Description

The series of devices uses **Super Trench II** 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.

Application

- DC/DC Converter
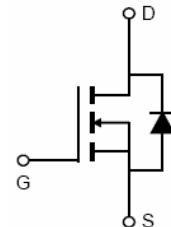- Ideal for high-frequency switching and synchronous rectification

General Features

- V_{DS} =120V, I_D =190A

    $R_{DS(ON)}$=3.0mΩ , typical (TO-220)@ V_{GS}=10V

    $R_{DS(ON)}$=2.8mΩ , typical (TO-263)@ 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

TO-220C   TO-263   Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VST12N028-TC	VST12N028	TO-220C	-	-	-
VST12N028-T3	VST12N028	TO-263	-	-	-

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

| Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	120	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	190	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	135	A
Pulsed Drain Current	I_{DM}	760	A
Maximum Power Dissipation	P_D	300	W
Derating factor		2	W/℃
Single pulse avalanche energy [Note 5]	E_{AS}	2300	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case[Note 2]	$R_{\theta JC}$	0.5	℃/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		120		-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=120V,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=95A	TO-220	-	3.0	3.5	mΩ
			TO-263		2.8	3.5	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=95A			90	-	S
Dynamic Characteristics [Note4]							
Input Capacitance	C_{Iss}	V_{DS}=60V,V_{GS}=0V, F=1.0MHz		-	12700	-	PF
Output Capacitance	C_{oss}			-	870	-	PF
Reverse Transfer Capacitance	C_{rss}			-	48	-	PF
Switching Characteristics [Note 4]							
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=60V,I_D=95A V_{GS}=10V,R_G=1.6Ω		-	34	-	nS
Turn-on Rise Time	t_r			-	27	-	nS
Turn-Off Delay Time	$t_{d(off)}$			-	78	-	nS
Turn-Off Fall Time	t_f			-	30	-	nS
Total Gate Charge	Q_g	V_{DS}=50V,I_D=95A, V_{GS}=10V		-	213	-	nC
Gate-Source Charge	Q_{gs}			-	58	-	nC
Gate-Drain Charge	Q_{gd}			-	58	-	nC
Drain-Source Diode Characteristics							
Diode Forward Voltage [Note 3]	V_{SD}	V_{GS}=0V,I_S=95A		-		1.2	V
Diode Forward Current [Note 2]	I_S			-	-	190	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F = 100A di/dt = 100A/µs [Note3]		-	101	-	nS
Reverse Recovery Charge	Qrr			-	280	-	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
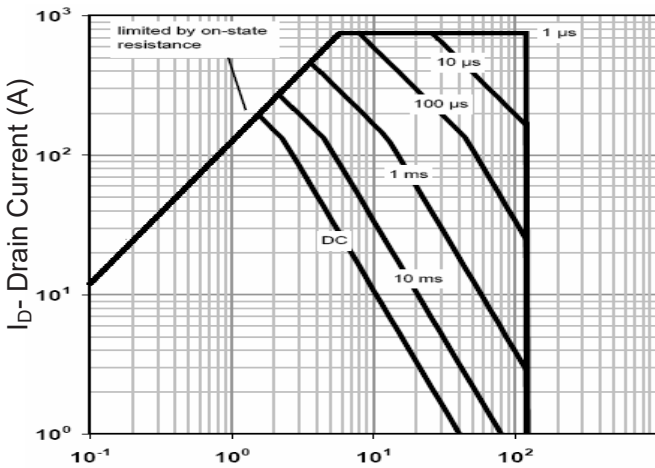5. EAS condition : Tj=25℃,V_{DD}=60V,V_G=10V,L=0.5mH,Rg=25Ω

Typical Electrical and Thermal Characteristics
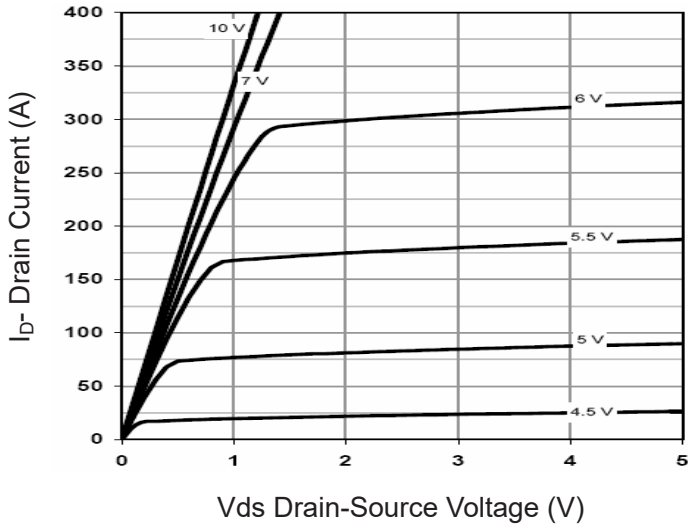
Figure 1 Output Characteristics
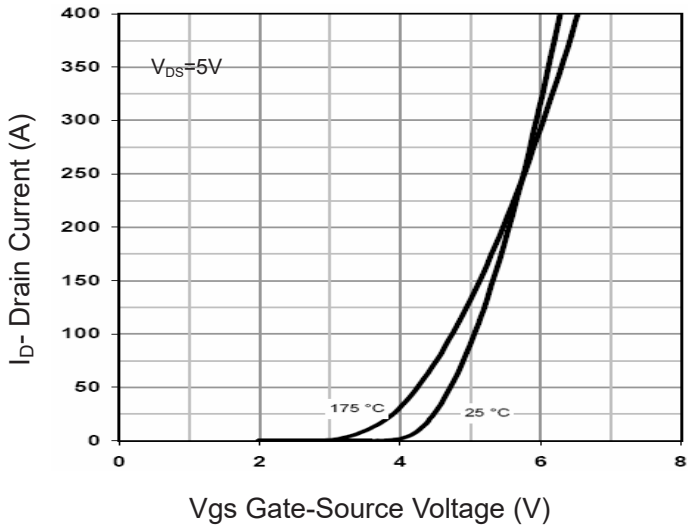
Figure 2 Transfer Characteristics
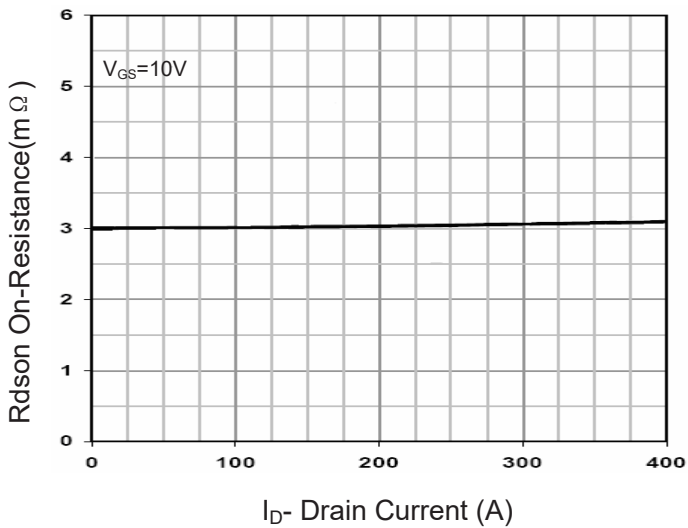
Figure 3 Rdson- Drain Current
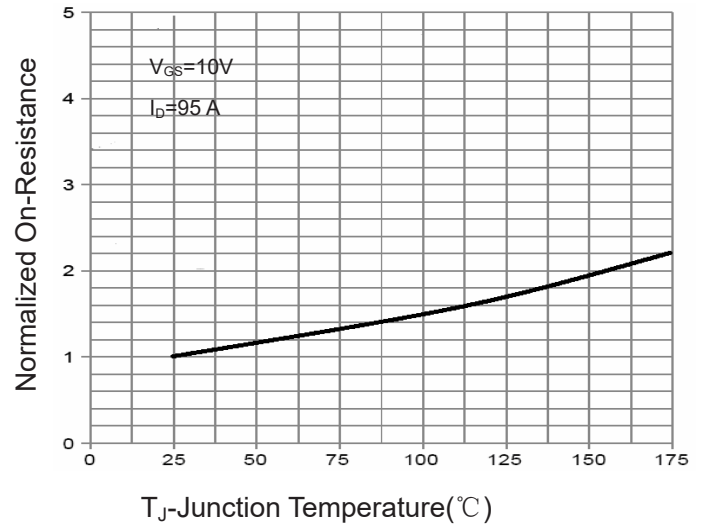
Figure 4 Rdson-Junction Temperature
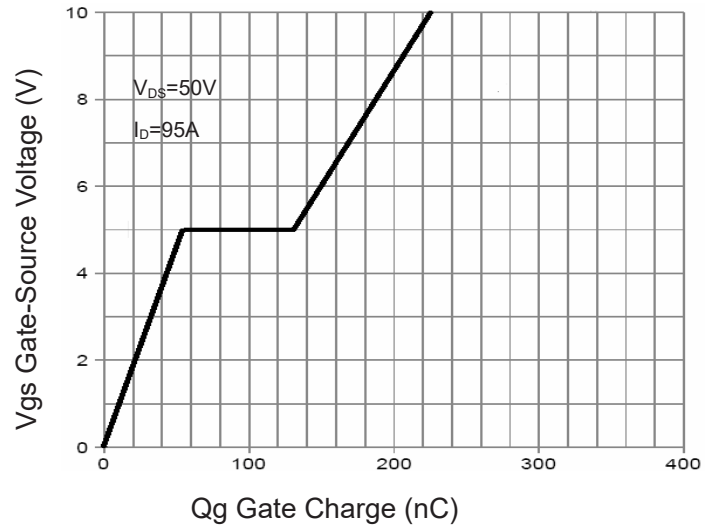
Figure 5 Gate Charge
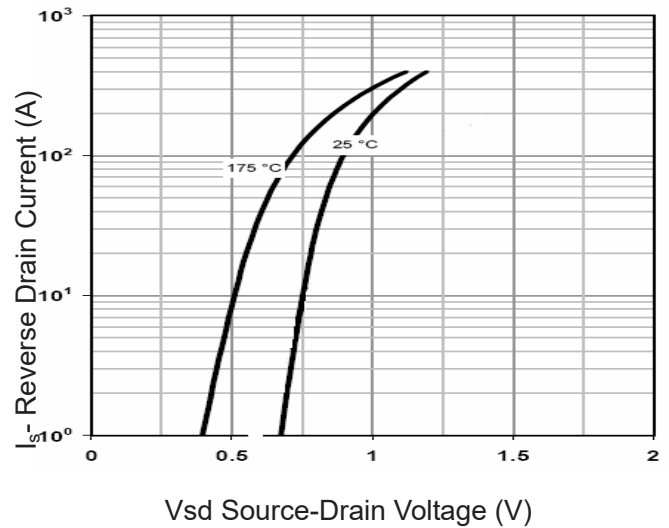
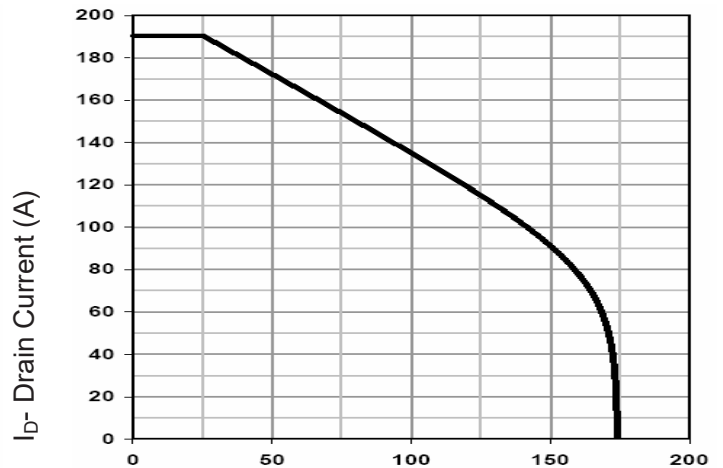**Figure 6 Source- Drain Diode Forward**
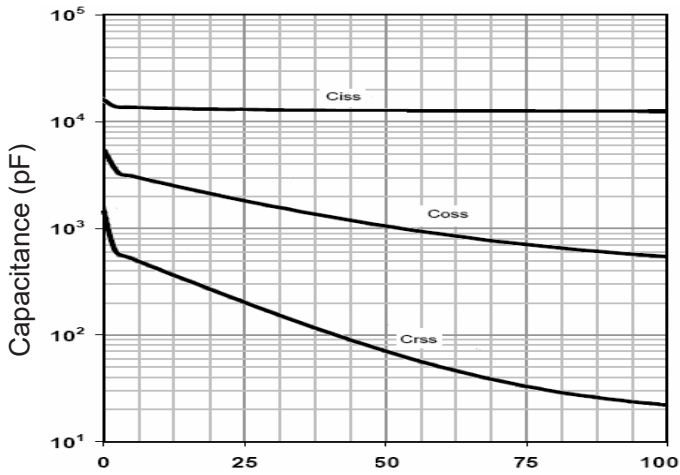
Figure 7 Capacitance vs Vds
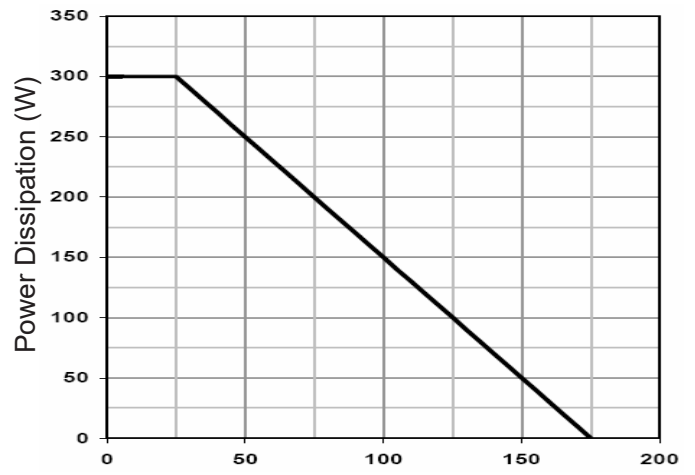
Figure 9 Power De-rating
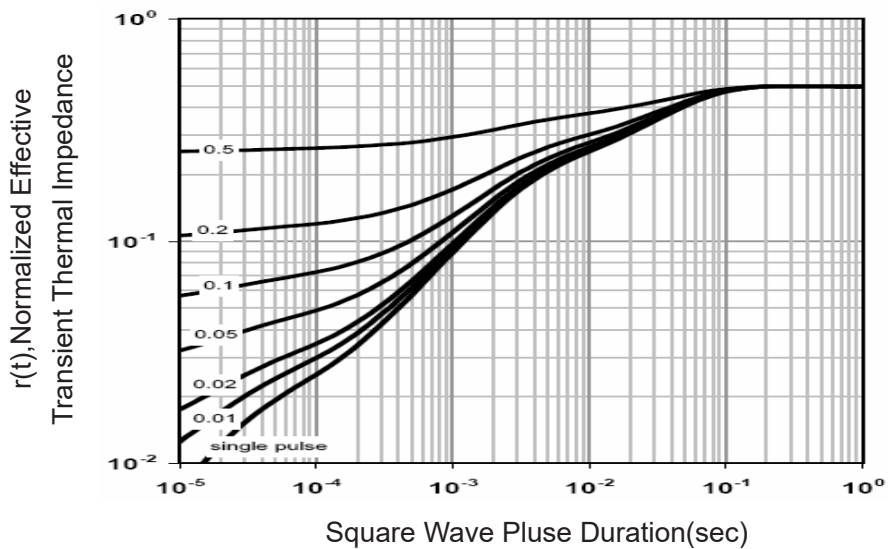

Figure 8 Safe Operation Area

Figure 10 Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance