



# MPC04N65

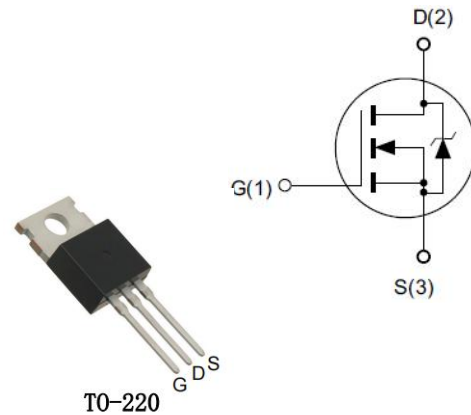
## N-Channel Power MOSFET

### Features

- ◆ 650V, 4A,  $R_{DS(ON)}(Typ.) = 2.3\Omega @ V_{GS} = 10V$ .
- ◆ Low  $C_{rss}$
- ◆ Fast Switching
- ◆ 100% Avalanche Tested

### Application

- ◆ Charger
- ◆ Standby Power



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

Symbol	Parameter	Limit	Unit
		TO-220	
$V_{DS}$	Drain-Source Voltage <sup>a</sup>	650	V
$V_{GS}$	Gate-Source Voltage	$\pm 30$	V
$I_D$	Drain Current-Continuous, $T_C = 25^\circ\text{C}$	4	A
	Drain Current-Continuous, $T_C = 100^\circ\text{C}$	2.5	A
$I_{DM}$	Drain Current-Pulsed <sup>b</sup>	16	A
$P_D$	Maximum Power Dissipation @ $T_J = 25^\circ\text{C}$	86	W
$E_{AS}$	Single Pulsed Avalanche Energy <sup>d</sup>	80	mJ
dv/dt	Peak Diode Recovery dv/dt <sup>e</sup>	5.0	V/ns
$T_J, T_{STG}$	Operating and Store Temperature Range	-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-Case Max.	1.45	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient Max.	62.5	$^\circ\text{C/W}$

### Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted.

#### Off Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu\text{A}$	650	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 650V, V_{GS} = 0V$	-	-	1	$\mu\text{A}$
$I_{GSS}$	Forward Gate Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 30V$	-	-	$\pm 100$	nA



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### ■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2	-	4	V
$R_{DS(on)}$	Static Drain-Source On-Resistance <sup>c</sup>	$V_{GS} = 10V, I_D = 2A$	-	2.3	2.7	$\Omega$

### ■ Dynamic Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$g_{fs}$	Forward Transconductance	$V_{DS}=15V, I_D = 2A$	-	3.5	-	S
$C_{iss}$	Input Capacitance	$V_{DS} = 25V,$ $V_{GS} = 0V,$ $f = 1.0MHz$	-	610	-	pF
$C_{oss}$	Output Capacitance		-	53	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	3.5	-	pF

### ■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 325V, I_D = 4A,$ $R_G = 25\Omega, V_{GS}=10V$	-	12.7	-	ns
$t_r$	Turn-On Rise Time		-	17.4	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	30.9	-	ns
$t_f$	Turn-Off Fall Time		-	10.5	-	ns
$Q_g$	Total Gate Charge	$V_{DS} = 520V, I_D = 4A,$ $V_{GS} = 10V$	-	14.2	-	nC
$Q_{gs}$	Gate-Source Charge		-	5.5	-	nC
$Q_{gd}$	Gate-Drain Charge		-	3.8	-	nC

### ■ Drain-Source Diode Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$I_S$	Drain-Source Diode Forward Continuous Current	$V_{GS} = 0V$	-	-	4	A
$I_{SM}$	Maximum Pulsed Current	$V_{GS} = 0V$	-	-	16	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 4A$	-	-	1.4	V
$T_{rr}$	Body Diode Reverse Recovery Time	$di/dt=100A/us$ $I_F=4A, V_{GS}=0V$	-	264	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	1.2	-	$\mu C$

Notes:

- $T_J = +25^\circ C$  to  $+150^\circ C$
- Repetitive rating; pulse width limited by maximum junction temperature.
- Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- $L=10mH, V_{DD}=50V, I_D=4.0A, Start T_J=25^\circ C$ .

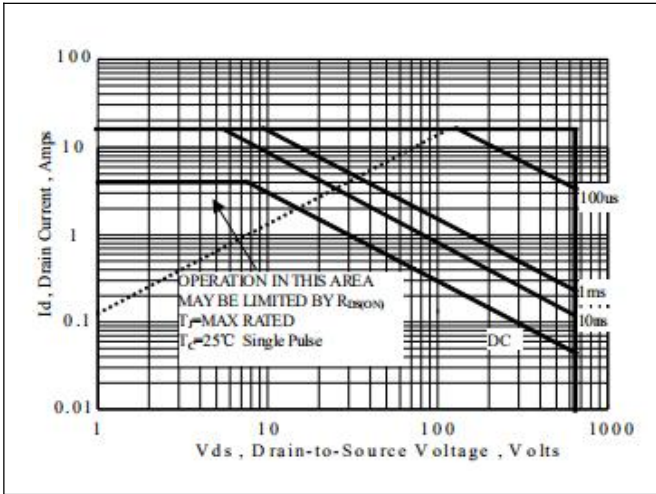


Figure 1. Maximum Safe Operating Area

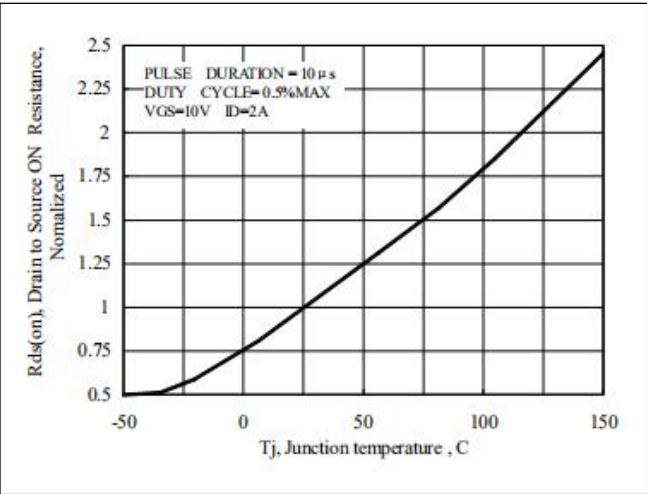


Figure 2. Normalized On-Resistance Variation with Temperature

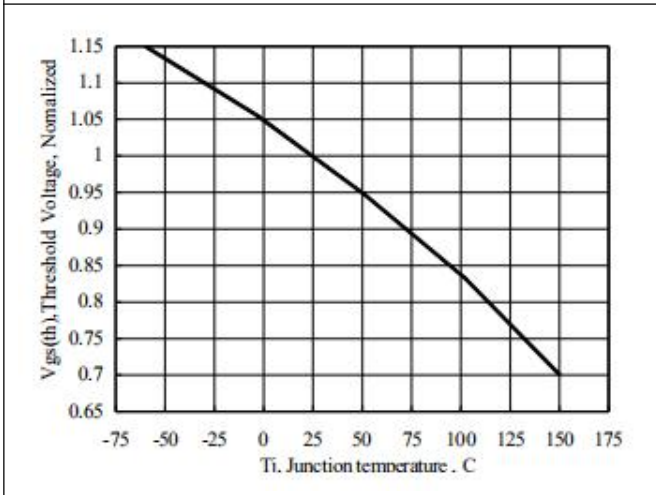


Figure 3. Typical Theshold Voltage vs Junction Temperature

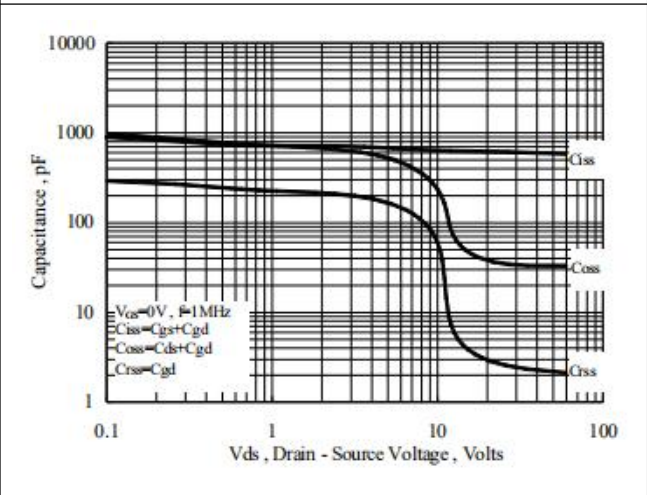


Figure 4. Capacitance Characteristics

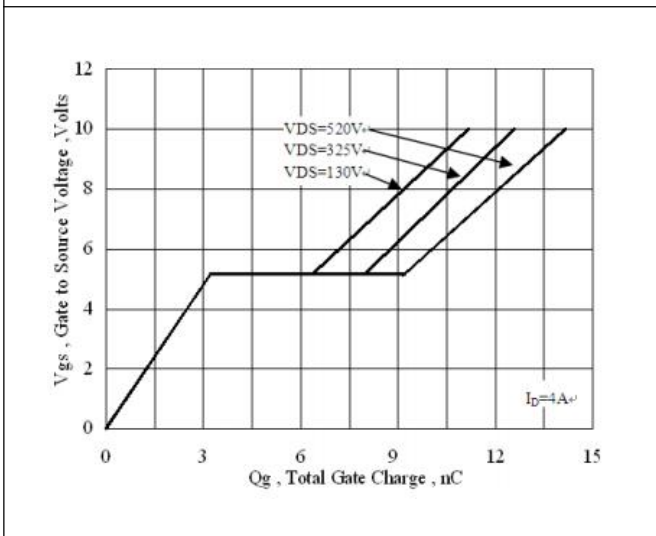


Figure 5. Gate Charge Characteristics

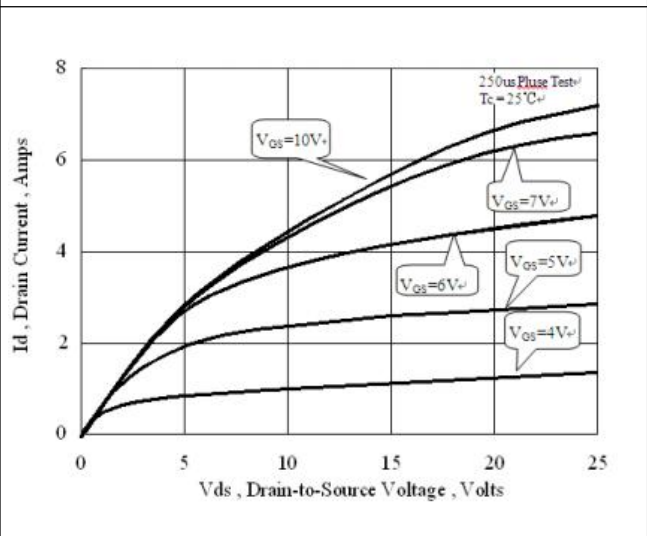


Figure 6. On-State Characteristics

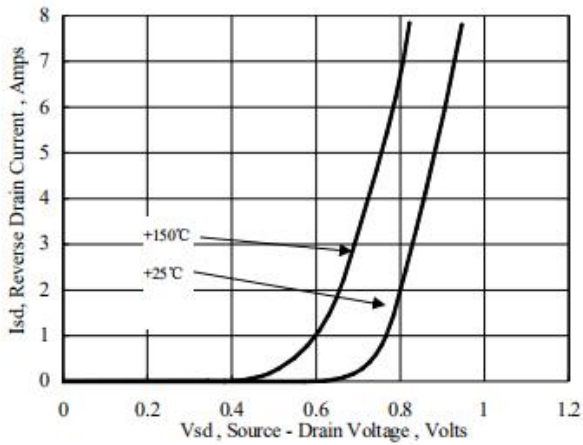


Figure 7. Typical Body Diode Transfer Characteristics

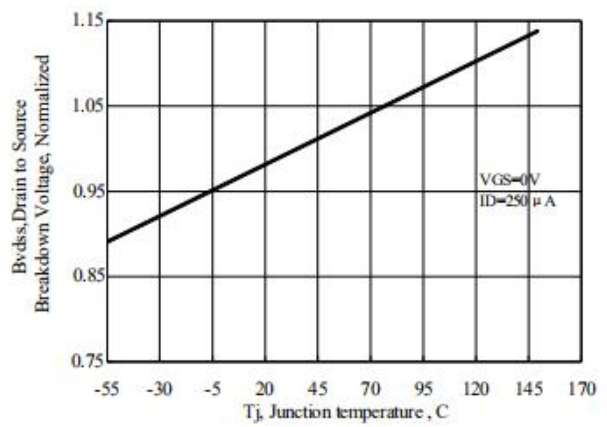


Figure 8. Typical Breakdown Voltage vs Junction Temperature

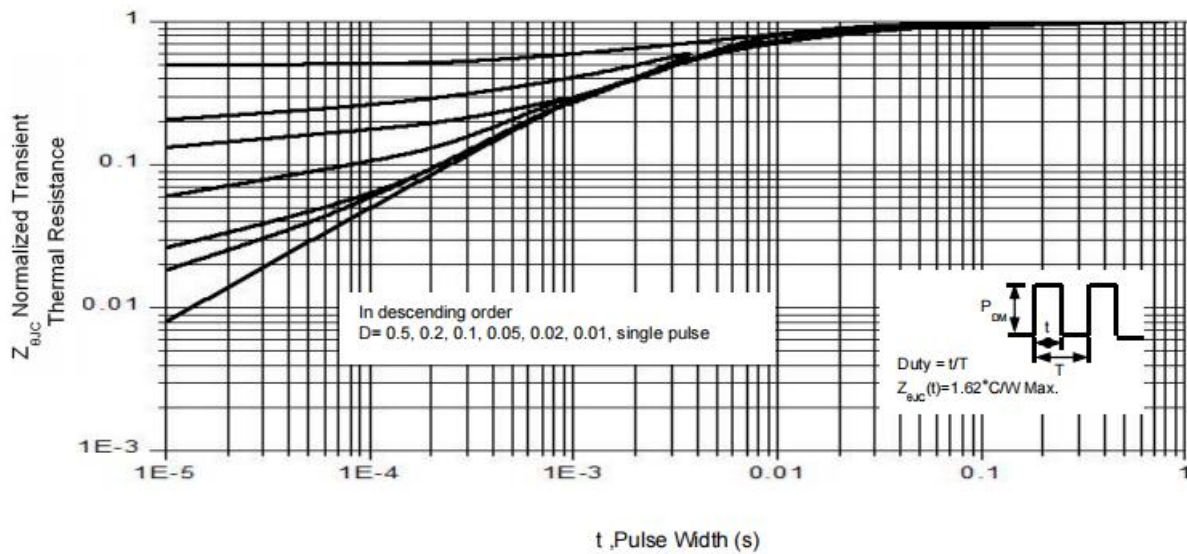


Figure 9. Normalized Effective Transient Thermal Impedance With Pulse Duration

### Package Information

