

Features

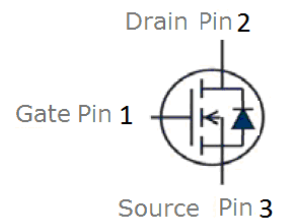
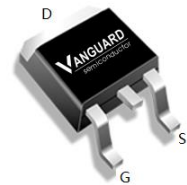
- Enhancement mode
- Low on-resistance $R_{DS(on)}$ @ $V_{GS}=10\text{ V}$
- Fast Switching and High efficiency
- 100% Avalanche Tested
- Pb-free lead plating; RoHS compliant



Part ID	Package Type	Marking	Tape and reel information
VSD040N15HS	TO-252	040N15H	2500pcs/Reel

V_{DS}	150	V
$R_{DS(on),TYP}$ @ $V_{GS}=10\text{ V}$	30	m Ω
I_D	45	A

TO-252



Maximum ratings, at $T_A = 25^\circ\text{C}$, unless otherwise specified

Symbol	Parameter	Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage	150	V
V_{GS}	Gate-Source voltage	± 20	V
I_S	Diode continuous forward current	$T_C = 25^\circ\text{C}$	45 A
I_D	Continuous drain current @ $V_{GS}=10\text{V}$	$T_C = 25^\circ\text{C}$	45 A
		$T_C = 100^\circ\text{C}$	32 A
I_{DM}	Pulse drain current tested ①	$T_C = 25^\circ\text{C}$	180 A
I_{DSM}	Continuous drain current @ $V_{GS}=10\text{V}$	$T_A = 25^\circ\text{C}$	4 A
		$T_A = 70^\circ\text{C}$	3 A
EAS	Avalanche energy, single pulsed ②	128	mJ
P_D	Maximum power dissipation	$T_C = 25^\circ\text{C}$	150 W
P_{DSM}	Maximum power dissipation ③	$T_A = 25^\circ\text{C}$	1.25 W
T_{STG}, T_J	Storage and Junction Temperature Range	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	100	$^\circ\text{C/W}$

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	150	--	--	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =150V, V _{GS} =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T _j =125°C)	V _{DS} =150V, V _{GS} =0V	--	--	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	3.0	3.6	4.4	V
R _{DS(ON)}	Drain-Source On-State Resistance ④	V _{GS} =10V, I _D =25A	--	30	40	mΩ
		T _j =100°C	--	41	--	mΩ
Dynamic Electrical Characteristics @ T_j = 25°C (unless otherwise stated)						
C _{iss}	Input Capacitance	V _{DS} =30V, V _{GS} =0V, f=1MHz	2140	2520	2900	pF
C _{oss}	Output Capacitance		180	210	240	pF
C _{riss}	Reverse Transfer Capacitance		110	130	150	pF
R _g	Gate Resistance	f=1MHz	--	2.8	--	Ω
Q _g	Total Gate Charge	V _{DS} =75V, I _D =25A, V _{GS} =10V	--	53	--	nC
Q _{gs}	Gate-Source Charge		--	14	--	nC
Q _{gd}	Gate-Drain Charge		--	20	--	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} =75V, I _D =25A, R _G =3.9Ω, V _{GS} =10V	--	15	--	ns
t _r	Turn-on Rise Time		--	33	--	ns
t _{d(off)}	Turn-Off Delay Time		--	38	--	ns
t _f	Turn-Off Fall Time		--	27	--	ns
Source- Drain Diode Characteristics @ T_j = 25°C (unless otherwise stated)						
V _{SD}	Forward on voltage	I _{SD} =25A, V _{GS} =0V	--	0.8	1.2	V
t _{rr}	Reverse Recovery Time	T _j =25°C, I _{sd} =25A, V _{GS} =0V	--	61	--	ns
Q _{rr}	Reverse Recovery Charge	di/dt=100A/μs	--	163	--	nC

NOTE:

- ① Repetitive rating; pulse width limited by max junction temperature.
- ② Limited by T_{Jmax}, starting T_J = 25°C, L = 1mH, R_G = 25Ω, I_{AS} = 16A, V_{GS} = 10V. Part not recommended for use above this value
- ③ The power dissipation P_{DSM} is based on R_{θJA} and the maximum allowed junction temperature of 150°C.
- ④ Pulse width ≤ 380μs; duty cycle ≤ 2%.

Typical Characteristics

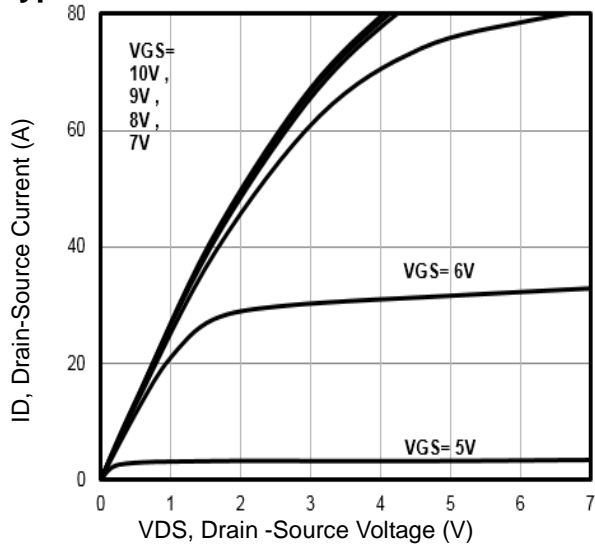


Fig1. Typical Output Characteristics

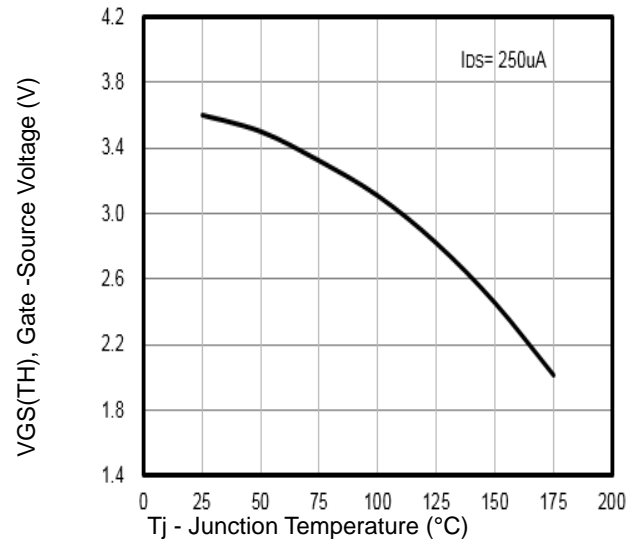


Fig2. $V_{GS(TH)}$ Gate -Source Voltage Vs. T_j

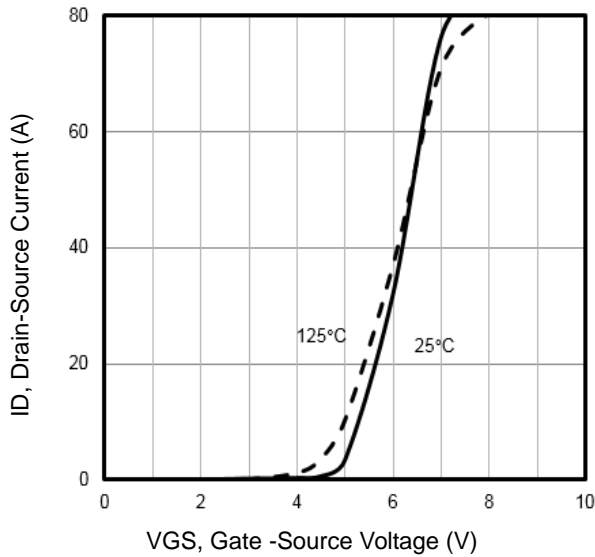


Fig3. Typical Transfer Characteristics

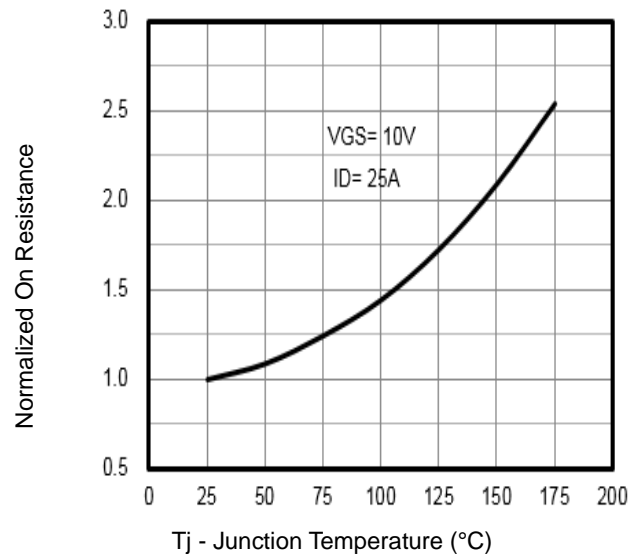


Fig4. Normalized On-Resistance Vs. T_j

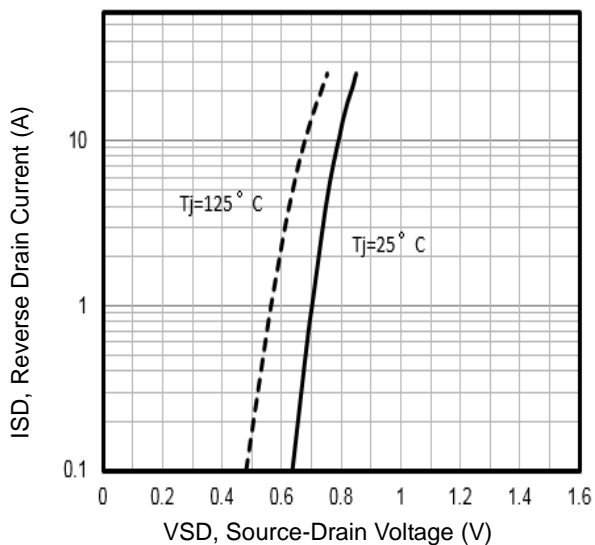


Fig5. Typical Source-Drain Diode Forward Voltage

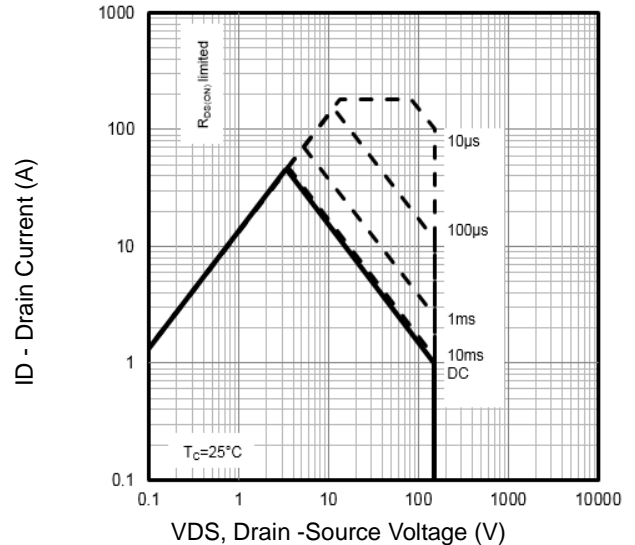


Fig6. Maximum Safe Operating Area

Typical Characteristics

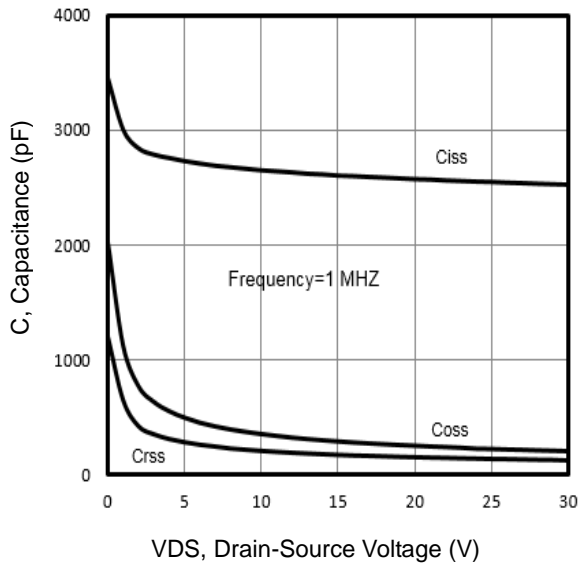


Fig7. Typical Capacitance Vs. Drain-Source Voltage

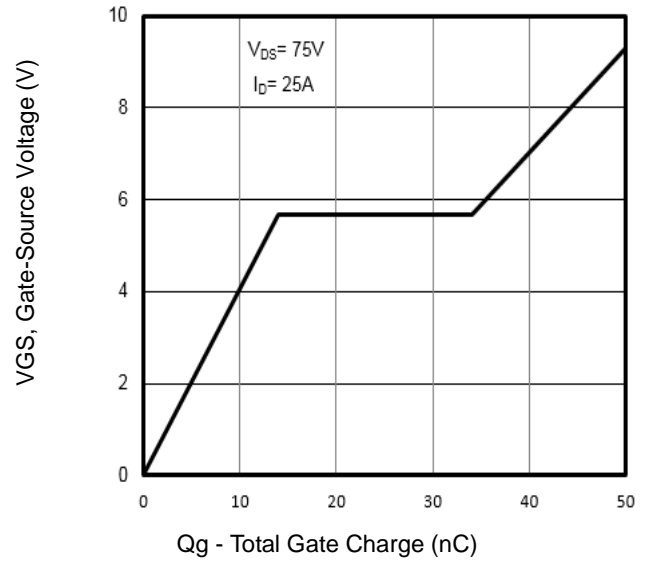


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

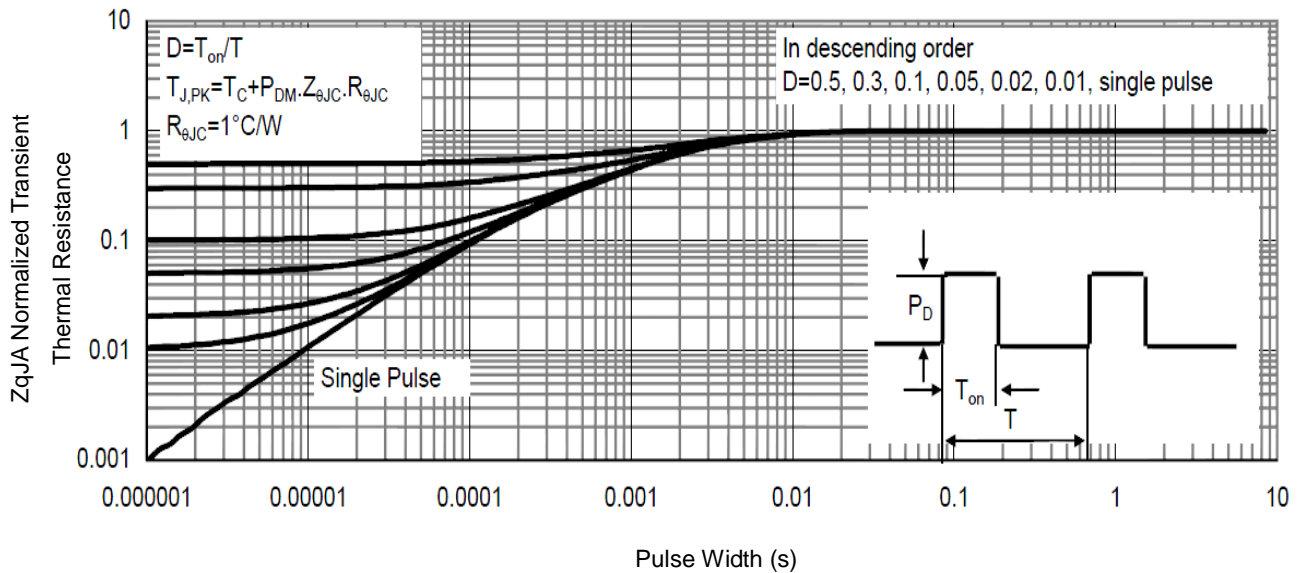


Fig9. Normalized Maximum Transient Thermal Impedance

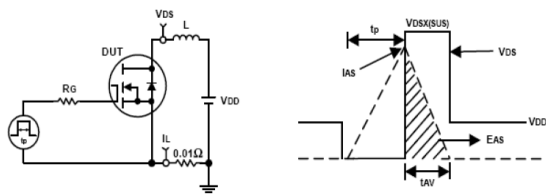


Fig10. Unclamped Inductive Test Circuit and waveforms

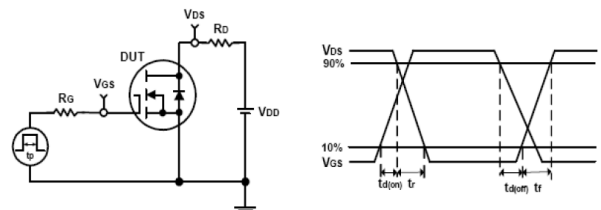
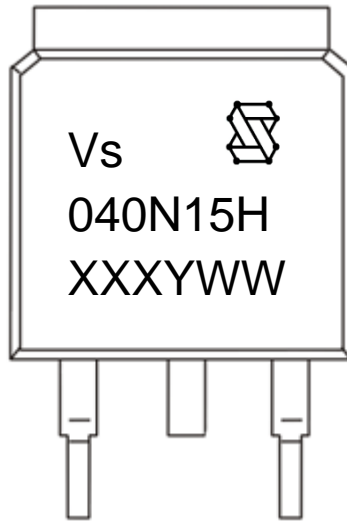


Fig11. Switching Time Test Circuit and waveforms

Marking Information



1st line: Vanguard Code (Vs), Vanguard Logo

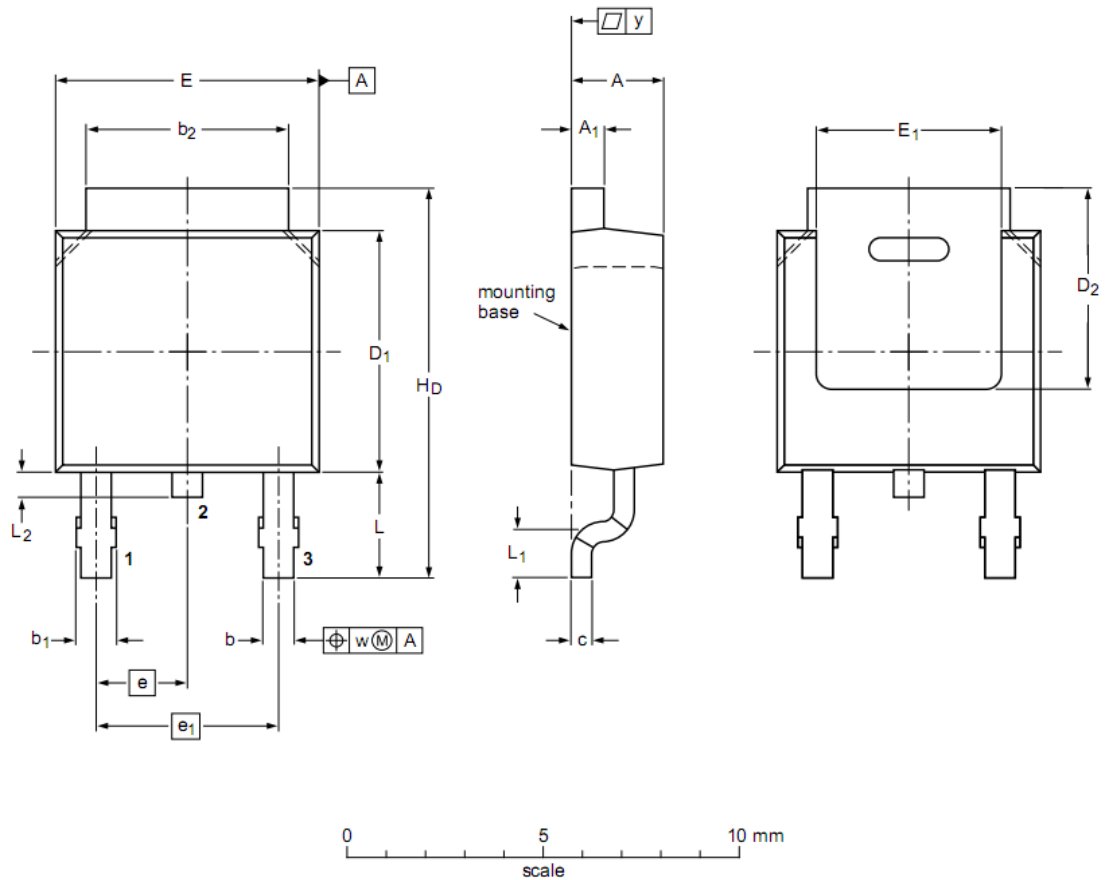
2nd line: Part Number (040N15H)

3rd line: Date code (XXXYWW)

XXX: Wafer Lot Number Code , code changed with Lot Number

Y: Year Code, (e.g. E=2017, F=2018, G=2019, H=2020, etc)

WW: Week Code (01 to 53)

TO-252 Package Outline Data


Symbol	Dimensions (unit: mm)		
	Min	Typ	Max
A	2.20	2.30	2.38
A₁	0.46	0.50	0.63
b	0.64	0.76	0.89
b₁	0.77	0.85	1.14
b₂	5.00	5.33	5.46
c	0.458	0.508	0.558
D₁	5.98	6.10	6.223
D₂	5.21	--	--
E	6.40	6.60	6.731
E₁	4.40	--	--
e	2.286 BSC		
e₁	--	4.57	--
H_D	9.40	10.00	10.40
L	2.743 REF		
L₁	1.40	1.52	1.77
L₂	0.50	0.80	1.01
w	--	0.20	--
y	--	--	0.20

Notes:

1. Refer to JEDEC TO-252 variation AA
2. Dimension "E" does NOT include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.1524mm per side.
3. Dimension "D1" does NOT include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.1524mm per end.

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