



20V N-Channel MOSFETs

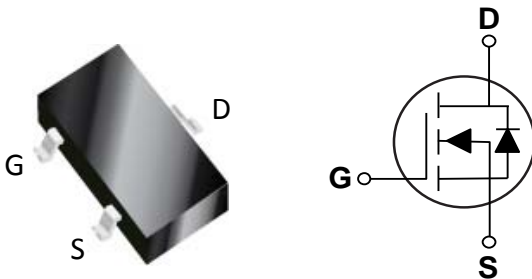
**General Description**

The TNMNB055 is the high cell density trench N-ch MOSFETs, which provides excellent  $R_{DS(ON)}$  and efficiency for most of the small power switching and load switch applications.

The TNMNB055 meets the RoHS and Green Product requirement with full function reliability approved.

<b>BV<sub>DSS</sub></b>	<b>R<sub>DS(ON)</sub></b>	<b>I<sub>D</sub></b>
20 V	55 mΩ	3.6 A

SOT-23 Pin Configuration



**Features**

- 20V, 3.6A,  $R_{DS(ON)}=55m\Omega @V_{GS}=4.5V$
- Green Device Available
- Super Low Gate Charge
- Excellent Cdv/dt effect decline
- Advanced high cell density Trench technology

**Absolute Maximum Ratings  $T_c=25^\circ C$  unless otherwise noted**

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Drain Current - Continuous, $V_{GS} @ 4.5V$ (NOTE 1) ( $T_A=25^\circ C$ )	3.6	A
	Drain Current - Continuous, $V_{GS} @ 4.5V$ (NOTE 1) ( $T_A=70^\circ C$ )	2.8	A
$I_{DM}$	Drain Current - Pulsed (NOTE 2)	14.4	A
$P_D$	Total Power Dissipation (NOTE 3) ( $T_A=25^\circ C$ )	1	W
$T_J$	Operating Junction Temperature Range	-50 to 150	$^\circ C$
$T_{STG}$	Storage Temperature Range	-50 to 150	$^\circ C$
Marking Code		AG	

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max	Unit
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (NOTE 1)	---	125	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction to Case (NOTE 1)	---	80	$^\circ C/W$



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Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	20	---	---	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	5	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V	---	---	±100	nA

On Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance (NOTE 2)	V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A	---	---	55	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =2A	---	---	75	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	0.4	---	1.2	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =3A	---	10.5	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A	---	4.6	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	0.7	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	1.5	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =10V, V <sub>GS</sub> =4.5V, R <sub>G</sub> =3.3Ω, I <sub>D</sub> =3A	---	1.6	---	ns
T <sub>r</sub>	Rise Time		---	42	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	14	---	
T <sub>f</sub>	Fall Time		---	7	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, F=1MHz	---	310	---	pF
C <sub>oss</sub>	Output Capacitance		---	49	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	35	---	

Drain-Source Diode Characteristics and Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current (NOTE 1、4)	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	3.6	A
V <sub>SD</sub>	Diode Forward Voltage (NOTE 2)	V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C	---	---	1.2	V

NOTES :

1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
3. The power dissipation is limited by 150°C junction temperature
4. The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.



Characteristics Curves

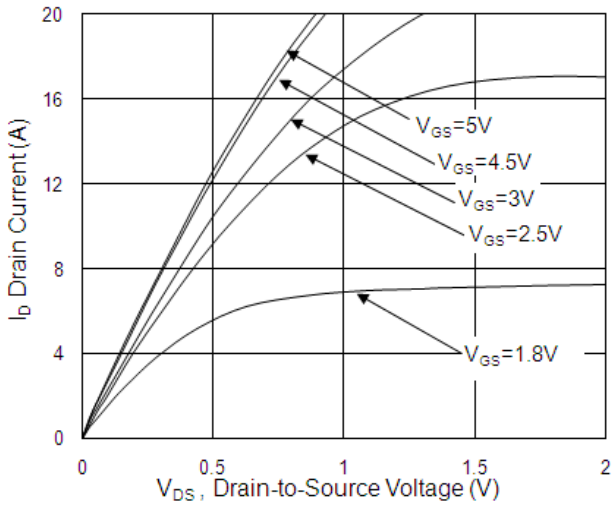


Fig.1 Typical Output Characteristics

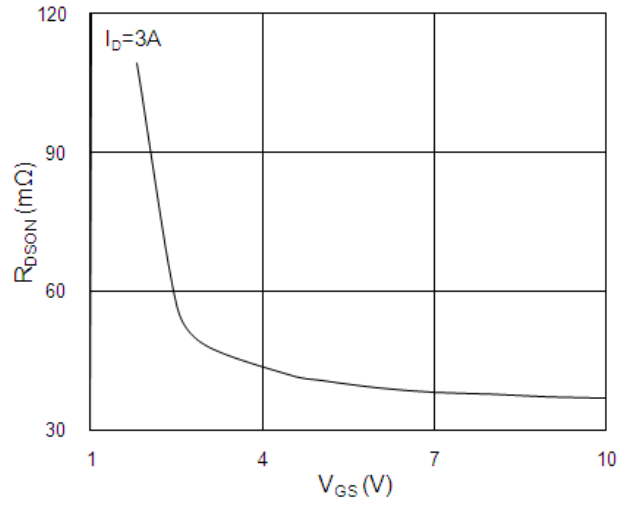


Fig.2 On-Resistance vs. Gate-Source Voltage

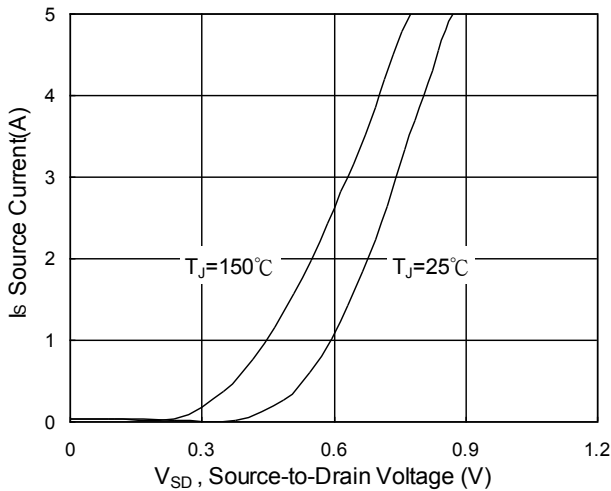


Fig.3 Forward Characteristics of Reverse

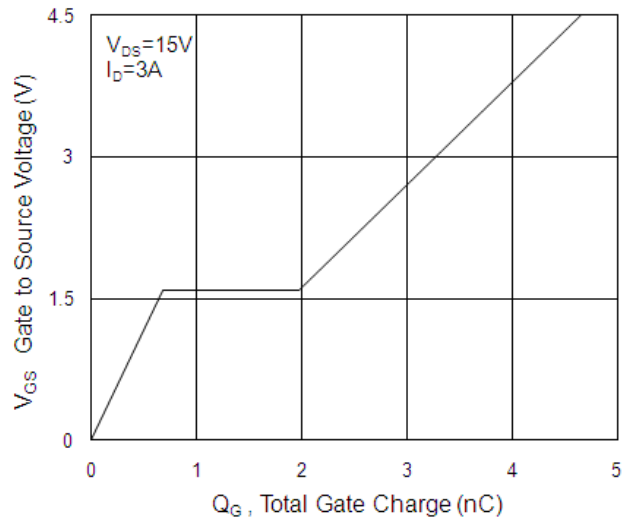


Fig.4 Gate-Charge Characteristics

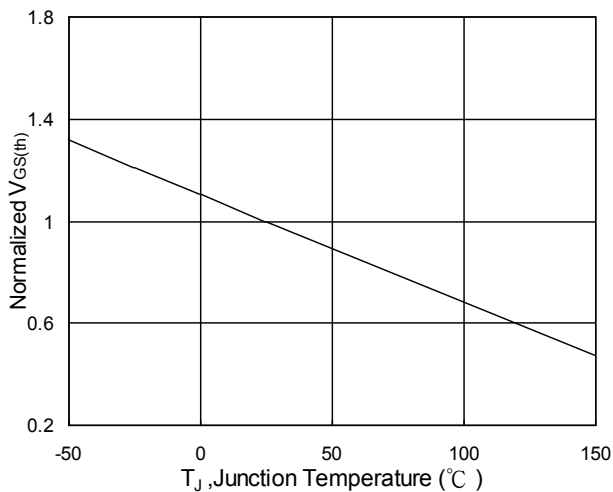


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

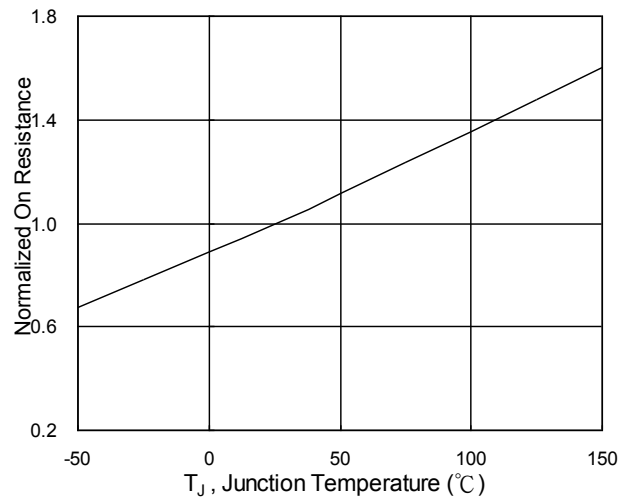


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$



Characteristics Curves

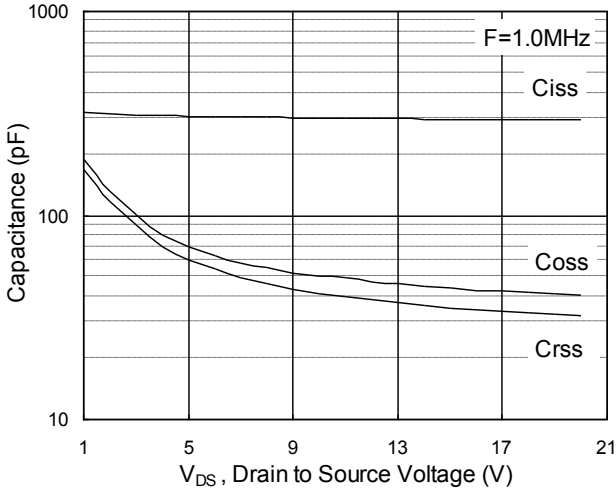


Fig.7 Capacitance

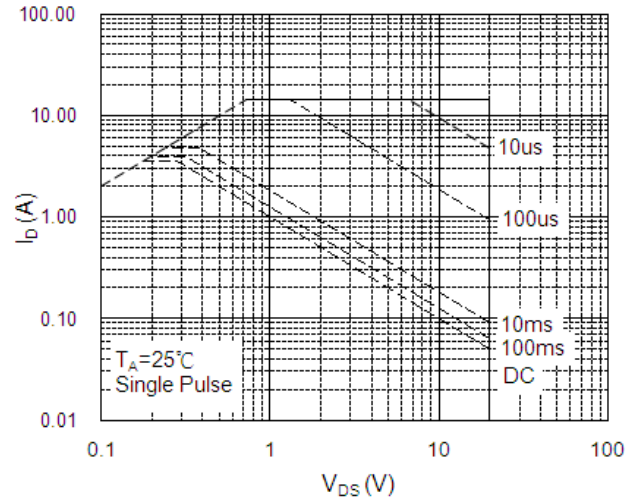


Fig.8 Safe Operating Area

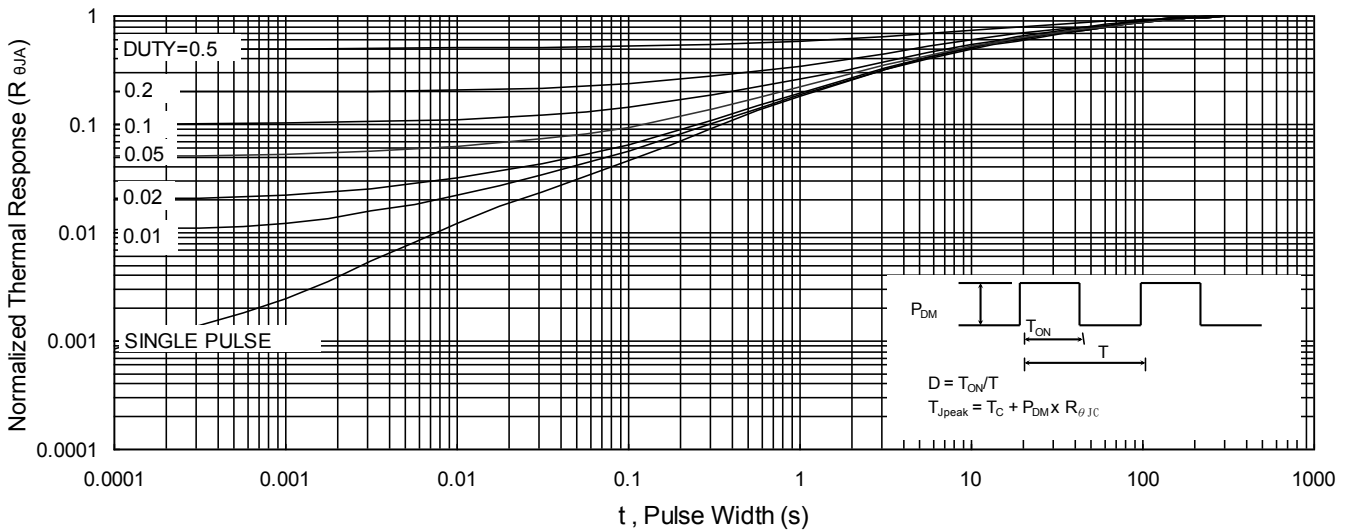


Fig.9 Normalized Maximum Transient Thermal Impedance

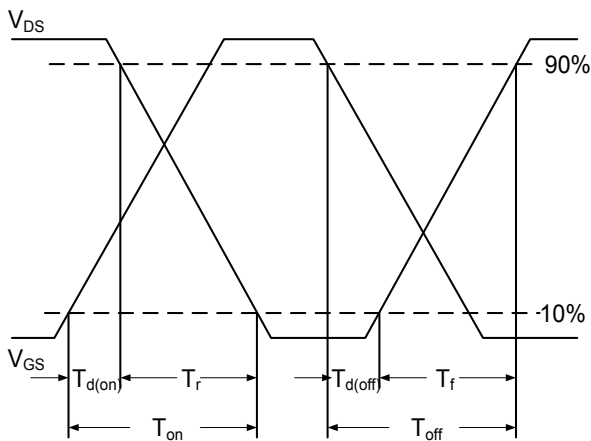


Fig.10 Switching Time Waveform

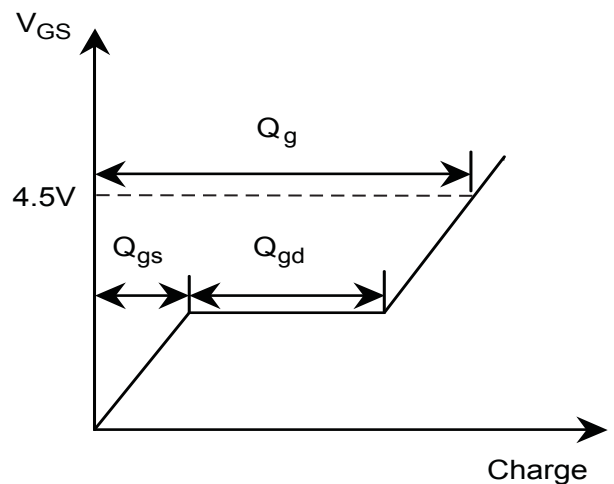
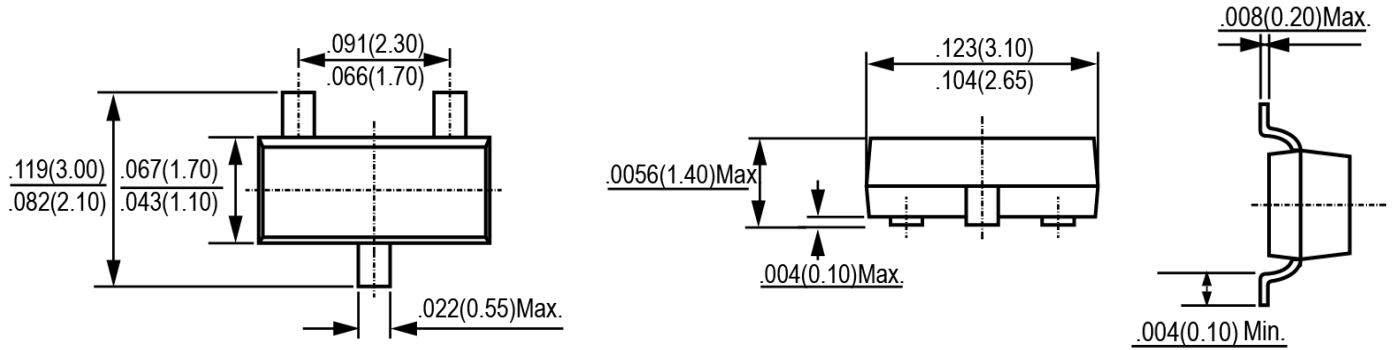


Fig.11 Gate Charge Waveform



Package Outline Dimensions



SOT-23

Dimensions in inches and (millimeters)



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