

Description

The VST10P220 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

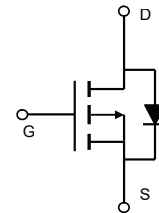
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = -100V, I_D = -55A$
 $R_{DS(ON)} = 19.5m\Omega$ (typical) @ $V_{GS} = -10V$
 $R_{DS(ON)} = 22.5m\Omega$ (typical) @ $V_{GS} = -4.5V$
- 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
VST10P220	VST10P220-D56	DFN5x6	-	-	-

Absolute Maximum Ratings ($T_c=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-100	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	-55	A
Drain Current-Continuous($T_c=100^\circ\text{C}$)	$I_D(100^\circ\text{C})$	-39	A
Pulsed Drain Current	I_{DM}	-220	A
Maximum Power Dissipation	P_D	140	W
Derating factor		1.12	W/°C
Single pulse avalanche energy (Note 1)	E_{AS}	670	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	°C

Thermal Characteristic

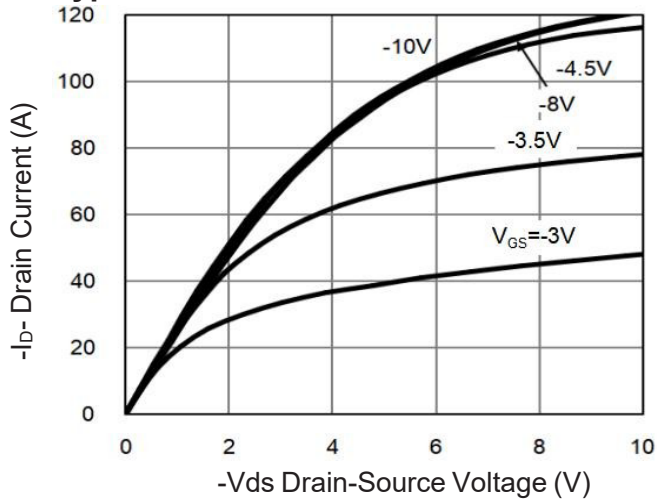
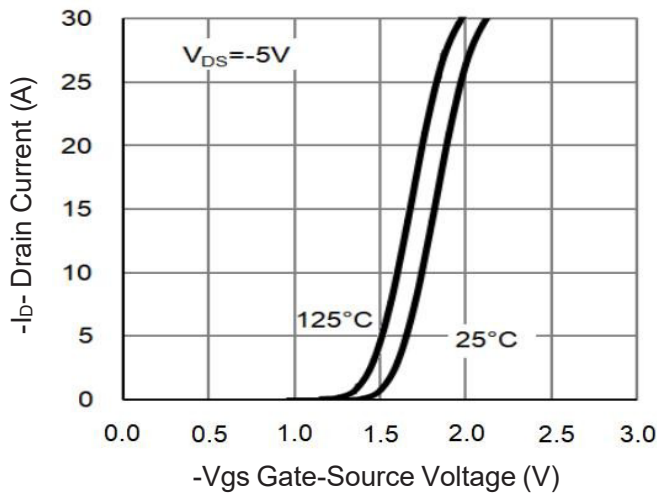
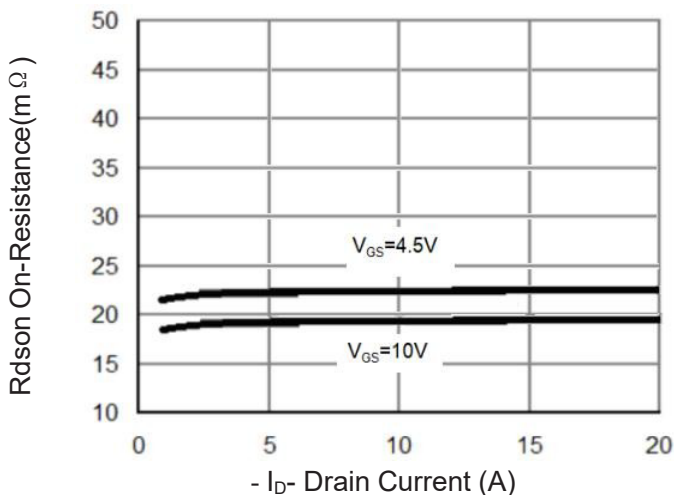
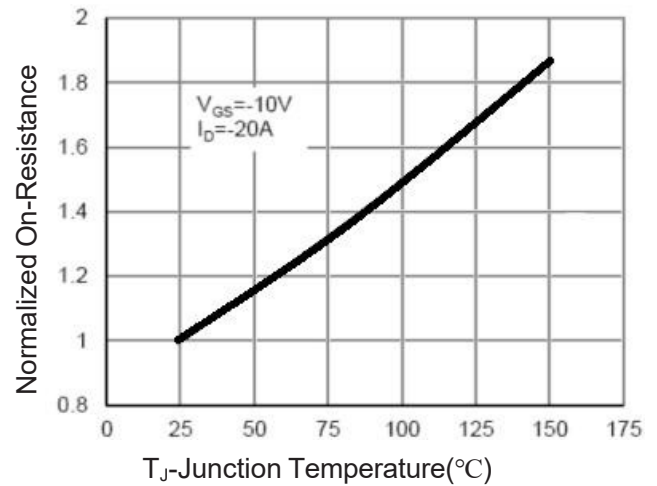
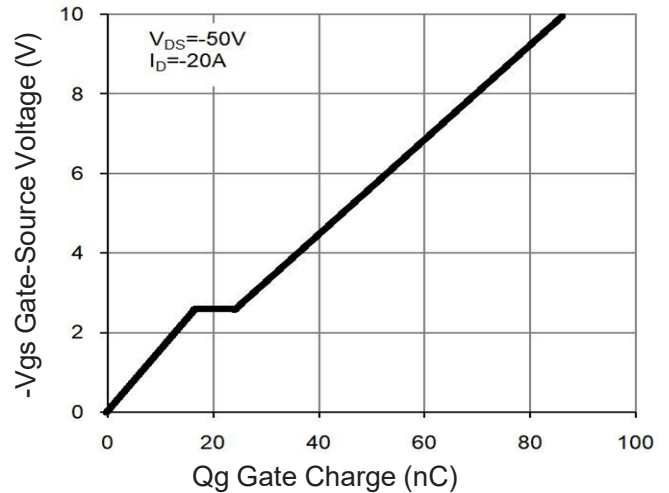
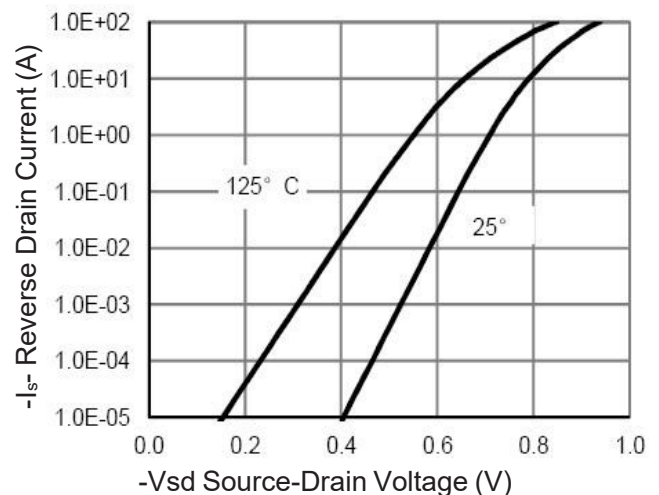
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.89	°C/W
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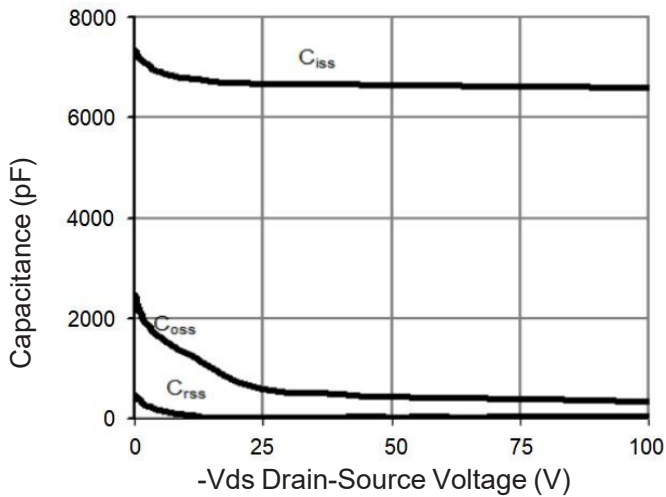
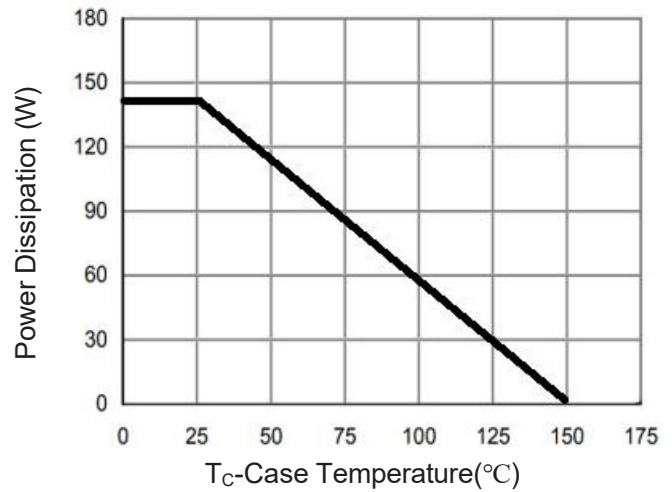
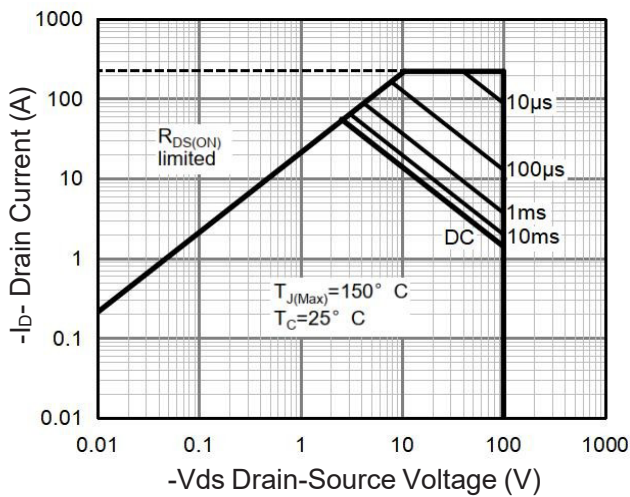
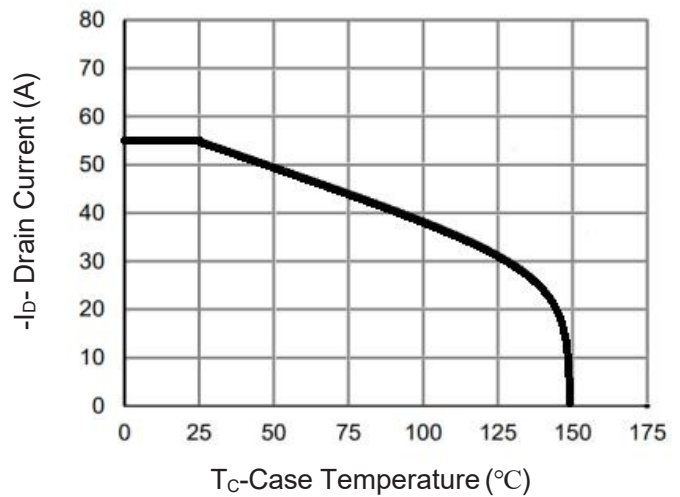
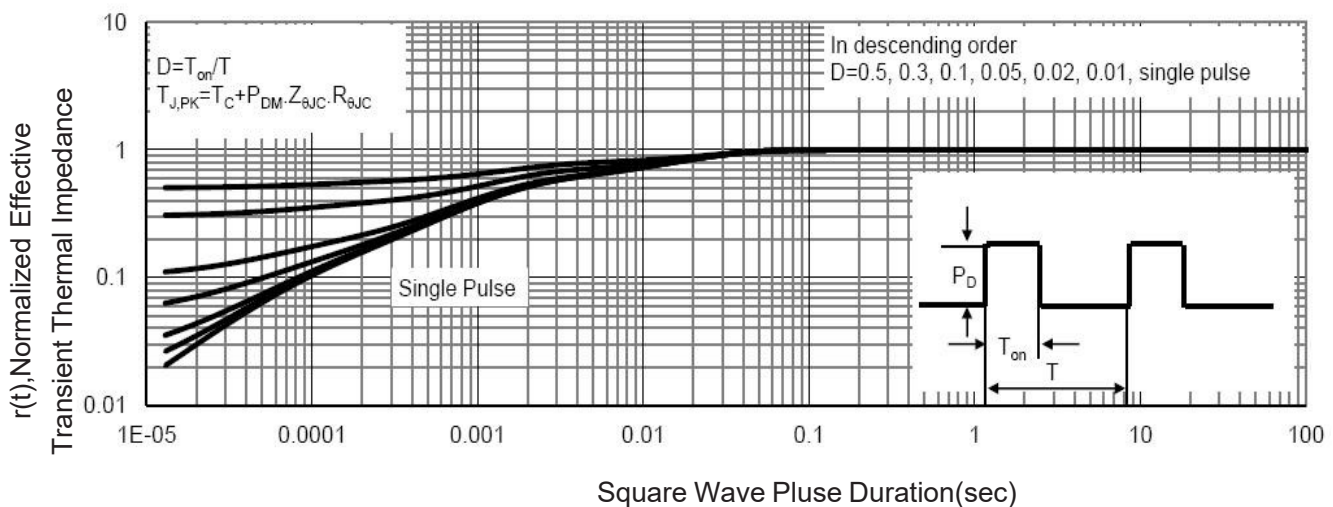
Electrical Characteristics ($T_c=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-100		-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-100V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.2	-1.7	-2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-20A$	-	19.5	26	m Ω
		$V_{GS}=-4.5V, I_D=-20A$	-	22.5	30	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-20A$	-	30	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=-50V, V_{GS}=0V,$ $F=1.0MHz$	-	6900	-	PF
Output Capacitance	C_{oss}		-	430	-	PF
Reverse Transfer Capacitance	C_{rss}		-	10.5	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-50V, I_D=-20A$ $V_{GS}=-10V, R_G=1.6\Omega$	-	15	-	nS
Turn-on Rise Time	t_r		-	18	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	50	-	nS
Turn-Off Fall Time	t_f		-	18	-	nS
Total Gate Charge	Q_g	$V_{DS}=-50V, I_D=-20A,$ $V_{GS}=-10V$	-	86.5	-	nC
Gate-Source Charge	Q_{gs}		-	16.6	-	nC
Gate-Drain Charge	Q_{gd}		-	9.0	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=-20A$	-		-1.2	V
Diode Forward Current	I_S		-	-	-55	A
Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}C, I_F = -20A$ $di/dt = 100A/\mu s$	-	55	-	nS
Reverse Recovery Charge	Q_{rr}		-	101	-	nC

Notes:

1. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=-50V, V_G=-10V, L=0.5\text{mH}, R_g=25\Omega$
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 $T_J(\text{MAX})=150^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

Figure 1 Output Characteristics

Figure 2 Transfer Characteristics

Figure 3 R_DS(on) - Drain Current

Figure 4 R_DS(on) - 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 (Note 3)

Figure 10 Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance