

• General Description

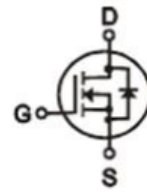
The ZM028N04P combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for load switch and battery protection applications.

• 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

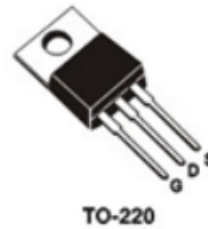
- MB/VGA Vcore
- SMPS 2nd Synchronous Rectifier
- POL application
- BLDC Motor driver

• Product Summary


$V_{DS} = 45V$

$R_{DS(ON)} = 2.8m\Omega$

$I_D = 140A$


• Ordering Information:

Part NO.	ZM028N04P
Marking	ZM028N04
Packing Information	REEL TAPE
Basic ordering unit (pcs)	500

• Absolute Maximum Ratings ($T_C = 25^\circ C$)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	45	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	$I_D @ TC=25^\circ C$	140	A
	$I_D @ TC=75^\circ C$	106	A
	$I_D @ TC=100^\circ C$	88	A
Pulsed Drain Current ①	I_{DM}	420	A
Total Power Dissipation($TC=25^\circ C$)	$P_D @ TC=25^\circ C$	100	W
Total Power Dissipation($TA=25^\circ C$)	$P_D @ TA=25^\circ C$	3.5	W
Operating Junction Temperature	T_J	-55 to 150	$^\circ C$
Storage Temperature	T_{STG}	-55 to 150	$^\circ C$
Single Pulse Avalanche Energy	E_{AS}	720	mJ

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	2.1	$^{\circ}C/W$
Thermal resistance, junction - ambient	R_{thJA}	-	-	65	$^{\circ}C/W$
Soldering temperature, wave soldering for 10s	T_{sold}	-	-	265	$^{\circ}C$

●Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	45			V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\mu A$	1.2		2.5	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 40V, V_{GS} = 0V$			1.0	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 24A$		2.8	3.6	m Ω
		$V_{GS} = 4.5V, I_D = 12A$		3.7	4.8	m Ω
Forward Trans conductance	g_{FS}	$V_{DS} = 25V, I_D = 10A$		16		s
Source-drain voltage	V_{SD}	$I_S = 24A$		0.8	1.0	V

●Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Input capacitance	C_{iss}	$f = 1MHz$	-	5600	-	pF
Output capacitance	C_{oss}		-	700	-	
Reverse transfer capacitance	C_{rss}		-	520	-	

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

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Total gate charge	Q_g	$V_{DD} = 25V$	-	44	-	nC
Gate - Source charge	Q_{gs}	$I_D = 8A$	-	16	-	
Gate - Drain charge	Q_{gd}	$V_{GS} = 10V$	-	22	-	

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

Fig.1 SOA Maximum Safe Operating Area

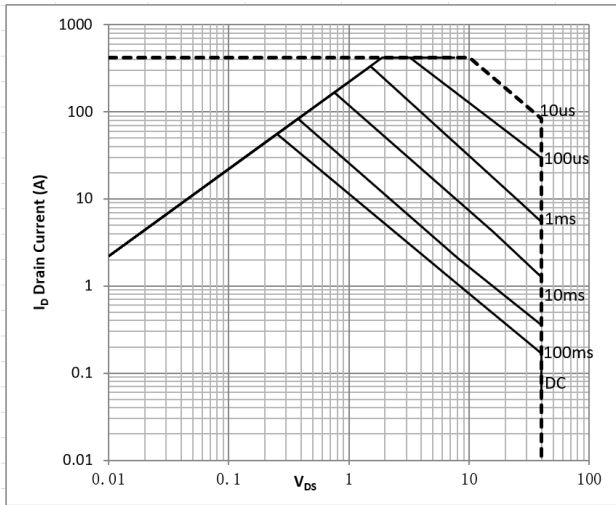


Fig.2 ID-Junction Temperature

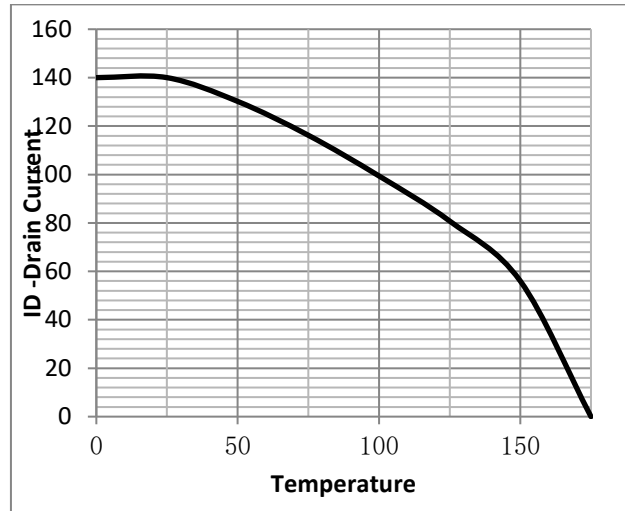


Fig.3 Gate-Charge Characteristics

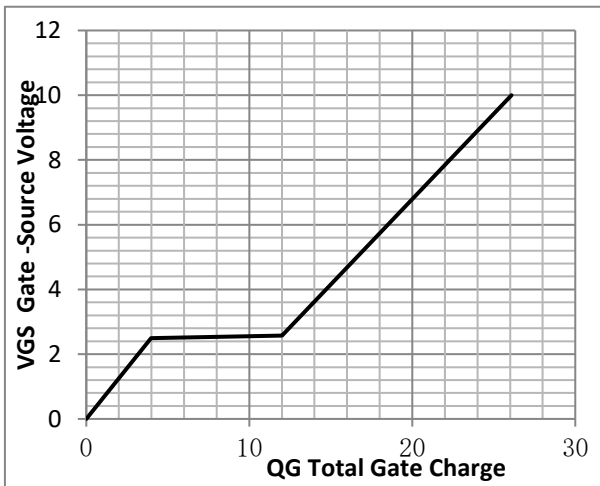


Fig.4 Capacitance Characteristics

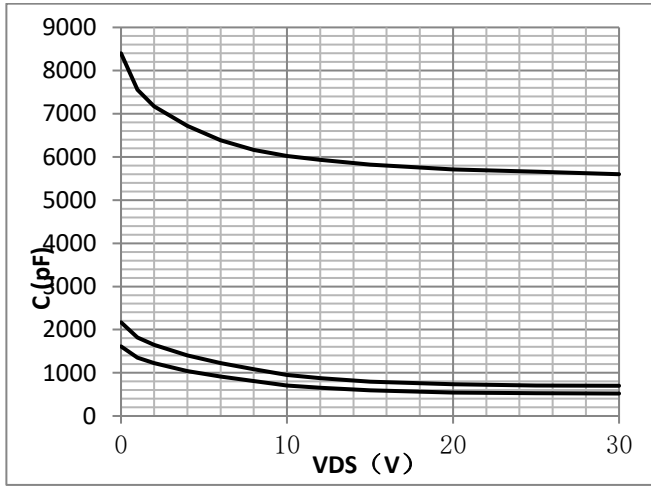


Fig.5 Power Dissipation

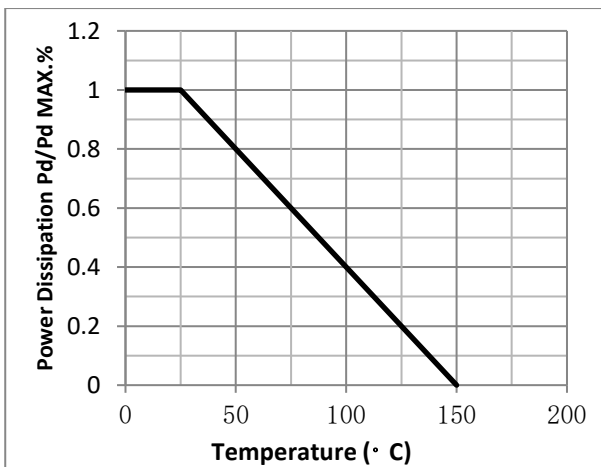


Fig.6 Typical output Characteristics

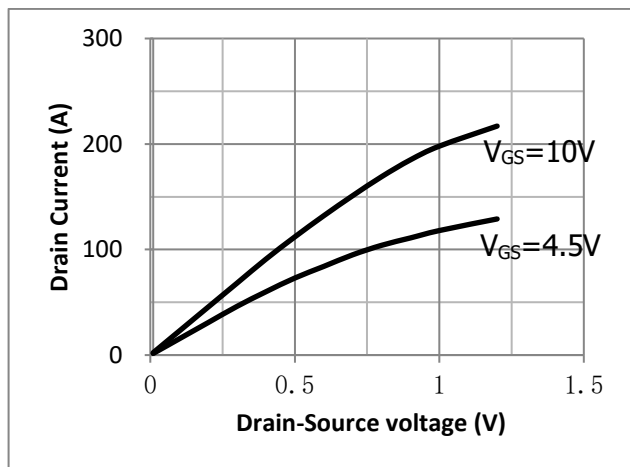


Fig.7 Threshold Voltage V.S Junction Temperature Fig.8 Resistance V.S Drain Current

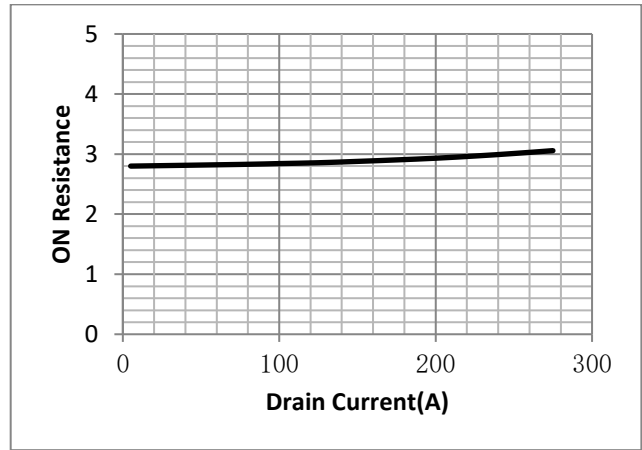
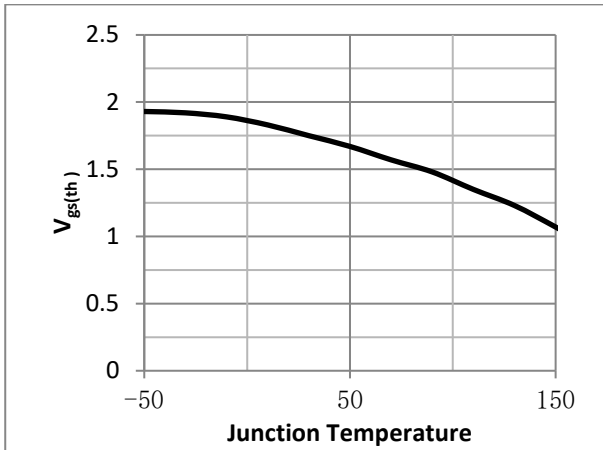


Fig.9 On-Resistance VS Gate Source Voltage

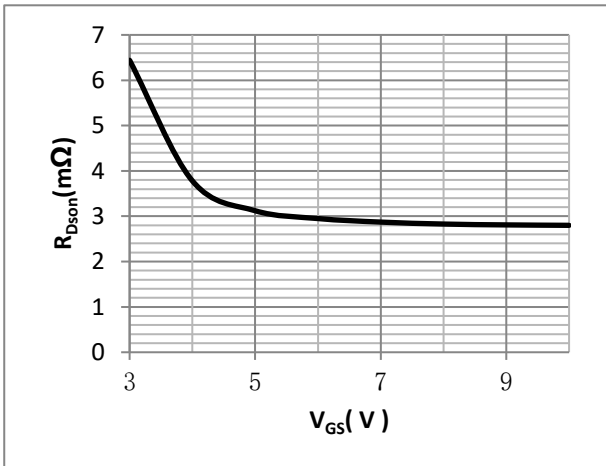


Fig.10 On-Resistance V.S Junction Temperature

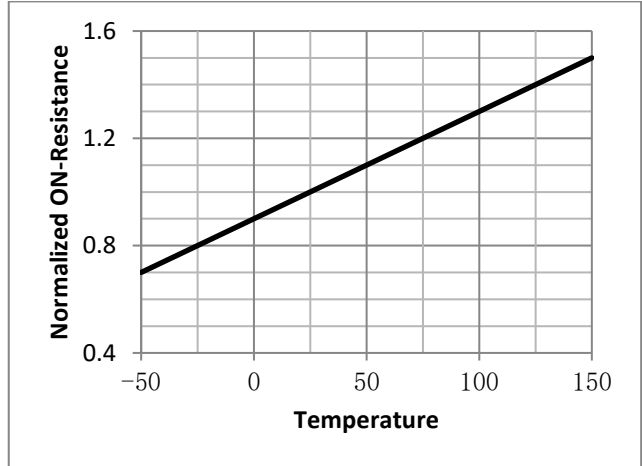


Fig.11 Switching Time Measurement Circuit

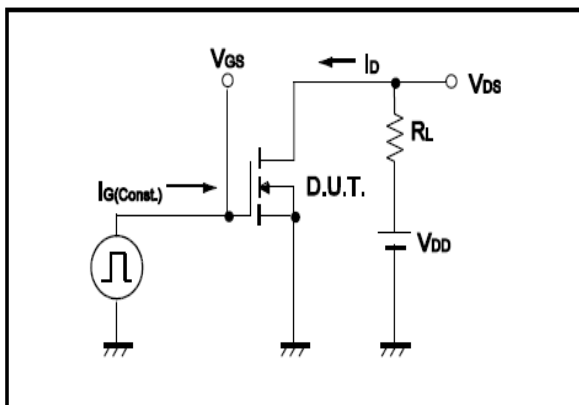


Fig.12 Gate Charge Waveform

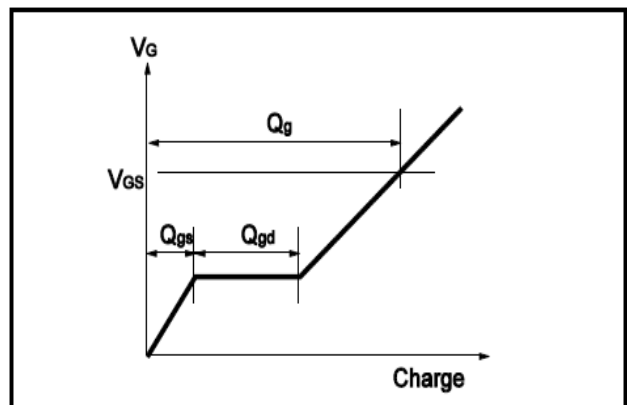


Fig.9 Switching Time Measurement Circuit

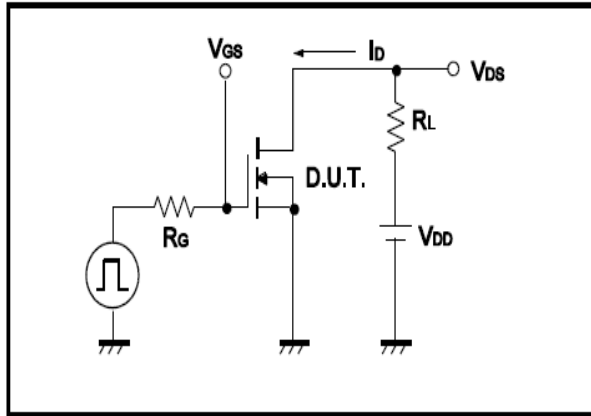


Fig.10 Gate Charge Waveform

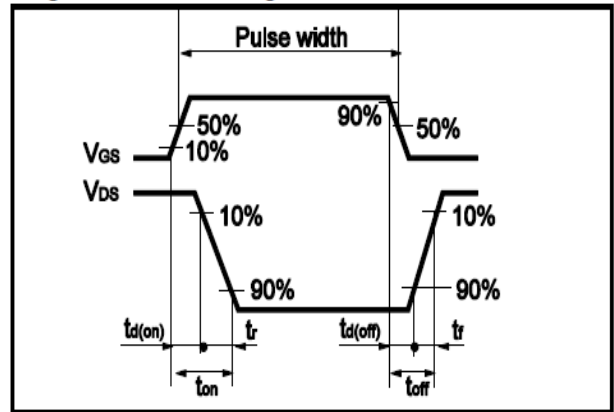


Fig.11 Avalanche Measurement Circuit

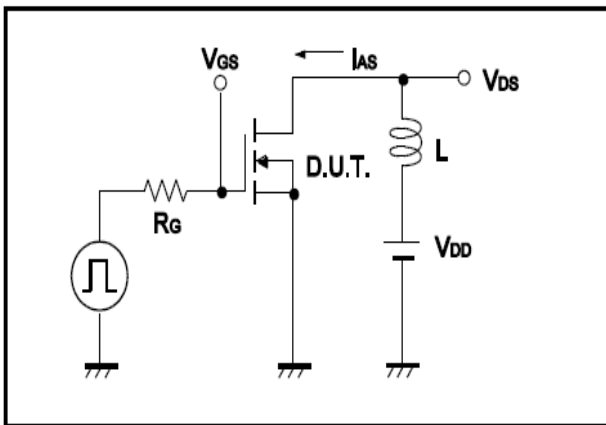
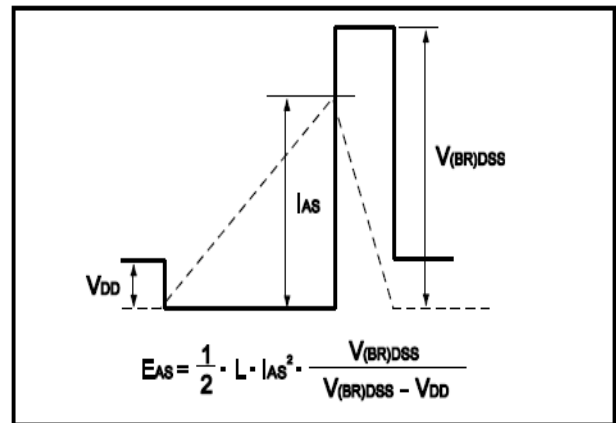


Fig.12 Avalanche Waveform



• 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

