杰力科技股份有限公司
Excelliance MOS Corporation

EMP29N04ES

N-Channel Logic Level Enhancement Mode Field Effect Transistor

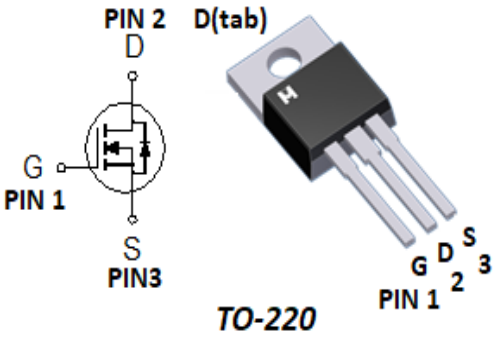
Product Summary:

BV_{DSS}	40V
$R_{DSON\ (MAX.)}$	2.9mΩ
I_D	221A

N Channel MOSFET

UIS, Rg 100% Tested

RoHS & Halogen Free & TSCA Complianet



ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C Unless Otherwise Noted)

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS	UNIT
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C = 25 °C	I_D	221	A
	T_C = 100 °C		139	
Pulsed Drain Current[1]		I_{DM}	674	
Avalanche Current		I_{AS}	69	
Avalanche Energy	L = 0.1mH	E_{AS}	236	mJ
Repetitive Avalanche Energy[2]	L = 0.05mH	E_{AR}	118	
Power Dissipation	T_C = 25 °C	P_D	227	W
	T_C = 100 °C		90	
Operating Junction & Storage Temperature Range		T_j, T_{stg}	-55 to 150	°C

100% UIS testing in condition of V_D=20V, L=0.1mH, V_G=10V, I_L=40A, Rated V_{DS}=40V N-CH

THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNIT
Junction-to-Case	$R_{\theta JC}$		0.55	°C / W
Junction-to-Ambient	$R_{\theta JA}$		62.5	

[1]Pulse width limited by maximum junction temperature.

[2]Duty cycle ≤ 1%

[3]The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25°C.

ELECTRICAL CHARACTERISTICS (T_J = 25 °C, Unless Otherwise Noted)

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
STATIC						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	40			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	1	1.4	2	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0V, V_{GS} = ±20V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 32V, V_{GS} = 0V			1	μA
		V_{DS} = 30V, V_{GS} = 0V, T_J = 125 °C			25	
On-State Drain Current[1]	$I_{D(ON)}$	V_{DS} = 10V, V_{GS} = 10V	172			A
Drain-Source On-State Resistance[1]	$R_{DS(ON)}$	V_{GS} = 10V, I_D = 20A		2.5	2.9	mΩ
		V_{GS} = 4.5V, I_D = 20A		3.2	4.0	
Forward Transconductance[1]	g_{fs}	V_{DS} = 5V, I_D = 20A		60		S
DYNAMIC						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 20V, f = 1MHz		6923		pF
Output Capacitance	C_{oss}			1244		
Reverse Transfer Capacitance	C_{rss}			13		
Gate Resistance	R_g	V_{GS} = 15mV, V_{DS} = 0V, f = 1MHz		2.0		Ω
Total Gate Charge[1,2]	Q_g(V_{GS}=10V)	V_{DS} = 20V, V_{GS} = 10V, I_D = 50A		82.9		nC
	Q_g(V_{GS}=4.5V)			34.3		
Gate-Source Charge[1,2]	Q_{gs}			27.2		
Gate-Drain Charge[1,2]	Q_{gd}			4.3		
Turn-On Delay Time[1,2]	$t_{d(on)}$	Vdd=20V, ID=100A, Rg=6 ohm, Vgs=10V		15.5		nS
Rise Time[1,2]	t_r			123.5		
Turn-Off Delay Time[1,2]	$t_{d(off)}$			91.5		
Fall Time[1,2]	t_f			116		
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T_C = 25 °C)						
Continuous Current	I_S				221	A
Pulsed Current[3]	I_{SM}				674	
Forward Voltage[1]	V_{SD}	I_F = 20A, V_{GS} = 0V			1.2	V
Reverse Recovery Time	t_{rr}	Vdd=40V, IF=100A, di/dt (A/uS)=100, L=0.1mH, Rg=10 ohm		32.7		nS
Reverse Recovery Charge	Q_{rr}			19.3		nC

[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

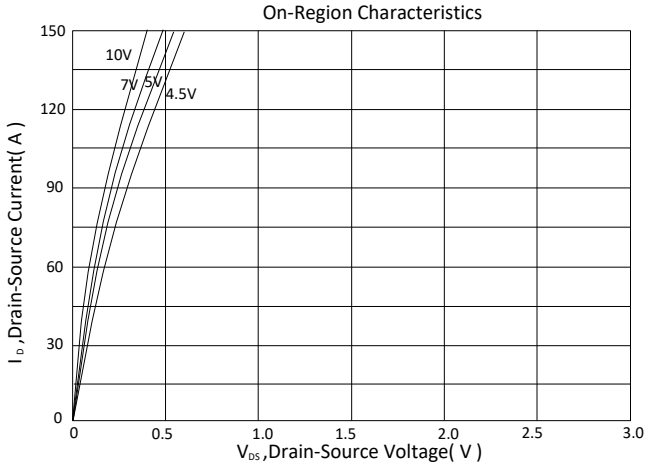
[2]Independent of operating temperature.

[3]Pulse width limited by maximum junction temperature.

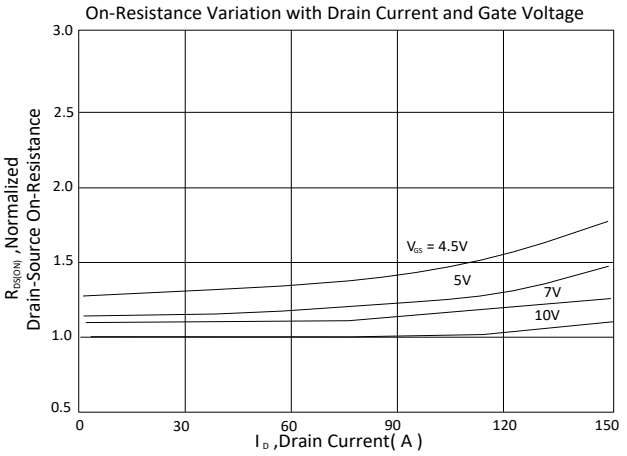
EMC will review datasheet by quarter, and update new version.

TYPICAL CHARACTERISTICS

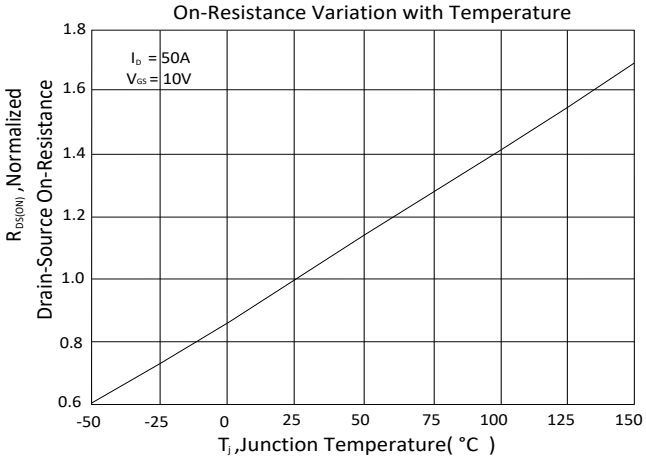
On-Region Characteristics



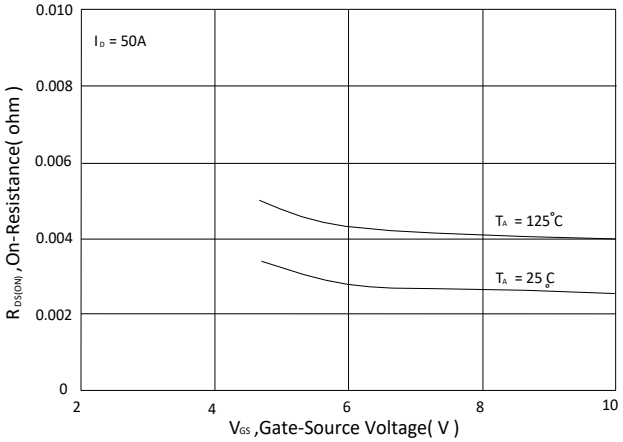
On-Resistance Variation with Drain Current and Gate Voltage



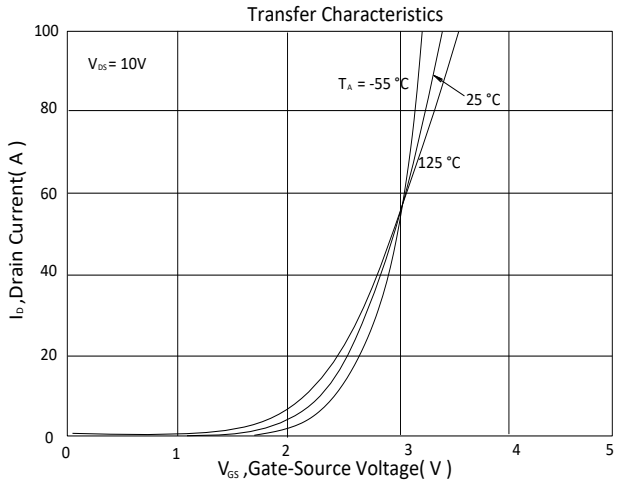
On-Resistance Variation with Temperature



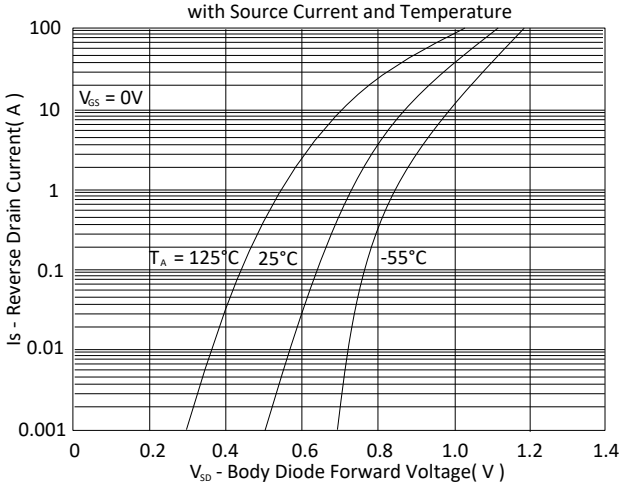
On-Resistance Variation with Gate-Source Voltage

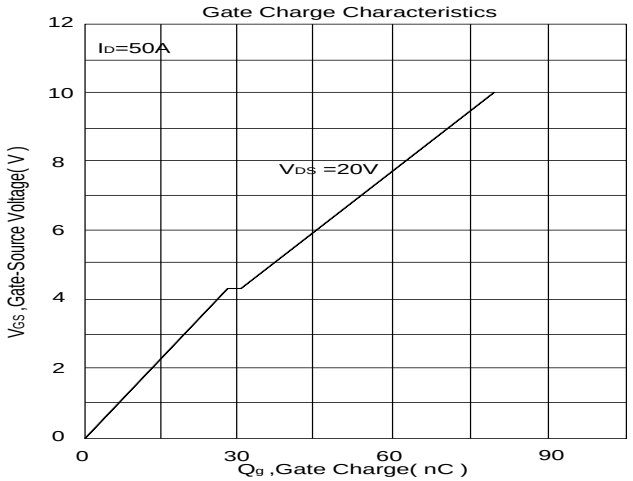


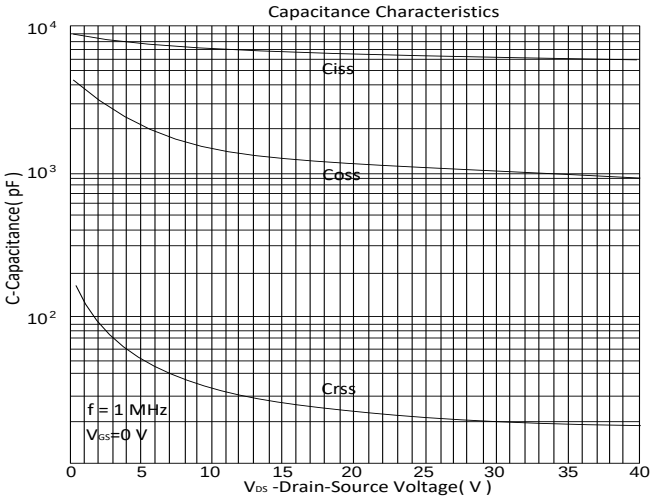
Transfer Characteristics

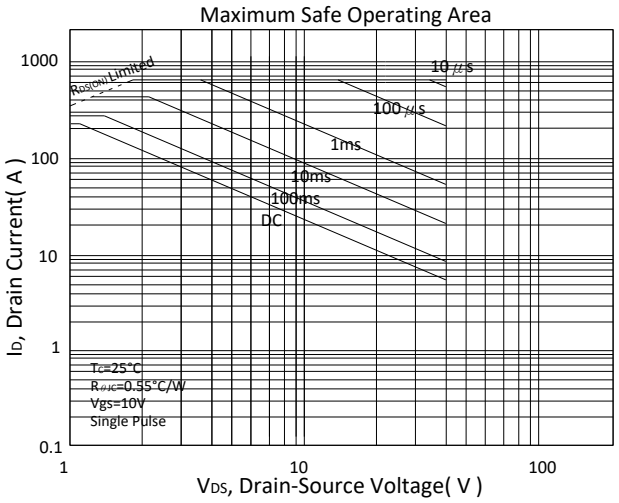


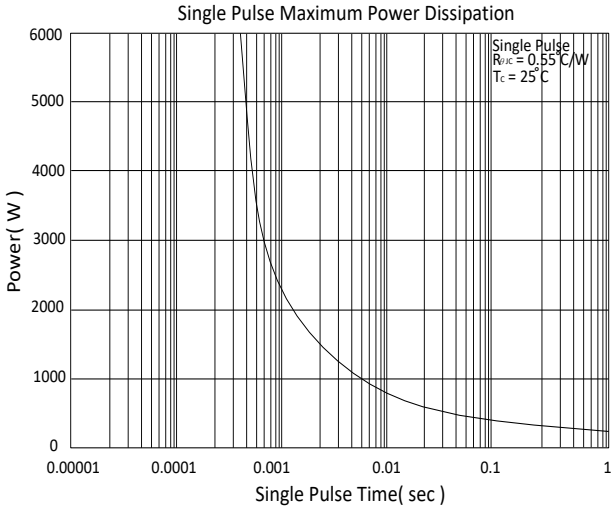
Body Diode Forward Voltage Variation with Source Current and Temperature

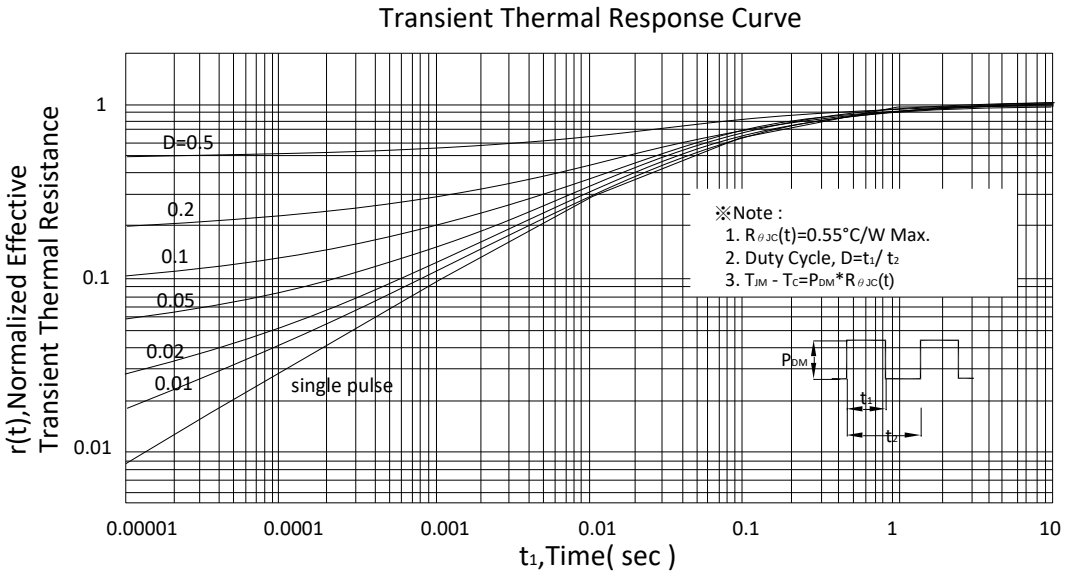



Gate Charge Characteristics
ID=50A
VDS =20V
VGS ,Gate-Source Voltage(V)
Qg ,Gate Charge(nC)


Capacitance Characteristics
Ciss
Coss
Crss
f = 1 MHz
VGS=0 V
C-Capacitance(pF)
VDS -Drain-Source Voltage(V)

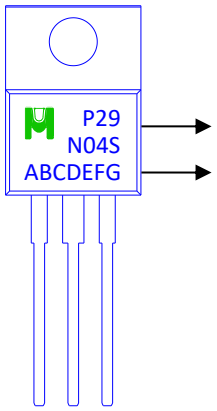

Maximum Safe Operating Area
RDS(ON) Limited
10μs
100μs
1ms
10ms
100ms
DC
TC=25°C
RθJC=0.55°C/W
VGS=10V
Single Pulse
ID, Drain Current(A)
VDS, Drain-Source Voltage(V)


Single Pulse Maximum Power Dissipation
Single Pulse
RθJC = 0.55°C/W
TC = 25°C
Power(W)
Single Pulse Time(sec)


Transient Thermal Response Curve
D=0.5
0.2
0.1
0.05
0.02
0.01
single pulse
※Note :
1. RθJC(t)=0.55°C/W Max.
2. Duty Cycle, D=t1/ t2
3. TJM - TC=PDM*RθJC(t)
PDM
t1
t2
r(t),Normalized Effective Transient Thermal Resistance
t1,Time(sec)

Ordering & Marking Information:

Device Name: EMP29N04ES for TO-220



P29N04S: Device Name

ABCDEFG: Date Code

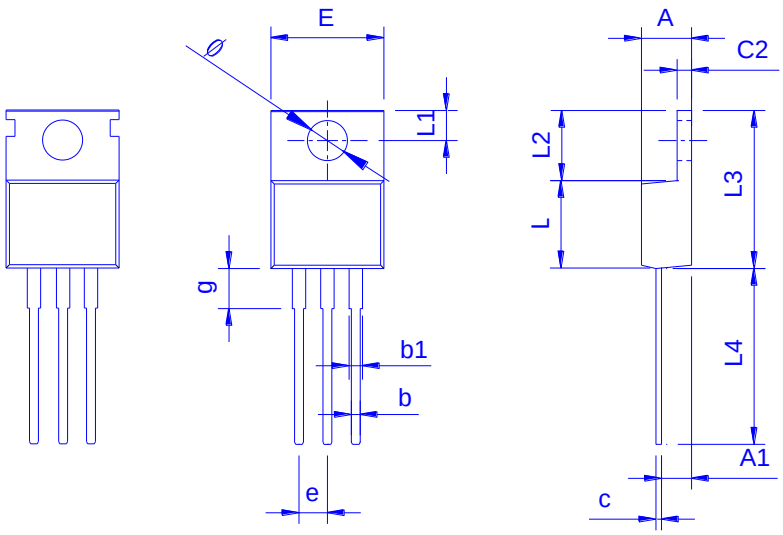
A: Assembly House

B: Year(A:2008 B:2009 C:2010….)

C: Month(A:01 B:02 C:03 D:04 E:05 F:06 G:07 H:08 I:09 J:10 K:11 L:12)

DEFG: Serial No.

Outline Drawing



Dimension in mm

Dimension	A	A1	b	b1	c	c2	E	L	L1	L2	L3	L4	Ø	e	g
Min.	4.240	2.250	0.700	1.170	0.310	1.150	9.910	8.500	2.590	6.100	14.700	12.700	3.400	2.440	2.850
Typ.	4.440	2.400	0.800	1.550	0.500	1.270	10.160	8.920	2.800	6.300	15.370	13.720	3.840	2.540	3.800
Max.	4.700	2.820	0.910	1.750	0.650	1.400	10.360	9.750	3.250	6.800	16.900	13.970	3.935	2.640	4.000

◆ Tube Information:50pcs/Tube (1000pcs/Box)