Description

The VST04N050 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.

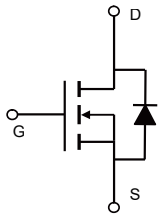
Application

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

General Features

- V_{DS} =40V,I_D =75A
  $R_{DS(ON)}$=5.1mΩ (typical) @ V_{GS}=10V
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating

DFN5x6



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VST04N050	VST04N050-D56	DFN5x6	-	-	-

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

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	V
Drain Current-Continuous	(T_C=25℃)	I_D	75	A
	(T_C=100℃)		53	
Maximum Power Dissipation	(T_C=25℃)	P_D	55	W
Pulsed Drain Current		I_{DM}	300	A
Derating factor			0.44	W/℃
Single pulse avalanche energy (Note 1)		E_{AS}	163	mJ
Operating Junction and Storage Temperature Range		T_J,T_{STG}	-55 To 150	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	2.3	℃/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	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	2	3	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A	-	5.1	5.7	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=20A	-	25	-	S
Dynamic Characteristics						
Input Capacitance	C_{lss}	V_{DS}=20V,V_{GS}=0V, F=1.0MHz	-	1050	-	pF
Output Capacitance	C_{oss}		-	500	-	pF
Reverse Transfer Capacitance	C_{rss}		-	25	-	pF
Switching Characteristics (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V,I_D=20A V_{GS}=10V,R_G=1.6Ω	-	7	-	nS
Turn-on Rise Time	t_r		-	30	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	25	-	nS
Turn-Off Fall Time	t_f		-	8	-	nS
Total Gate Charge	Q_g	V_{DS}=20V,I_D=20A, V_{GS}=10V	-	18	-	nC
Gate-Source Charge	Q_{gs}		-	6.5	-	nC
Gate-Drain Charge	Q_{gd}		-	4.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_S=20A	-	-	1.2	V
Diode Forward Current	I_S		-	-	75	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F = I_S di/dt = 100A/μs	-	14	-	nS
Reverse Recovery Charge	Qrr		-	16	-	nC

Notes:

1. EAS condition : Tj=25℃,V_{DD}=20V,V_G=10V,L=0.5mH,Rg=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of TJ(MAX)=150°C. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

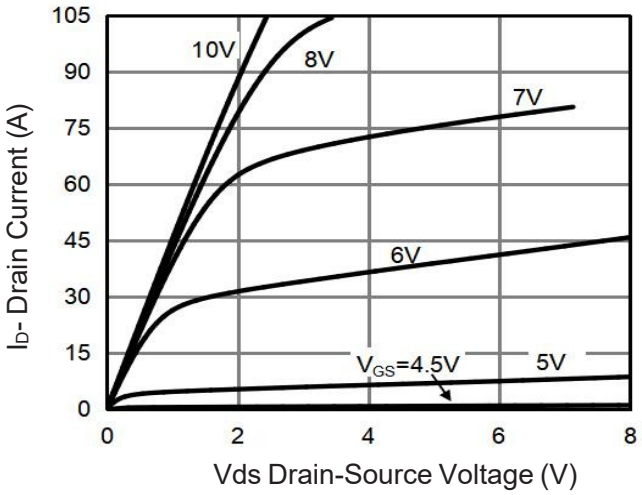


Figure 1 Output Characteristics

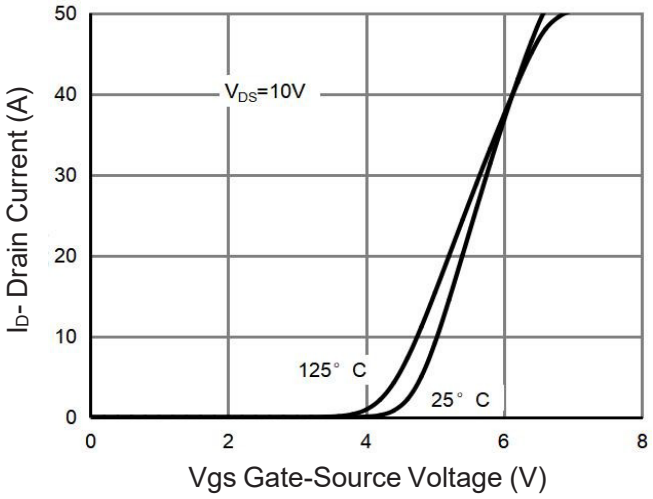


Figure 2 Transfer Characteristics

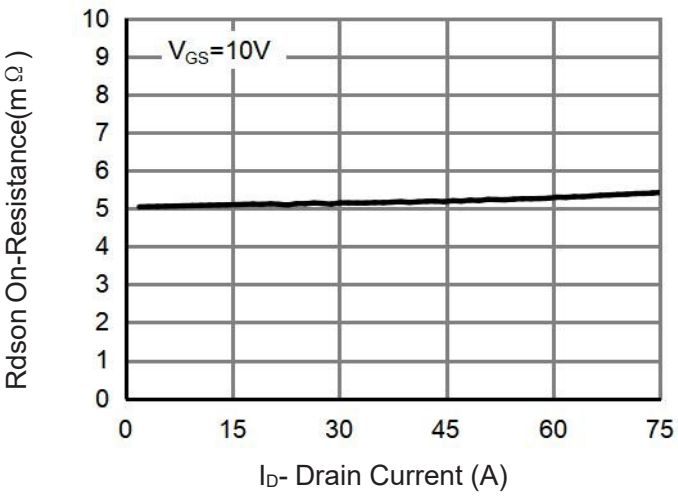


Figure 3 Rdson- Drain Current

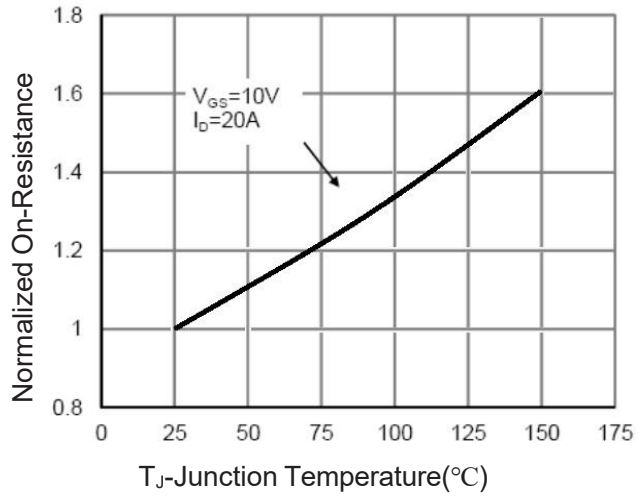


Figure 4 Rdson-Junction Temperature

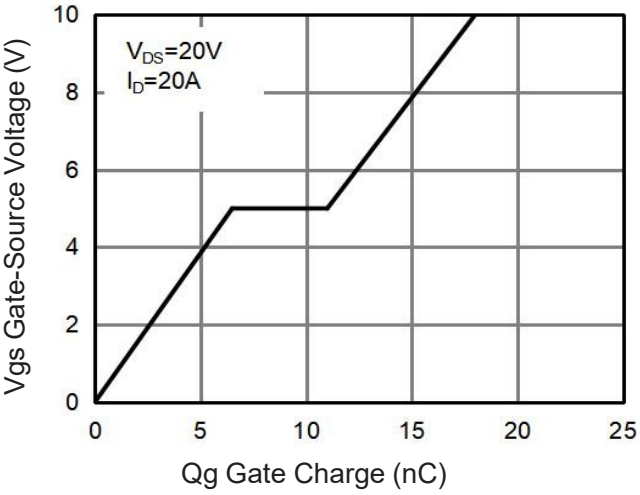


Figure 5 Gate Charge

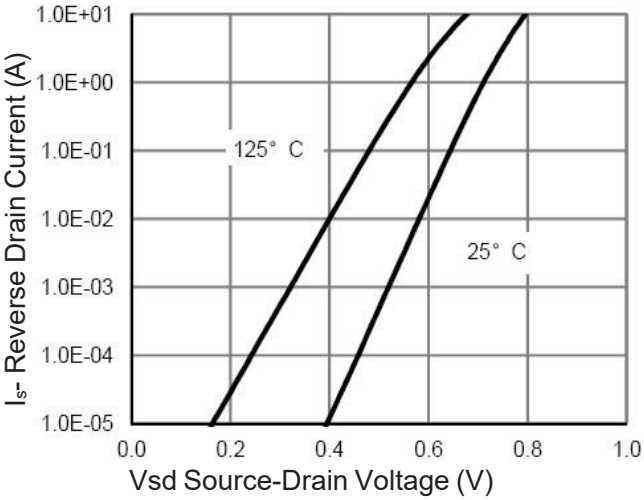


Figure 6 Source- Drain Diode Forward

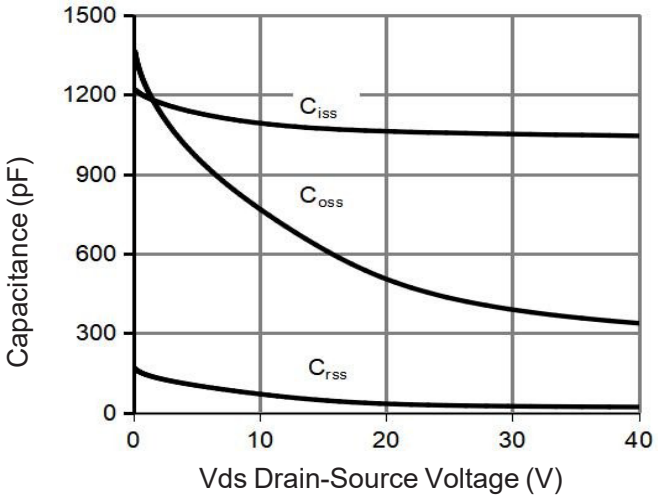


Figure 7 Capacitance vs Vds

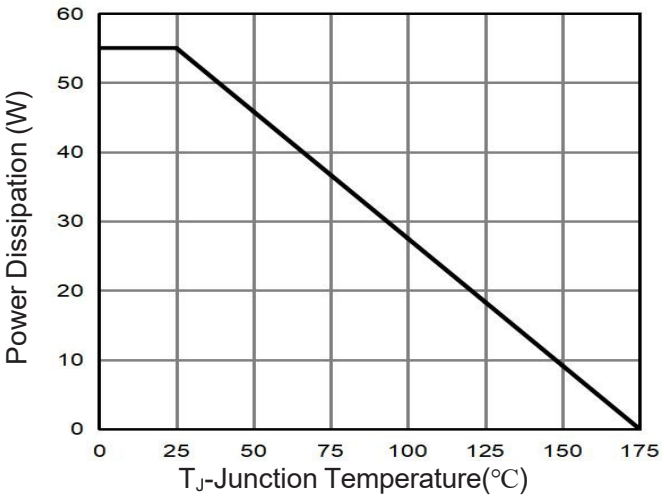


Figure 9 Power De-rating

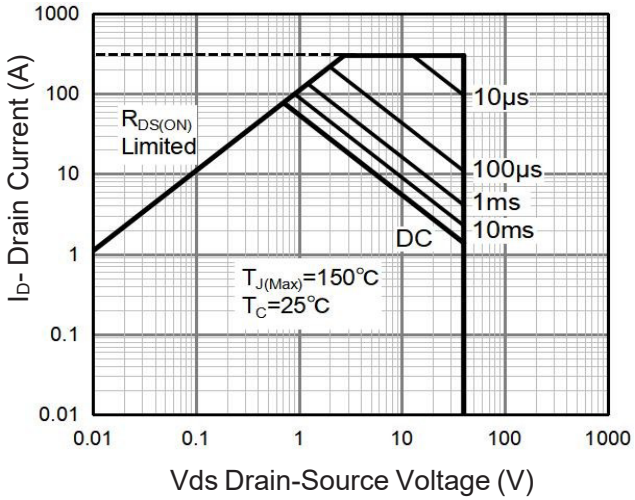


Figure 8 Safe Operation Area (Note3)

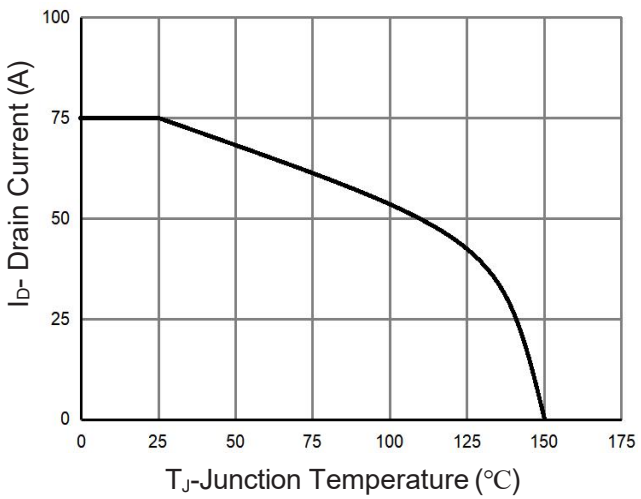


Figure 10 Current De-rating

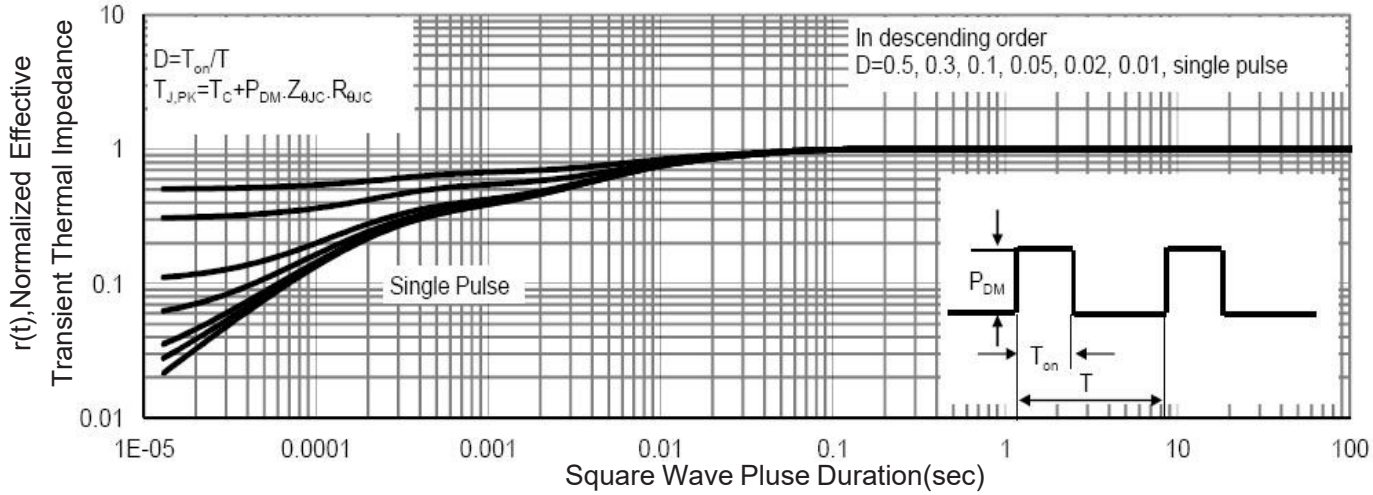


Figure 11 Normalized Maximum Transient Thermal Impedance