

Description

The VST04P220 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

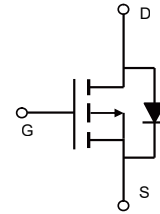
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = -40V, I_D = -30A$
 $R_{DS(ON)} = 22.5m\Omega$ (typical) @ $V_{GS} = -10V$
 $R_{DS(ON)} = 31.5m\Omega$ (typical) @ $V_{GS} = -4.5V$
- 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-252



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VST04P220	VST04P220-T2	TO-252	Ø330mm	16mm	2500units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	-30	A
Drain Current-Continuous($T_c=100^{\circ}C$)	$I_D(100^{\circ}C)$	-21	A
Pulsed Drain Current	I_{DM}	-120	A
Maximum Power Dissipation	P_D	70	W
Derating factor		0.47	W/ $^{\circ}C$
Single pulse avalanche energy ^(Note 1)	E_{AS}	80	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^{\circ}C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.14	$^{\circ}C/W$
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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}	$V_{GS}=0V, I_D=-250\mu A$	-40		-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-40V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.7	-2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-15A$	-	22.5	28.0	m Ω
		$V_{GS}=-4.5V, I_D=-15A$	-	31.5	44.0	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-20A$	-	18	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=-20V, V_{GS}=0V,$ $F=1.0MHz$	-	1000	-	PF
Output Capacitance	C_{oss}		-	315	-	PF
Reverse Transfer Capacitance	C_{rss}		-	18.5	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-20V, I_D=-15A$ $V_{GS}=-10V, R_G=1.6\Omega$	-	8	-	nS
Turn-on Rise Time	t_r		-	10	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	25	-	nS
Turn-Off Fall Time	t_f		-	6	-	nS
Total Gate Charge	Q_g	$V_{DS}=-20V, I_D=-15A,$ $V_{GS}=-10V$	-	18.5	-	nC
Gate-Source Charge	Q_{gs}		-	4.2		nC
Gate-Drain Charge	Q_{gd}		-	2.4		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=-15A$	-		-1.2	V
Diode Forward Current	I_S		-	-	-30	A
Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}C, I_F = -30A$ $di/dt = 100A/\mu s$	-	22	-	nS
Reverse Recovery Charge	Q_{rr}		-	25	-	nC

Notes:

1. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=-20V, V_G=-10V, L=0.5mH, R_g=25\Omega$
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 $T_{J(MAX)}=175^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

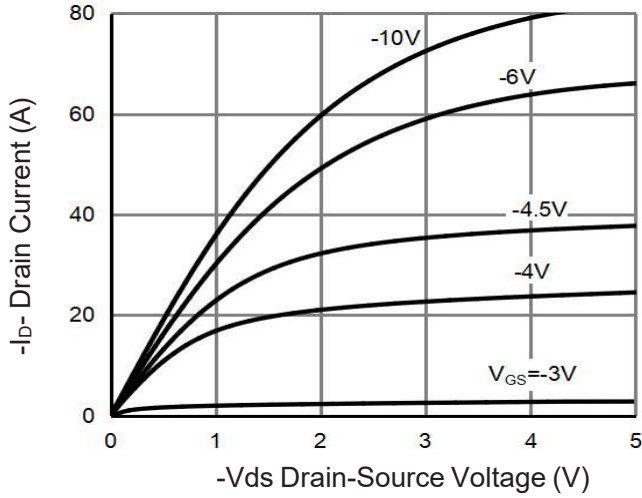


Figure 1 Output Characteristics

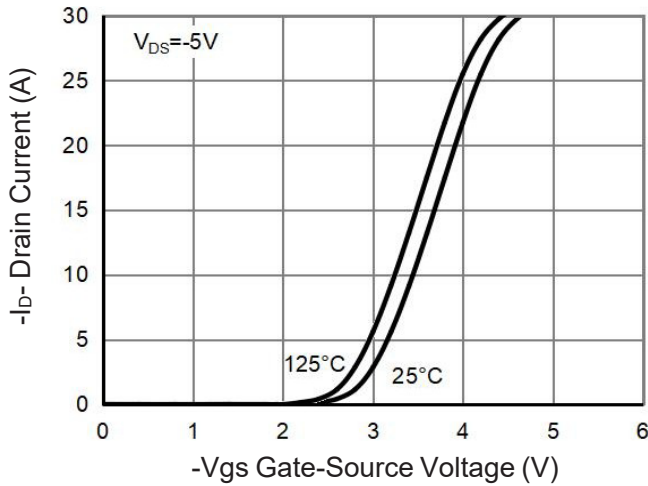


Figure 2 Transfer Characteristics

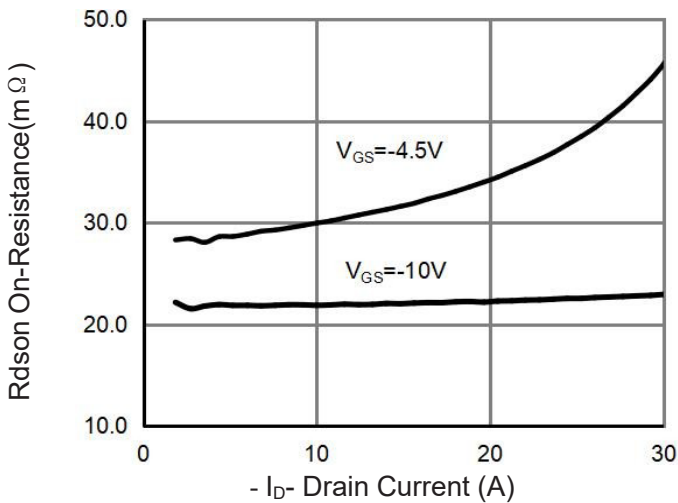


Figure 3 Rdson- Drain Current

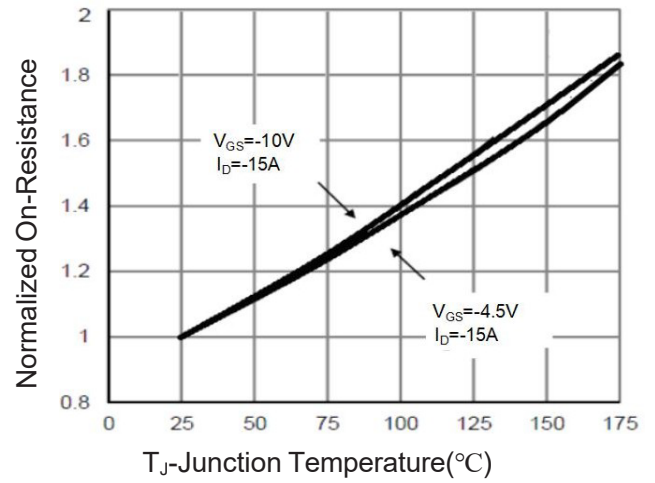


Figure 4 Rdson-Junction Temperature

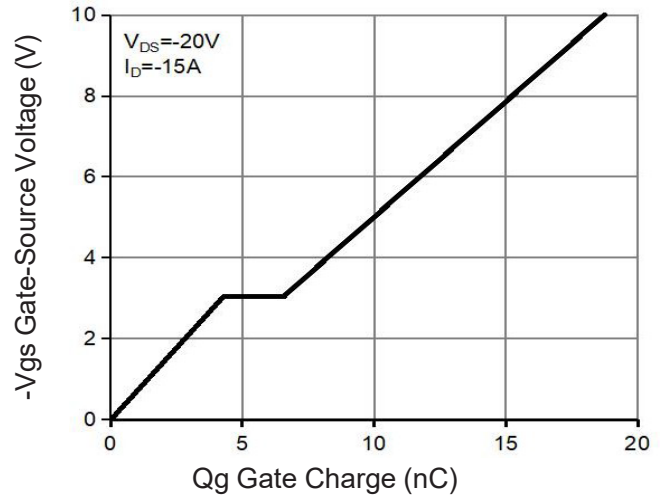


Figure 5 Gate Charge

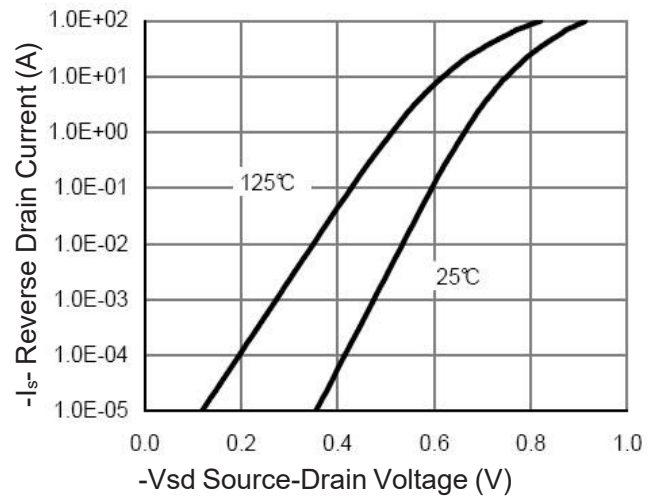
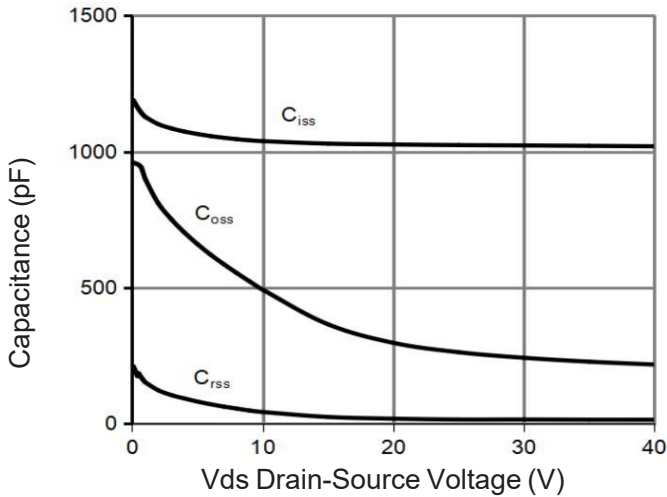
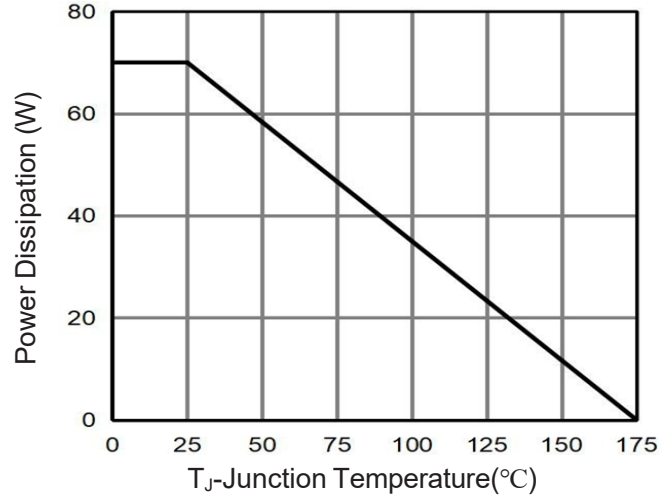
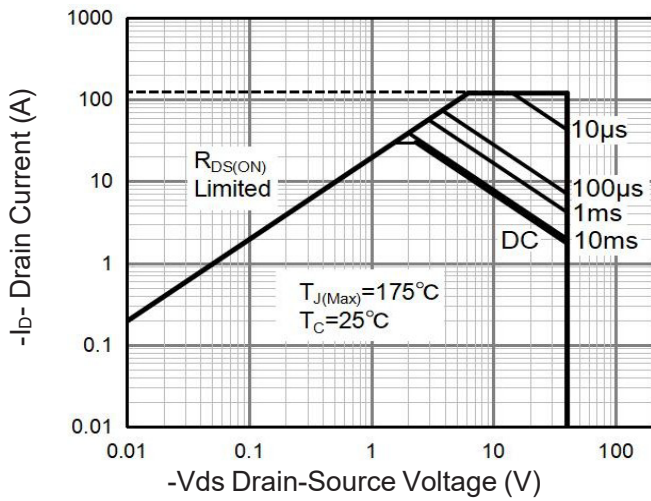
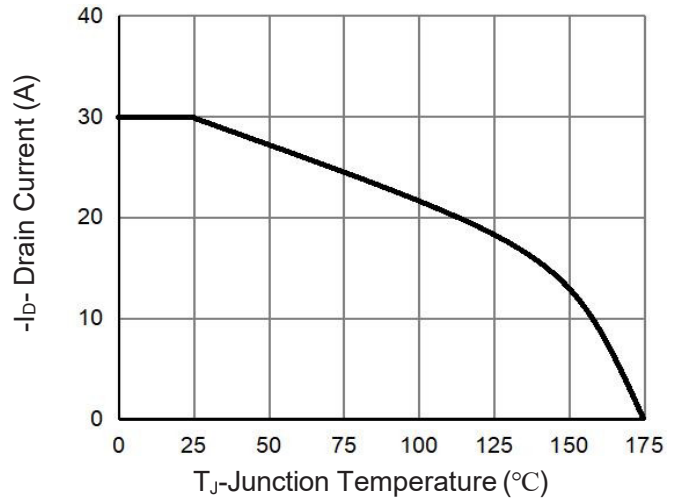
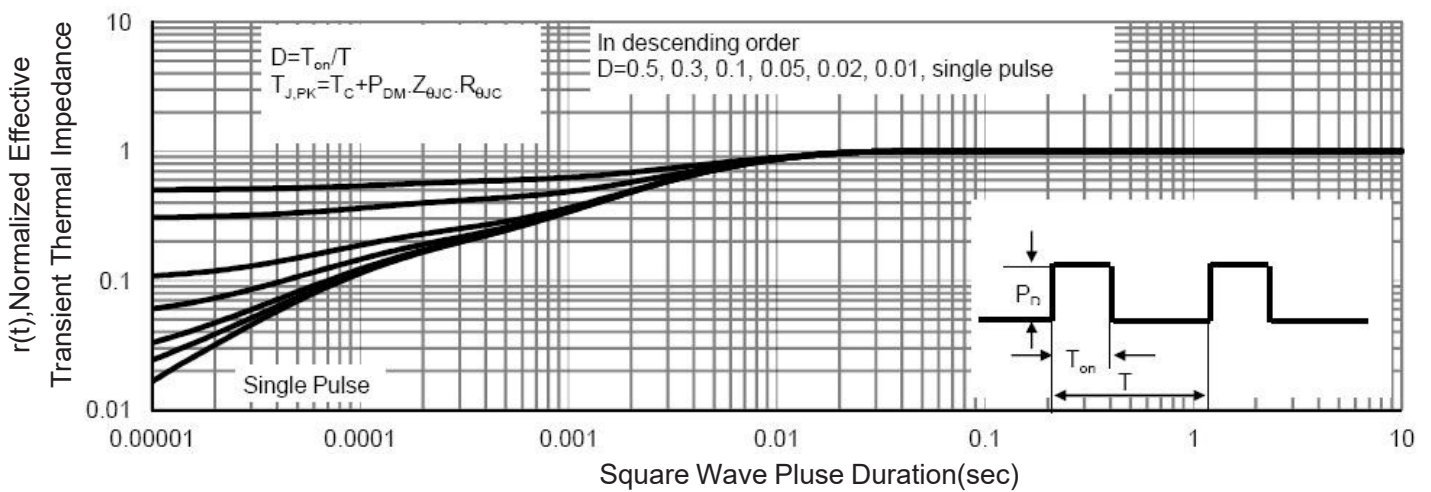


Figure 6 Source- Drain Diode Forward


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