

Features

- N-Channel
- Enhancement mode
- Very low on-resistance $R_{DS(on)}$ @ $V_{GS}=4.5\text{ V}$
- Fast Switching
- 100% Avalanche Tested
- Pb-free lead plating; RoHS compliant; Hg-Free

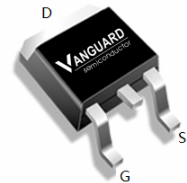


Halogen-Free

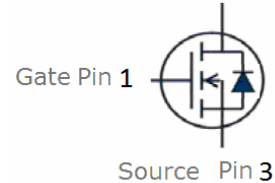
Part ID	Package Type	Marking	Tape and reel information
VSD040N04MS	TO-252	040N04M	2500pcs/reel

V_{DS}	40	V
$R_{DS(on),TYP} @ V_{GS}=10\text{ V}$	36	mΩ
$R_{DS(on),TYP} @ V_{GS}=4.5\text{ V}$	42	mΩ
I_D	20	A

TO-252



Drain Pin 2



Source Pin 3

Maximum ratings, at $T_J=25\text{ °C}$, unless otherwise specified

Symbol	Parameter		Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage		40	V
I_S	Diode continuous forward current	$T_C=25\text{ °C}$	20	A
I_D	Continuous drain current @ $V_{GS}=10\text{ V}$	$T_C=25\text{ °C}$	20	A
		$T_C=100\text{ °C}$	13	A
I_{DM}	Pulse drain current tested ①	$T_C=25\text{ °C}$	50	A
P_D	Maximum power dissipation	$T_C=25\text{ °C}$	30	W
V_{GS}	Gate-Source voltage		±20	V
T_{STG}	Storage temperature range		-55 to 175	°C
T_J	Maximum Junction Temperature		175	°C
EAS	Avalanche energy, single pulsed ②	$I_D=8\text{ A}$	3.2	mJ

Thermal Characteristics

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	5.0	°C/W
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	70	°C/W

Typical Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Static Electrical Characteristics @ T _J = 25°C (unless otherwise stated)						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V I _D =250μA	40	--	--	V
I _{DSS}	Zero Gate Voltage Drain Current(Tc=25°C)	V _{DS} =32V,V _{GS} =0V	--	0.01	1	μA
	Zero Gate Voltage Drain Current(Tc=125°C)	V _{DS} =32V,V _{GS} =0V	--	5	100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±20V,V _{DS} =0V	--	--	±100	nA
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} =V _{GS} ,I _D =250μA	1.0	2.0	3.0	V
R _{DS(ON)}	Drain-Source On-State Resistance①	V _{GS} =10V, I _D =10A	--	36	40	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance①	V _{GS} =4.5V, I _D =5A	--	42	50	mΩ
Dynamic Electrical Characteristics @ T _J = 25°C (unless otherwise stated)						
C _{iss}	Input Capacitance	V _{DS} =20V,V _{GS} =0V, f=1MHz	--	345	--	pF
C _{oss}	Output Capacitance		--	43	--	pF
C _{rss}	Reverse Transfer Capacitance		--	18	--	pF
Q _g	Total Gate Charge	V _{DS} =20V,I _D =5A, V _{GS} =10V	--	8.6	--	nC
Q _{gs}	Gate-Source Charge		--	1.7	--	nC
Q _{gd}	Gate-Drain Charge		--	2.2	--	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} =20V, I _D =1A, R _G =6.8Ω, V _{GS} =10V	--	5.8	--	nS
t _r	Turn-on Rise Time		--	2.8	--	nS
t _{d(off)}	Turn-Off Delay Time		--	16	--	nS
t _f	Turn-Off Fall Time		--	2.2	--	nS
Source- Drain Diode Characteristics@ T _J = 25°C (unless otherwise stated)						
I _{SD}	Source-drain current(Body Diode)	T _c =25°C	--	--	20	A
V _{SD}	Forward on voltage	I _{SD} =2A,V _{GS} =0V	--	0.78	1.3	V
t _{rr}	Reverse Recovery Time	T _J =25°C,I _{sd} =5A, V _{GS} =0V di/dt=100A/μs	--	25	--	nS
Q _{rr}	Reverse Recovery Charge		--	28	--	nC

NOTE:

① Pulse width ≤ 300μs; duty cycles ≤ 2%.

② Limited by T_{Jmax}, starting T_J = 25°C, L = 0.1mH, R_G = 25Ω, I_{AS} = 8A, V_{GS} = 10V. Part not recommended for use above this value.

Typical Characteristics

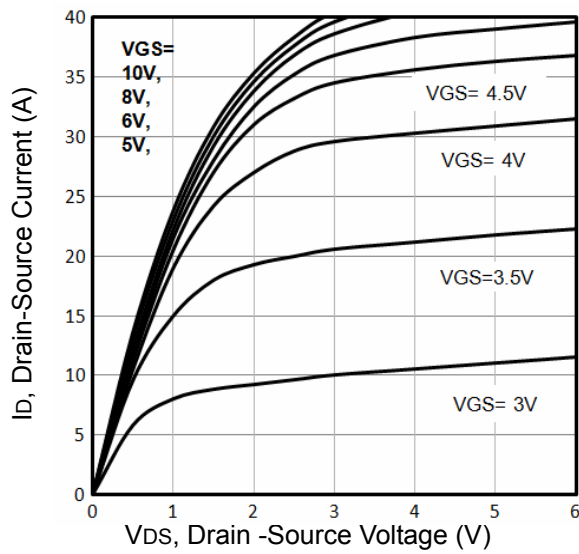


Fig1. Typical Output Characteristics

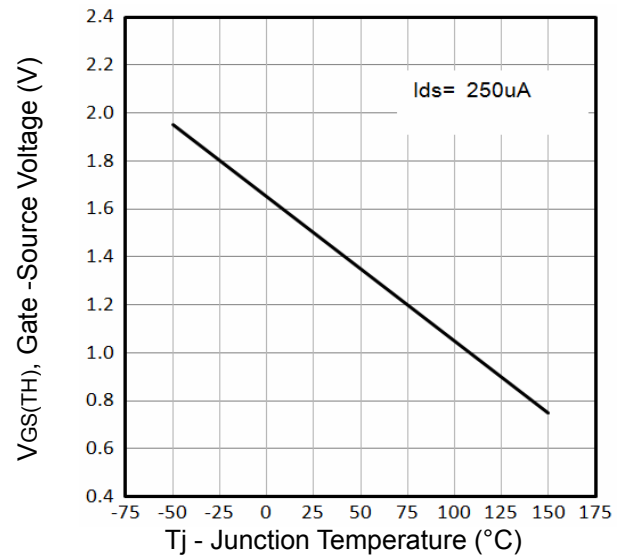


Fig2. Threshold Voltage Vs. Temperature

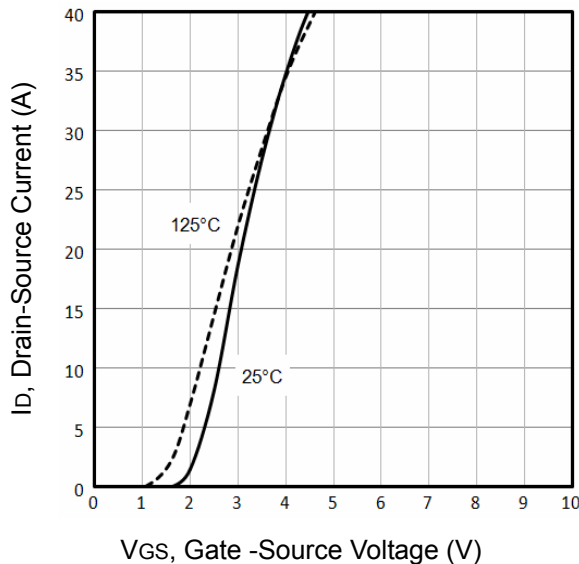


Fig3. Typical Transfer Characteristics

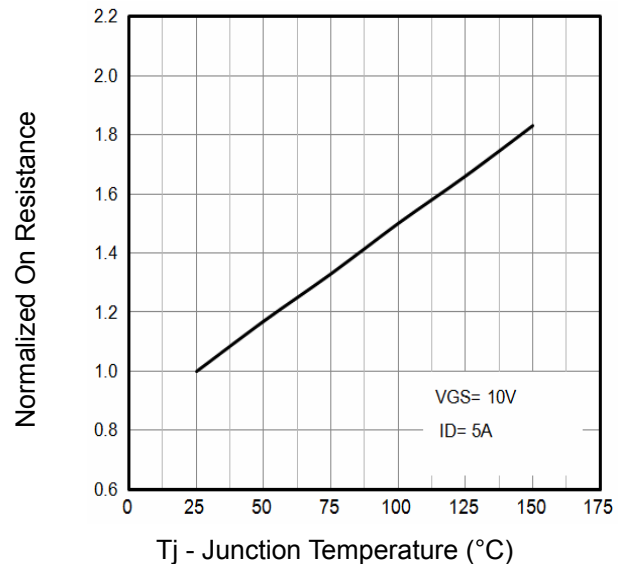


Fig4. Normalized On-Resistance Vs. Temperature

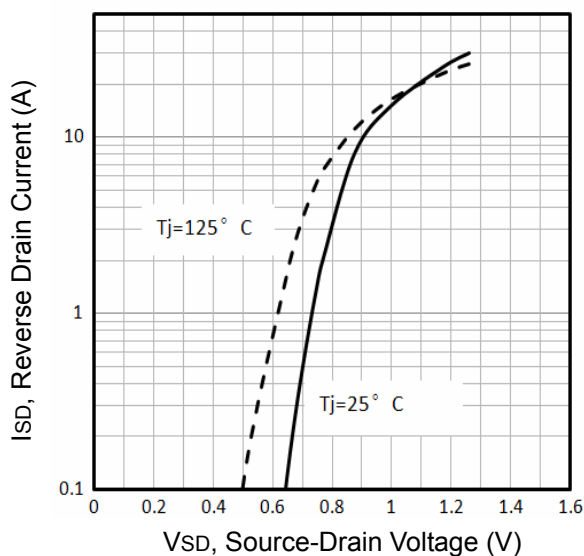


Fig5. Typical Source-Drain Diode Forward Voltage

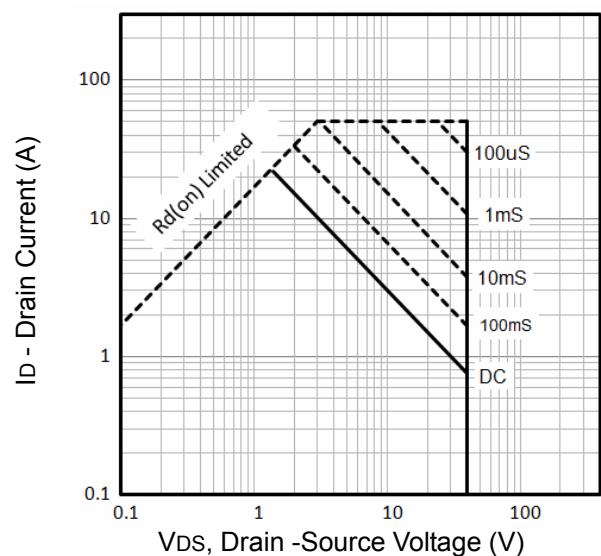
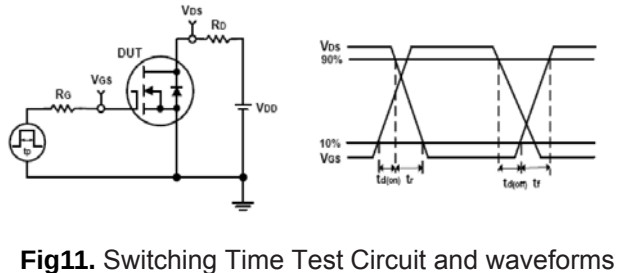
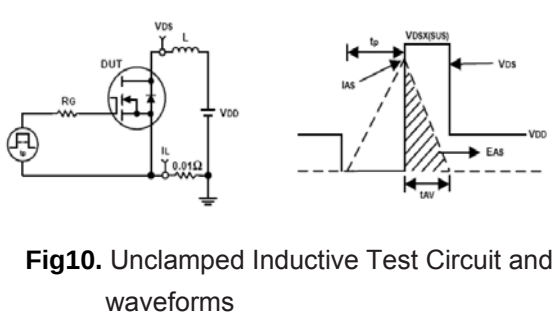
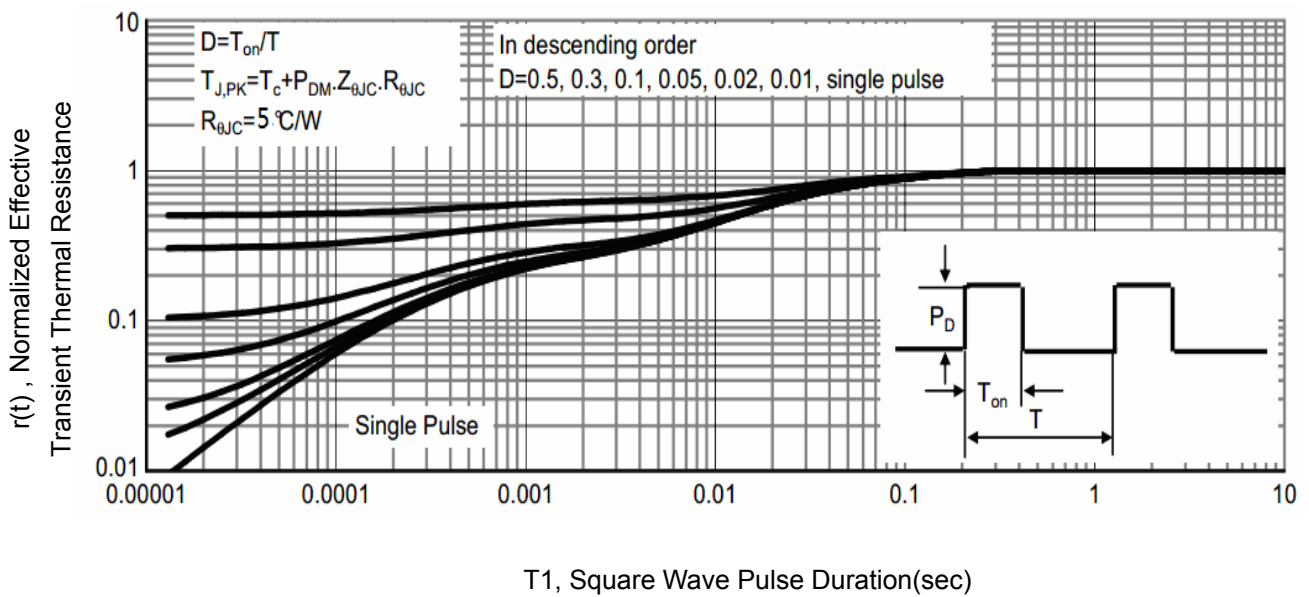
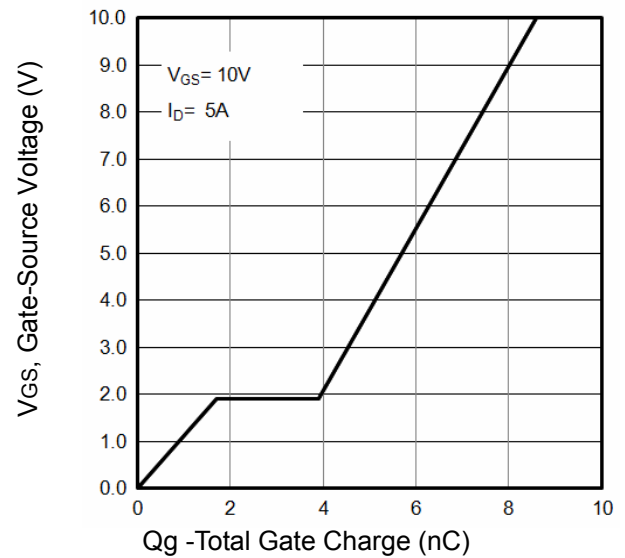
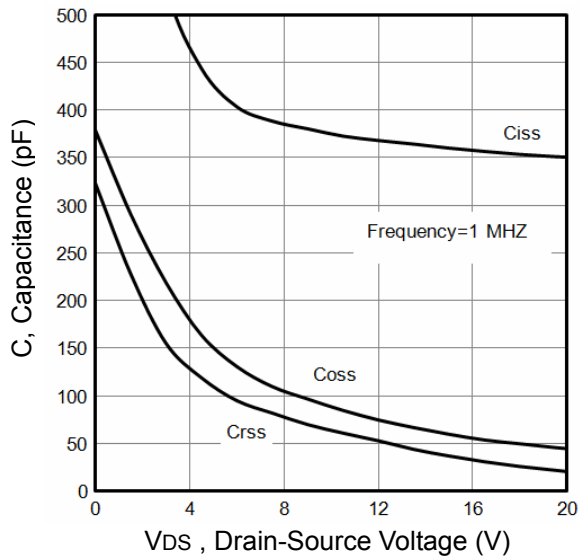
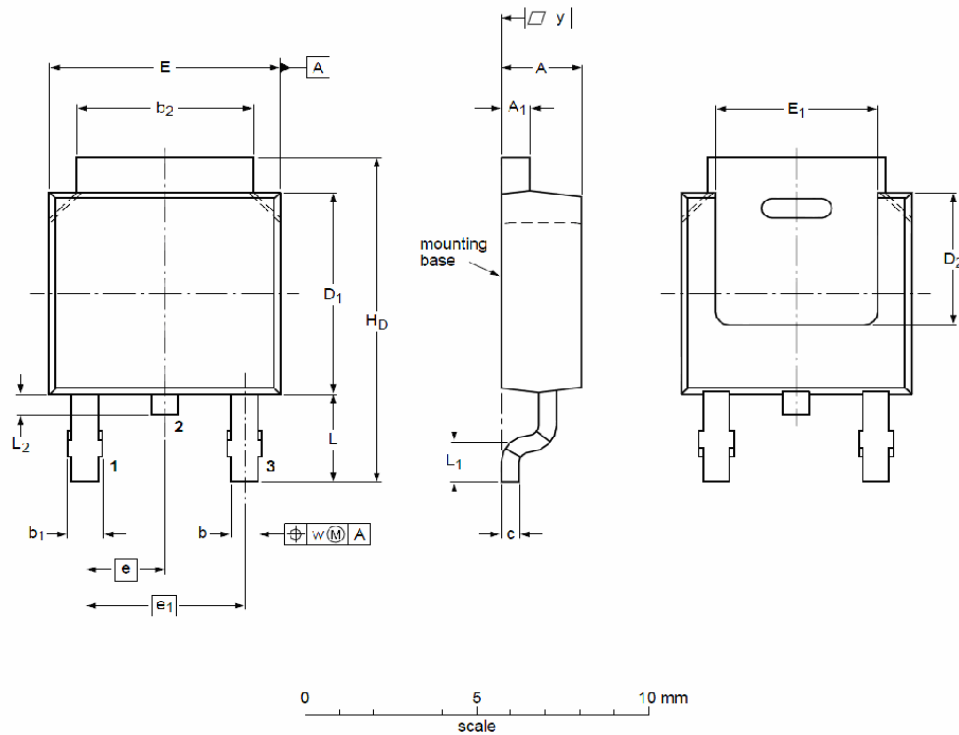


Fig6. Maximum Safe Operating Area

Typical Characteristics



TO-252 Package Outline



DIMENSIONS (unit : mm)

Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
A	2.22	2.30	2.38	A ₁	0.46	0.58	0.93
b	0.71	0.79	0.89	b ₁	0.90	0.98	1.10
b ₂	5.00	5.30	5.46	c	0.20	0.40	0.56
D ₁	5.98	6.05	6.22	D ₂	--	4.00	--
E	6.47	6.60	6.73	E ₁	5.10	5.28	5.45
e	--	2.28	--	e ₁	--	4.57	--
H _D	9.60	10.08	10.40	L	2.75	2.95	3.05
L ₁	--	0.50	--	L ₂	0.80	0.90	1.10
w	--	0.20	--	y	0.20	--	--

Customer Service

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