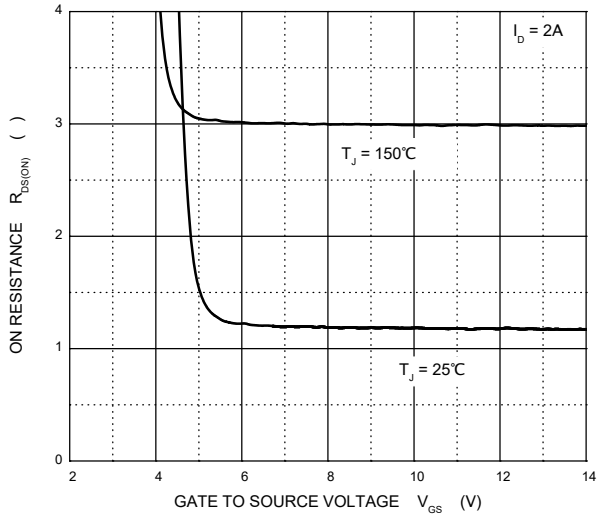
Transfer Characteristics



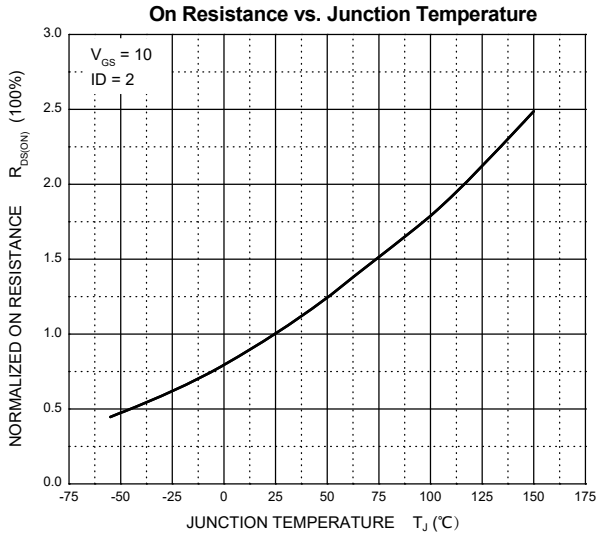
On Resistance vs. Drain Current



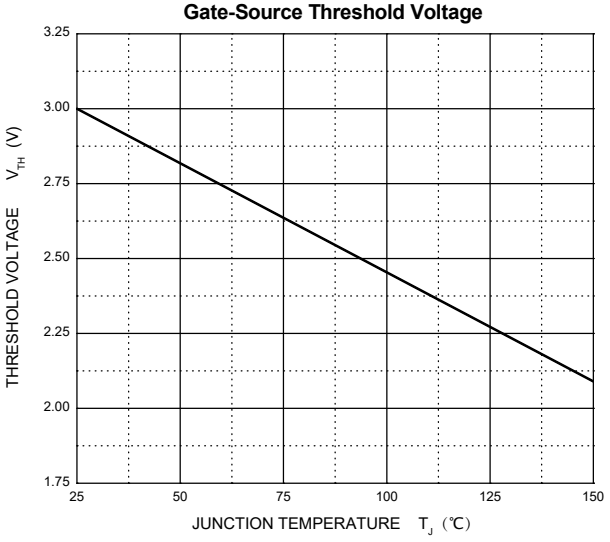
On Resistance vs. Gate-Source Bias



On Resistance vs. Junction Temperature

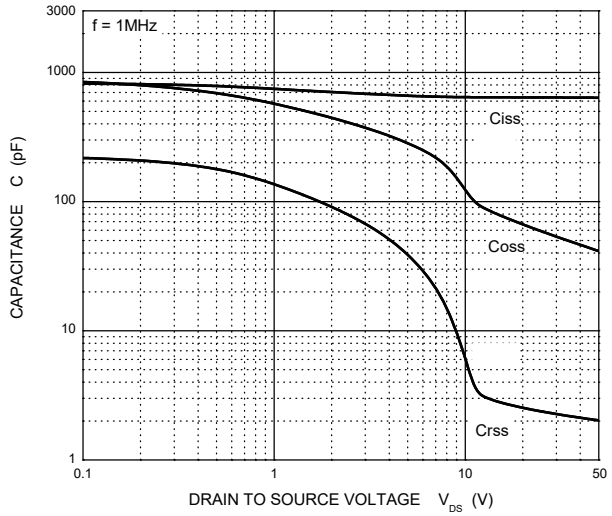


Gate-Source Threshold Voltage

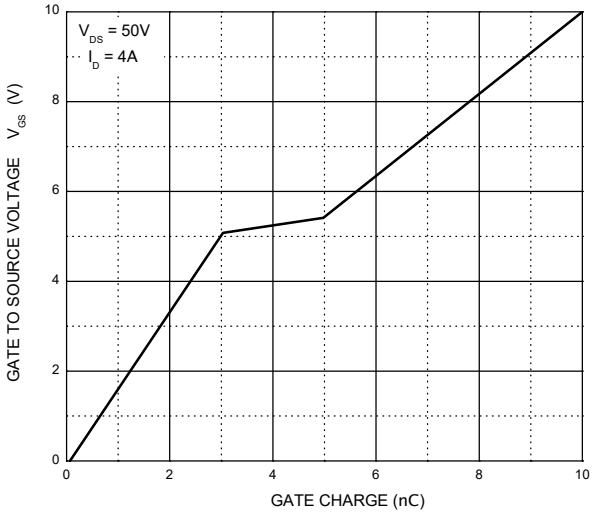


Typical Characteristics (T_J = 25℃, unless otherwise specified)

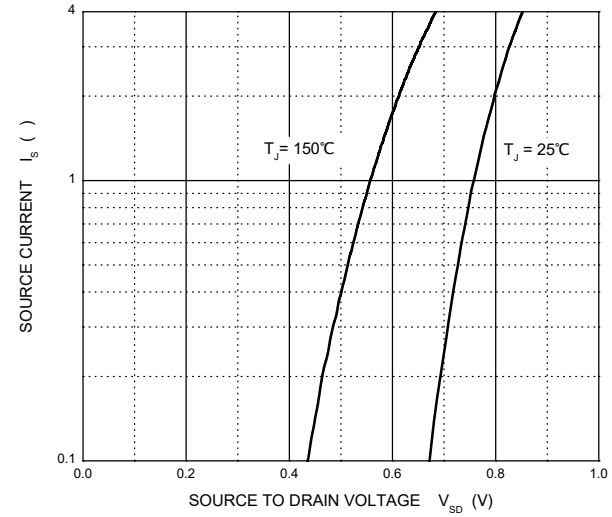
Typical Capacitances



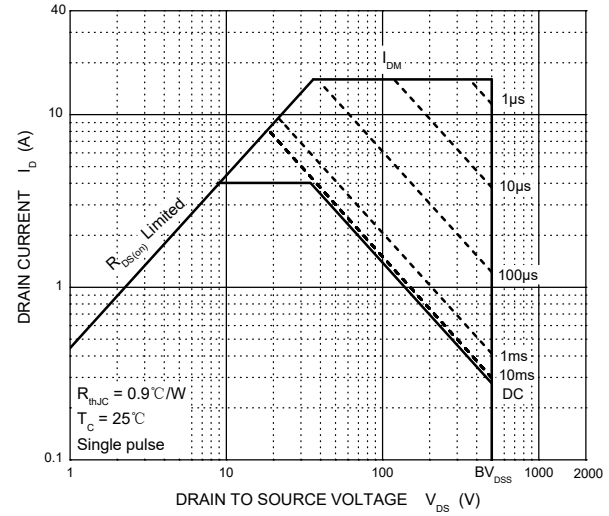
Gate Charge



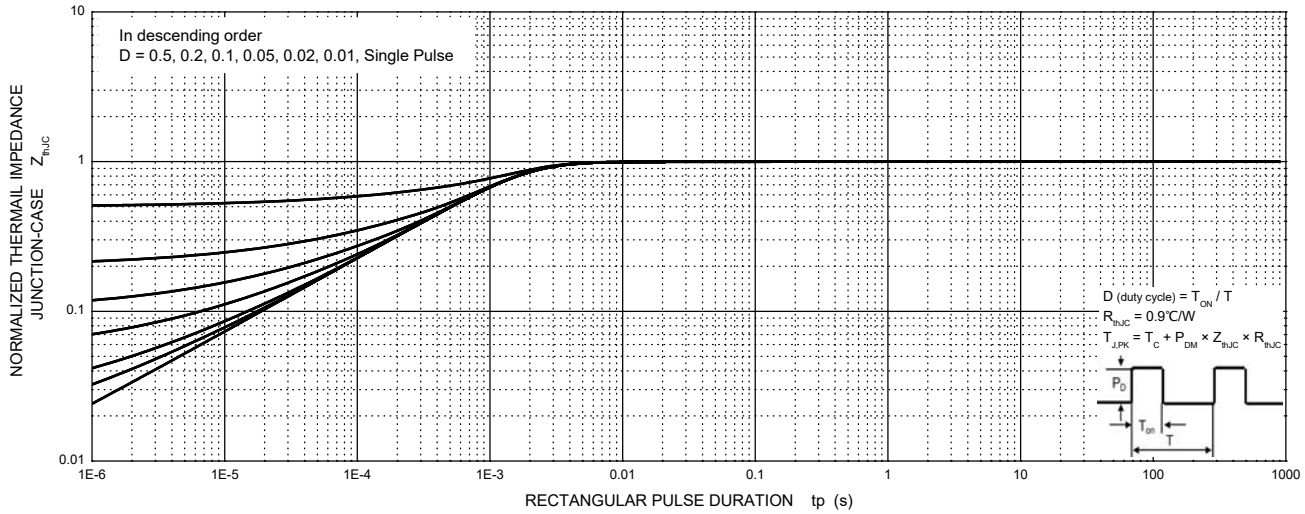
Source-Drain Diode Forward Characteristics



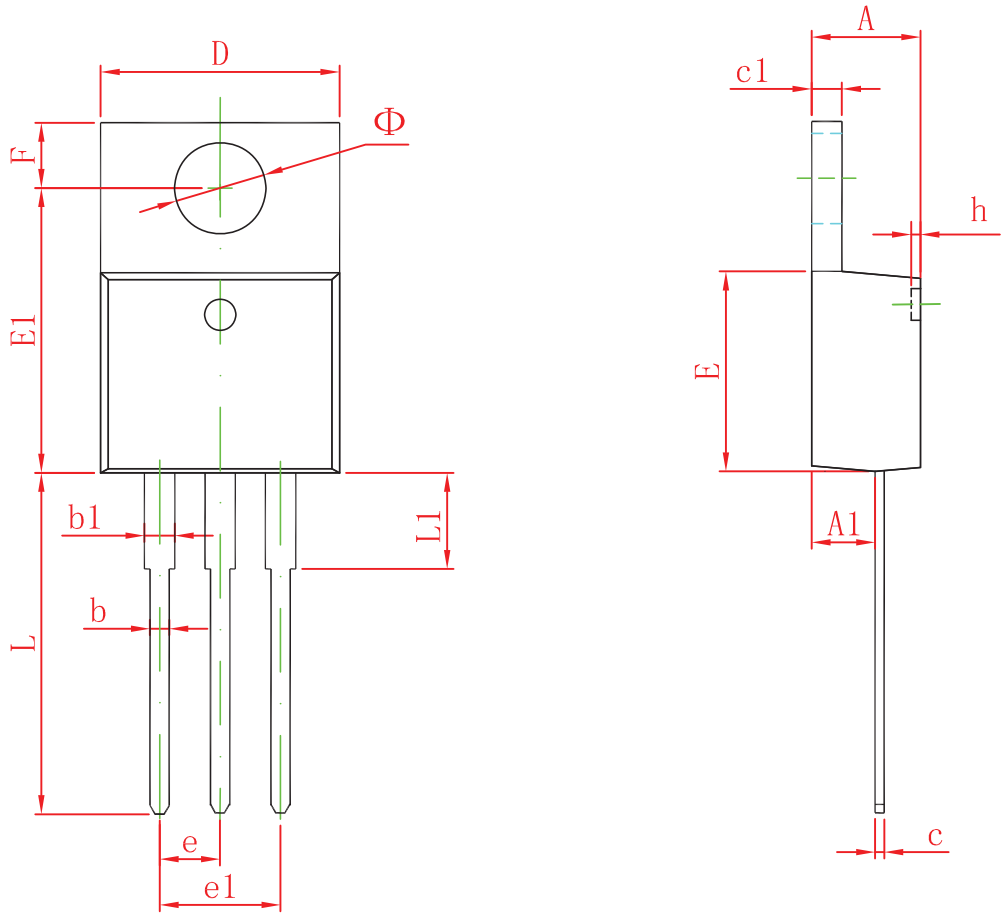
Maximum Safe Operating Area



Transient Thermal Impedance, Junction-Case



TO-220-3L Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.450	4.750	0.175	0.187
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.300	0.500	0.012	0.020
c1	1.170	1.370	0.046	0.054
D	9.830	10.330	0.387	0.407
E	8.500	8.900	0.335	0.350
E1	12.050	12.650	0.474	0.498
e	2.540 TYP		0.100 TYP	
e1	4.900	5.200	0.192	0.205
F	2.540	2.940	0.100	0.116
h	0.100 TYP		0.004 TYP	
L	13.300	13.800	0.523	0.543
L1	3.540	3.940	0.139	0.155
Φ	3.735	3.935	0.147	0.155