## Description

The VST15N056 uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g. This device is ideal for high-frequency switching and synchronous rectification.

General Features

- V_{DS} =150V,I_D =140A

  $R_{DS(ON)}$ <6.2mΩ @ V_{GS}=10V
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification
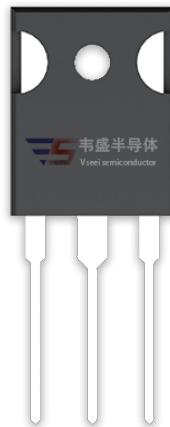
TO-247
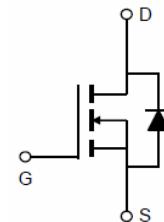
Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VST15N056-T7	VST15N056	TO-247	-	-	-

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	150	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	140	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	100	A
Pulsed Drain Current	I_{DM}	560	A
Maximum Power Dissipation	P_D	320	W
Derating factor		2.1	W/℃
Single pulse avalanche energy [Note 5]	E_{AS}	1296	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case[Note 2]	$R_{\theta JC}$	0.47	℃/W

Electrical Characteristics (T$_C$=25℃ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV$_{DSS}$	V$_{GS}$=0V I$_D$=250μA	150	-	-	V
Zero Gate Voltage Drain Current	I$_{DSS}$	V$_{DS}$=150V,V$_{GS}$=0V	-	-	1	μA
Gate-Body Leakage Current	I$_{GSS}$	V$_{GS}$=±20V,V$_{DS}$=0V	-	-	±100	nA
On Characteristics [Note 3]						
Gate Threshold Voltage	V$_{GS(th)}$	V$_{DS}$=V$_{GS}$,I$_D$=250μA	2.0	3.0	4.0	V
Drain-Source On-State Resistance	R$_{DS(ON)}$	V$_{GS}$=10V, I$_D$=70A	-	5.6	6.2	mΩ
Forward Transconductance	g$_{FS}$	V$_{DS}$=10V,I$_D$=70A	70	-	-	S
Dynamic Characteristics [Note4]						
Input Capacitance	C$_{Iss}$	V$_{DS}$=75V,V$_{GS}$=0V, F=1.0MHz	-	5500	7150	PF
Output Capacitance	C$_{oss}$		-	690	890	PF
Reverse Transfer Capacitance	C$_{rss}$		-	24	31	PF
Switching Characteristics [Note 4]						
Turn-on Delay Time	t$_{d(on)}$	V$_{DD}$=75V,I$_D$=70A V$_{GS}$=10V,R$_G$=4.7Ω	-	26	-	nS
Turn-on Rise Time	t$_r$		-	36	-	nS
Turn-Off Delay Time	t$_{d(off)}$		-	47	-	nS
Turn-Off Fall Time	t$_f$		-	15	-	nS
Total Gate Charge	Q$_g$	V$_{DS}$=75V,I$_D$=70A, V$_{GS}$=10V	-	80	104	nC
Gate-Source Charge	Q$_{gs}$		-	32	41	nC
Gate-Drain Charge	Q$_{gd}$		-	22	28	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage [Note 3]	V$_{SD}$	V$_{GS}$=0V,I$_F$= I$_S$	-		1.2	V
Diode Forward Current [Note 2]	I$_S$		-	-	140	A
Reverse Recovery Time	t$_{rr}$	T$_J$ = 25°C, I$_F$ = I$_S$ di/dt = 100A/μs [Note3]	-	140		nS
Reverse Recovery Charge	Qrr		-	498		nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : Tj=25℃,V$_{DD}$=50V,V$_G$=10V,L=0.5mH,Rg=25Ω

Test Circuit

1) E$_{AS}$ test Circuit
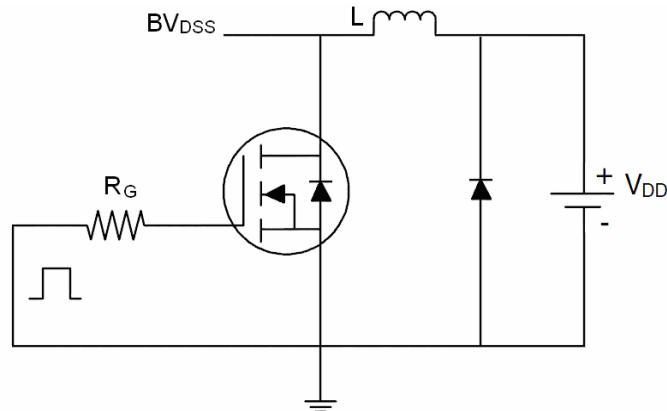
2) Gate charge test Circuit
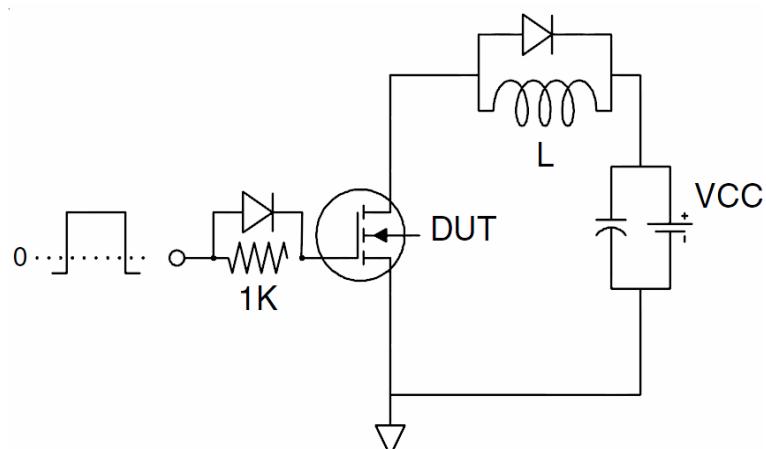
3) Switch Time Test Circuit
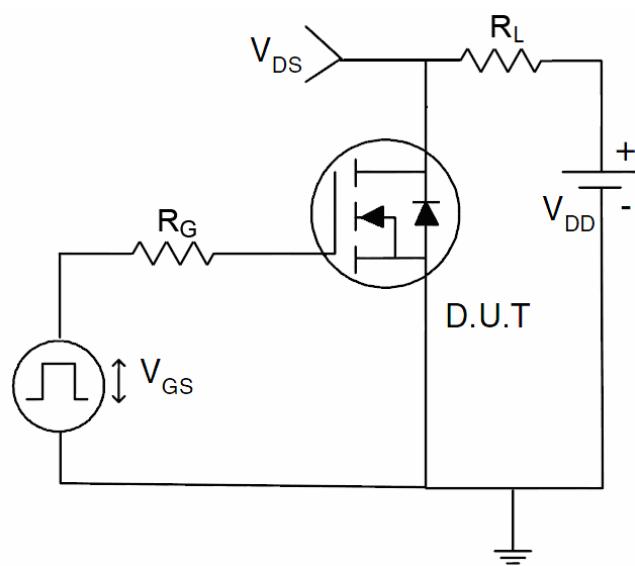
Typical Electrical and Thermal Characteristics
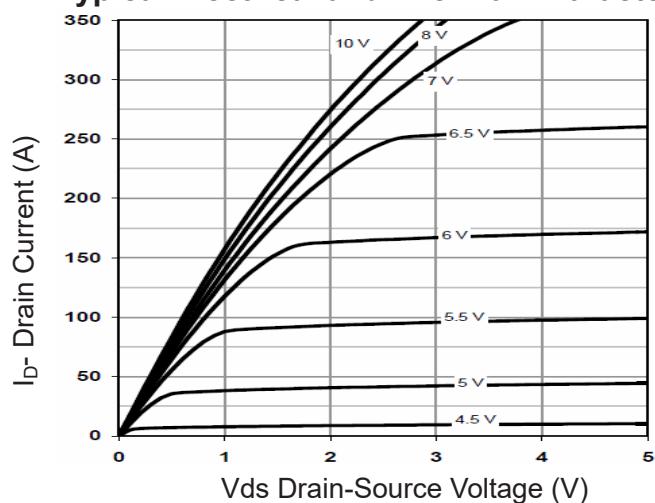
Figure 1 Output Characteristics

Figure 2 Transfer Characteristics
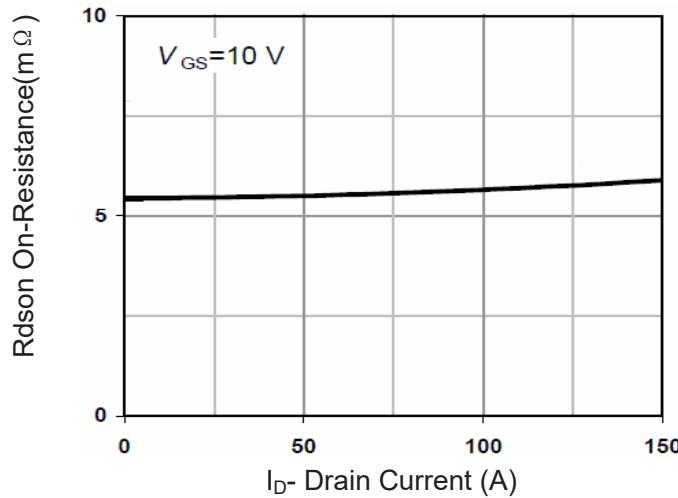
Figure 3 Rdson- Drain Current

Figure 4 Rdson-JunctionTemperature

Figure 5 Gate Charge
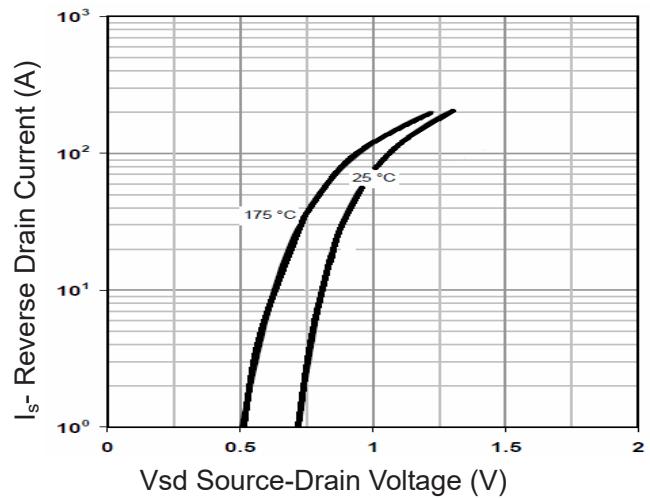
Figure 6 Source- Drain Diode Forward
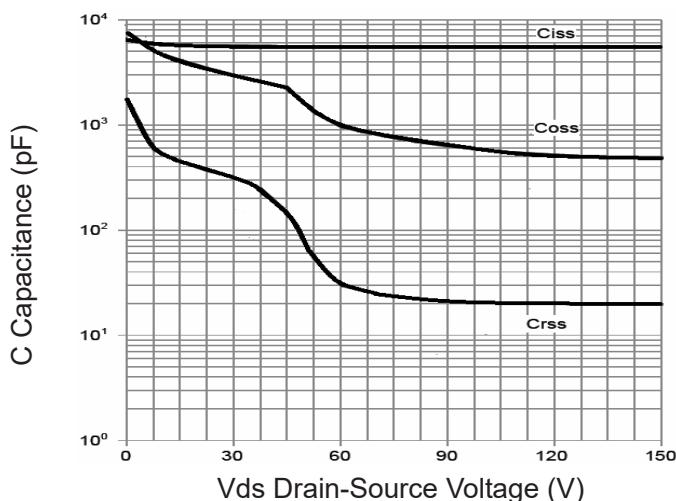
**Figure 7 Capacitance vs Vds**
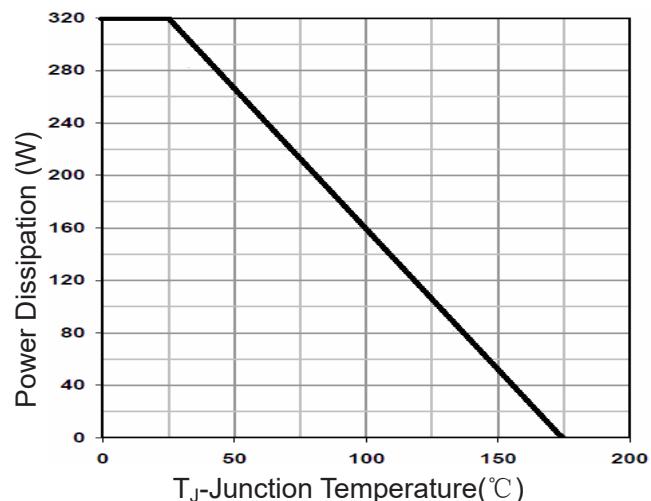
Figure 9 Power De-rating
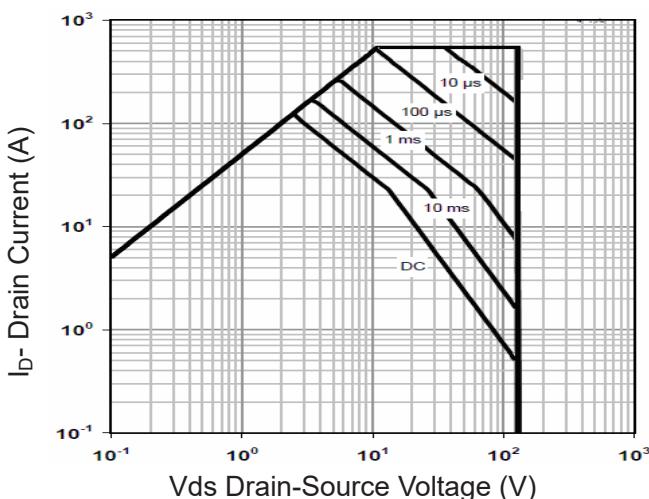
**Figure 8 Safe Operation Area**
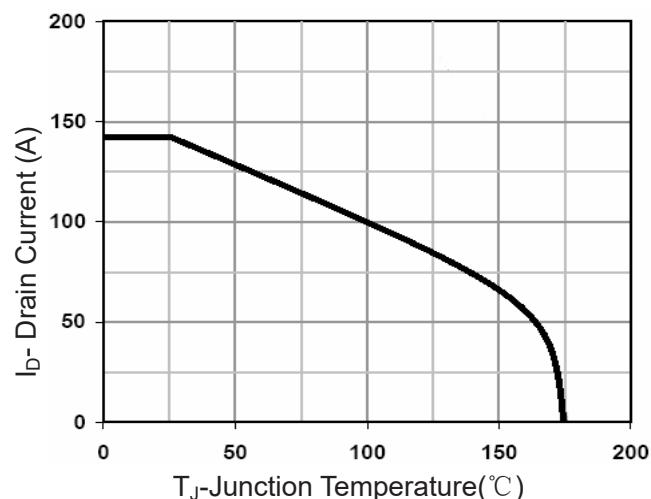
Figure 10 Current De-rating
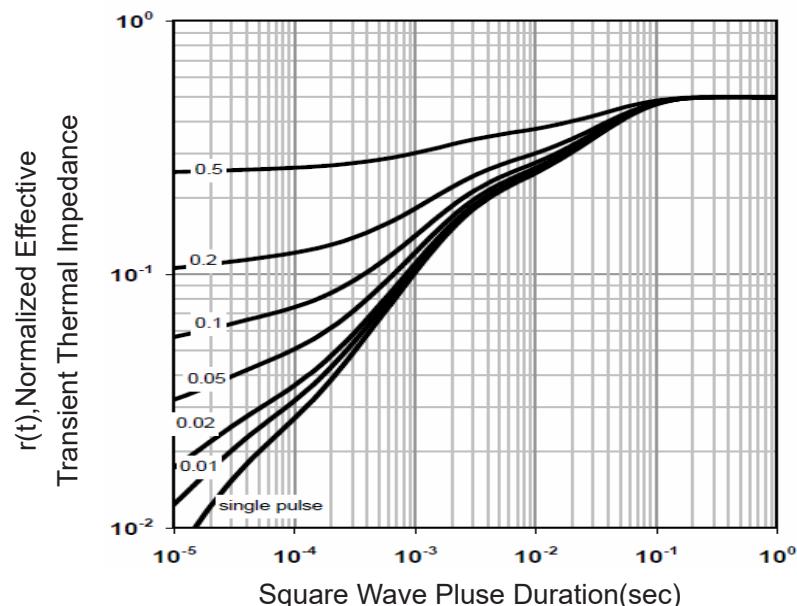
Figure 11 Normalized Maximum Transient Thermal Impedance