

• General Description

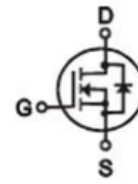
It combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$.

• Features

- Advance high cell density Trench technology
- Low $R_{DS(ON)}$ to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

• Application

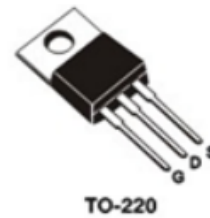
- MB/VGA Vcore
- SMPS 2nd Synchronous Rectifier
- POL application
- BLDC Motor driver

• Product Summary


$V_{DS} = 30V$

$R_{DS(ON)} = 1.2m\Omega$

$I_D = 240A$


• Ordering Information:

Part NO.	ZM012N03PC
Marking	ZM012N03
Packing Information	TUBE
Basic ordering unit (pcs)	500

• Absolute Maximum Ratings (T_C=25°C)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	20	V
Continuous Drain Current	$I_D @ TC=25^\circ C$	240	A
	$I_D @ TC=75^\circ C$	182	A
	$I_D @ TC=100^\circ C$	151	A
Pulsed Drain Current ④	I_{DM}	720	A
Total Power Dissipation	$P_D @ TC=25^\circ C$	150	W
Total Power Dissipation	$P_D @ TA=25^\circ C$	3.1	W
Operating Junction Temperature	T_J	-55 to 150	°C
Storage Temperature	T_{STG}	-55 to 150	°C
Single Pulse Avalanche Energy (L=0.5mH, $V_{GS}=10V$, $R_g=25\Omega$, $T_J=25^\circ C$)	E_{AS}	900	mJ

Single Pulse Avalanche Energy ($L=0.1\text{mH}, V_{GS}=10\text{V}, R_g=25\Omega, T_J=25^\circ\text{C}$)	E_{AS}	360	mJ
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•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	0.8	$^\circ\text{C/W}$
Thermal resistance, junction - ambient	R_{thJA}	-	-	40	$^\circ\text{C/W}$
Soldering temperature, wave soldering for 10s	T_{sold}	-	-	265	$^\circ\text{C}$

•Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0\text{V}, I_D=250\mu\text{A}$	30			V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu\text{A}$	1.2		2.5	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$			1.0	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20\text{V}, V_{DS}=0\text{V}$			± 100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}, I_D=24\text{A}$		1.2	1.5	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=12\text{A}$		1.4	1.7	$\text{m}\Omega$
Forward Transconductance	g_{FS}	$V_{DS}=25\text{V}, I_D=10\text{A}$		40		S
Source-drain voltage	V_{SD}	$I_S=24\text{A}$		0.8	1.28	V

•Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Input capacitance	C_{iss}	$f = 1\text{MHz}$	-	7750	-	pF
Output capacitance	C_{oss}		-	930	-	
Reverse transfer capacitance	C_{rss}		-	240	-	

•Gate Charge characteristics ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Total gate charge	Q_g	$V_{DD} = 15\text{V}$	-	125	-	nC
Gate - Source charge	Q_{gs}	$I_D = 20\text{A}$	-	16	-	
Gate - Drain charge	Q_{gd}	$V_{GS} = 10\text{V}$	-	25	-	

Note: ① Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$;

● **Electronic Characteristics**

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Input capacitance	Ciss	f = 1MHz, V _{DS} =25V	-	7830	-	pF
Output capacitance	Coss		-	893	-	
Reverse transfer capacitance	Crss		-	634	-	

● **Gate Charge characteristics (T_a = 25°C)**

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Gate Resistance	R _g	f = 1MHz		2.5		Ω
Total gate charge	Q _g	V _{DD} = 15V I _D = 20A V _{GS} = 10V	-	131	-	nC
Gate - Source charge	Q _{gs}		-	17.9	-	
Gate - Drain charge	Q _{gd}		-	31.3	-	
Turn-ON Delay time	t _{D(on)}	V _{GS} =10V, V _{DS} =15V R _G =3.3Ω, I _D =25A		12		ns
Turn-ON Rise time	t _r			13		ns
Turn-Off Delay time	t _{D(off)}			87		ns
Turn-Off Fall time	t _f			33		ns
Reverse Recovery Time	t _{RR}	V _{DD} = 20 V, dI _S /dt = 100 A/s, I _S = 30 A		24		ns
Charge Time	t _a			13.9		ns
Discharge Time	t _b			10.5		ns
Reverse Recovery Charge	Q _{RR}			15		ns

Note: ① Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$;

Fig.1 Power Dissipation

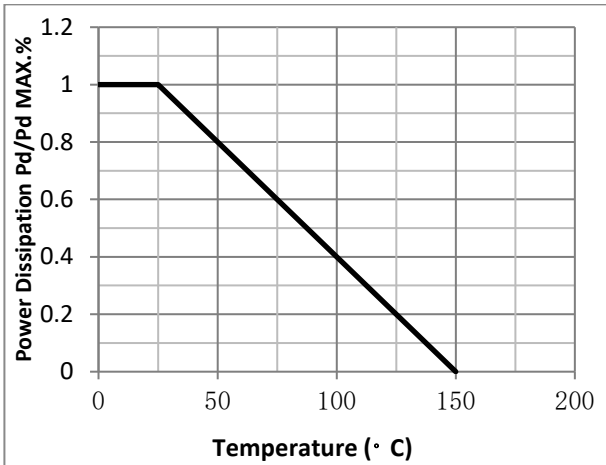


Fig.2 Typical output Characteristics

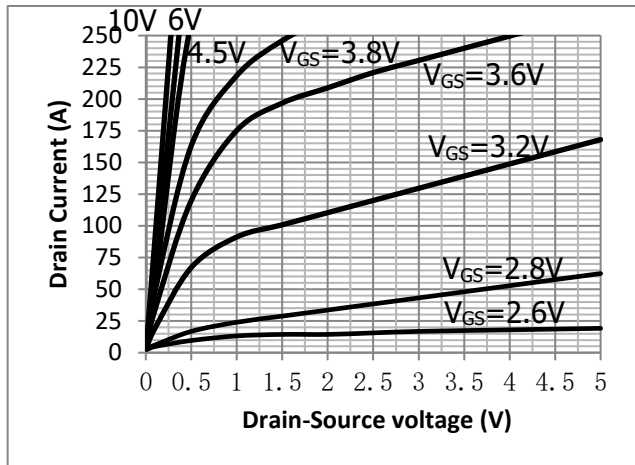


Fig.3 Threshold Voltage V.S Junction Temperature

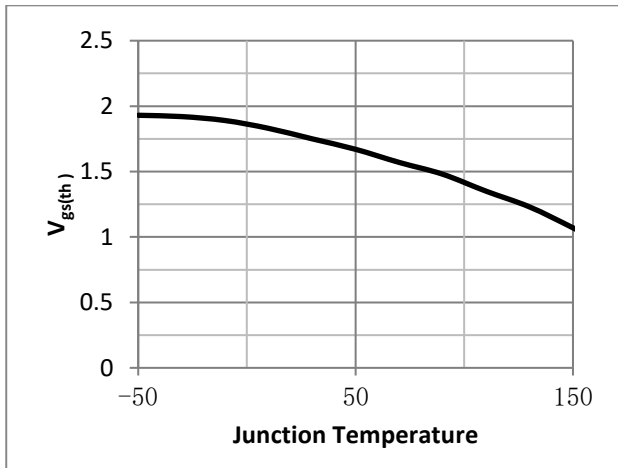


Fig.4 Resistance V.S Drain Current

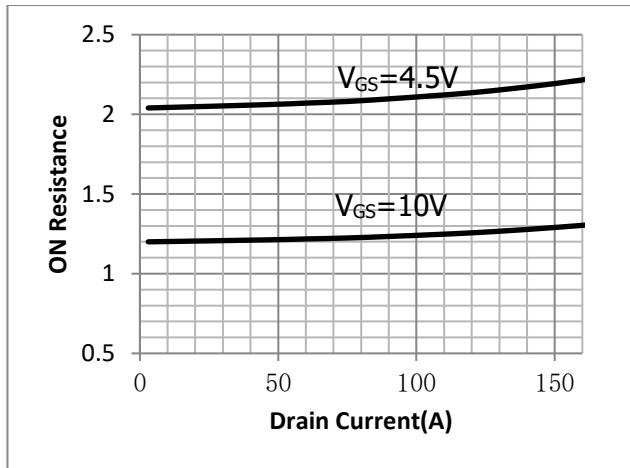


Fig.5 On-Resistance VS Gate Source Voltage

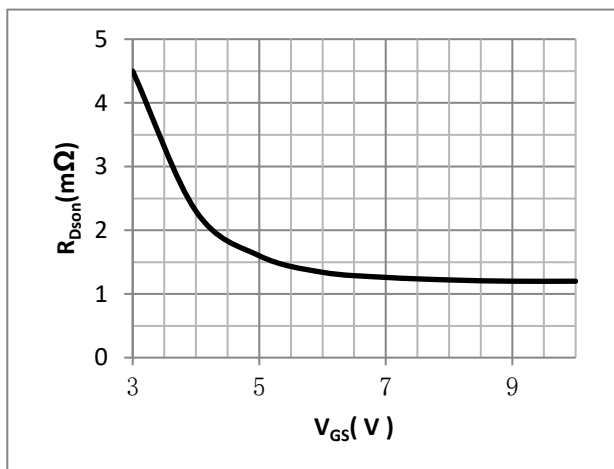


Fig.6 On-Resistance V.S Junction Temperature

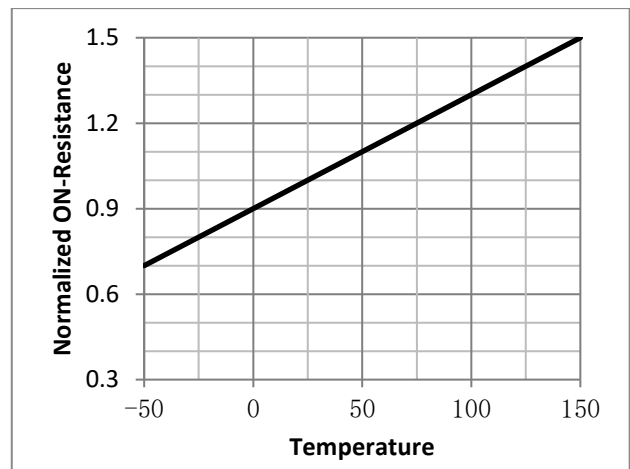


Fig.7 Gate Charge Characteristics

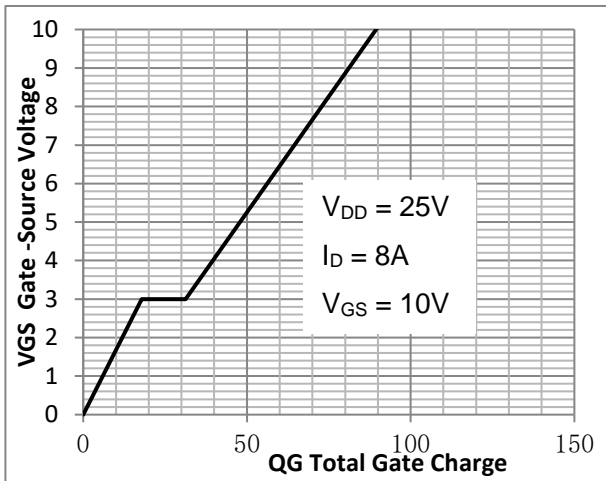


Fig.8 Capacitance vs V_{DS}

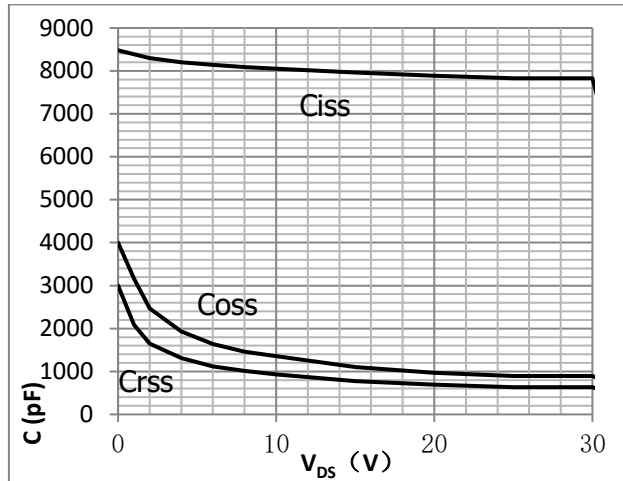


Fig.9 SOA Maximum Safe Operating Area

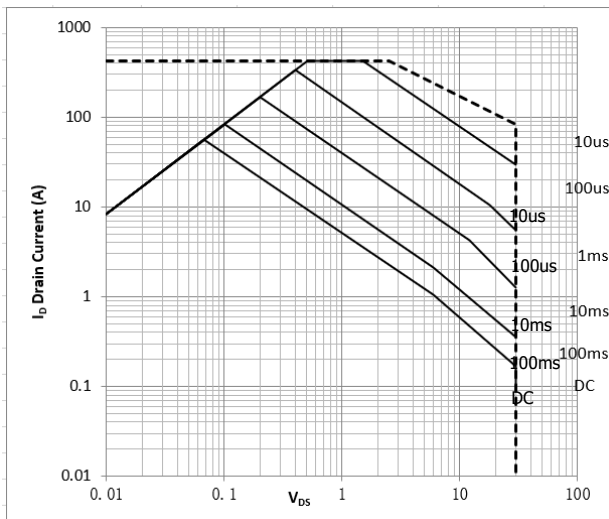


Fig.10 I_D -Junction Temperature

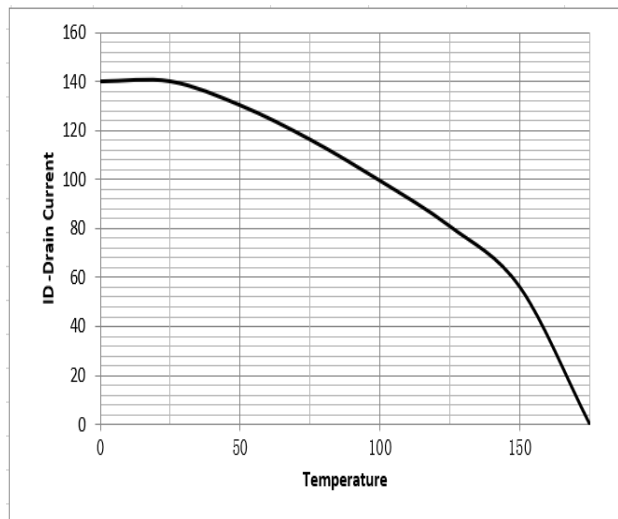


Figure 11. Diode Forward Voltage vs. Current

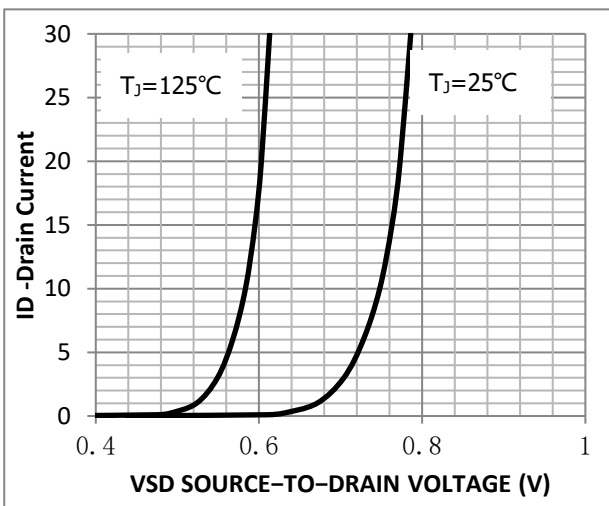


Figure 12. Transfer Characteristics

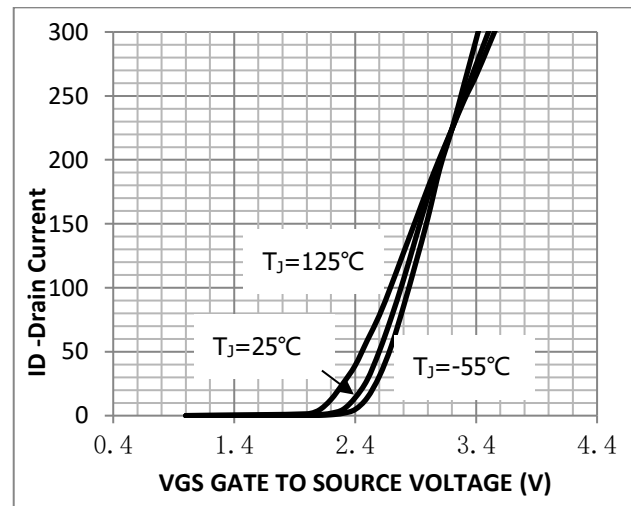


Fig.13 Switching Time Measurement Circuit

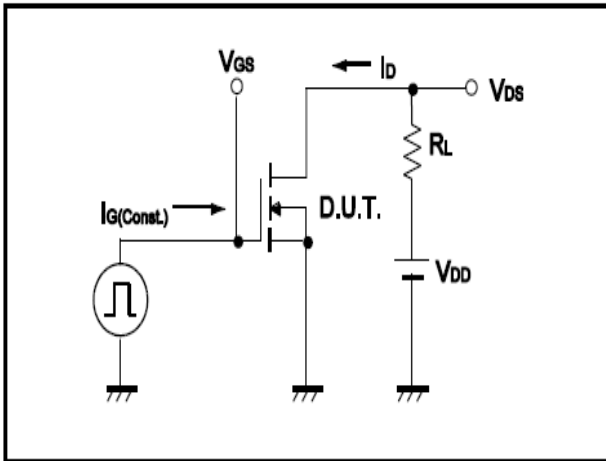


Fig.14 Gate Charge Waveform

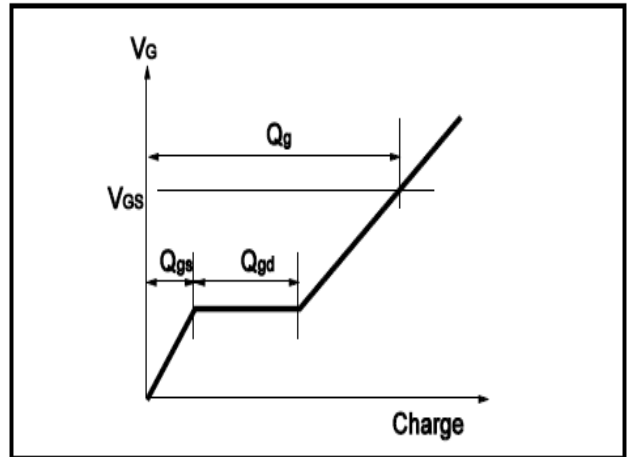


Fig.15 Resistive Switching Test Circuit

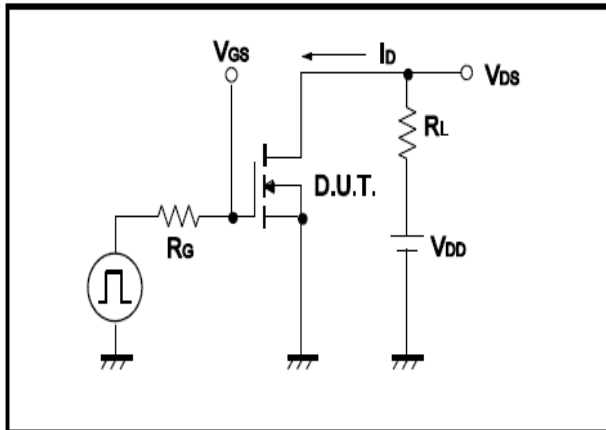


Fig.16 Resistive Switching Test Waveform

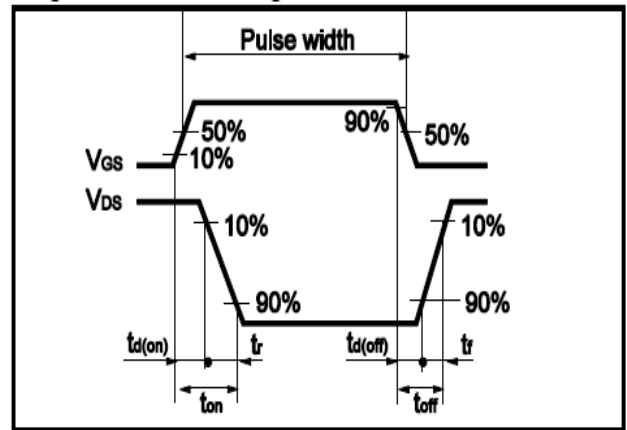


Fig.17 Avalanche Measurement Circuit

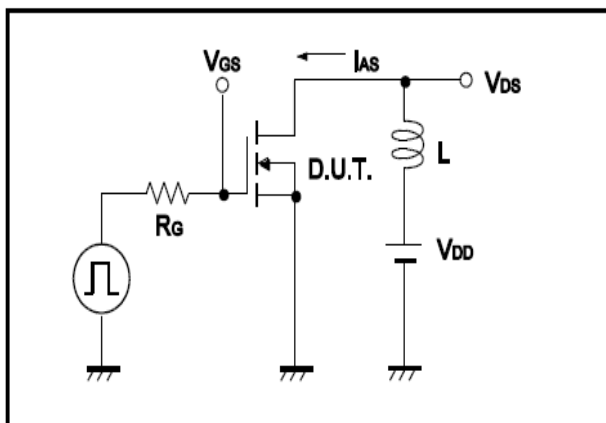
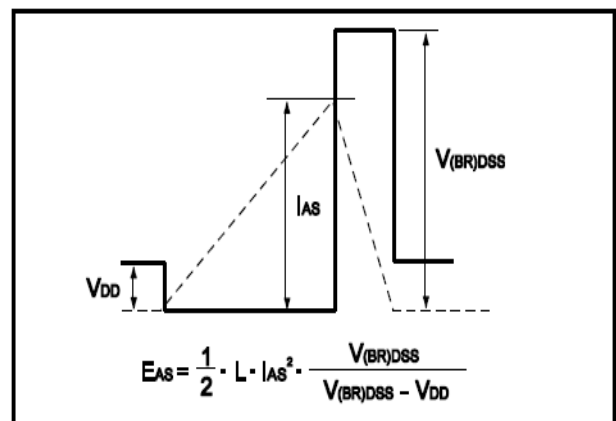


Fig.18 Avalanche Waveform



• Dimensions (TO-220)

Unit: mm

SYMBOL	min	nom	max	SYMBOL	min	nom	max
A	4.00		4.80	E	9.90		10.70
B	1.20		1.50	e		2.54	
B1	1.00		1.40	F	1.10		1.45
b1	0.65		1.00	L	12.50		14.50
c	0.35		0.75	L1	3.00	3.50	4.00
D	15.00		16.50	Q	2.50		3.00
D1	5.90		6.90	Q1	2.00		3.00
				ΦP	3.60		3.90

