

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

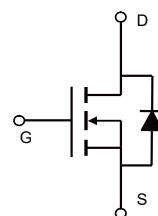
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS}=120V, I_D=120A$
 $R_{DS(ON)}=5.2m\Omega$, typical (TO-220)@ $V_{GS}=10V$
 $R_{DS(ON)}=5.0m\Omega$, 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-220



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VST12N050	VST12N050-TC	TO-220	-	-	-

Absolute Maximum Ratings ($T_C=25^\circ\text{C}$ 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	120	A
Drain Current-Continuous($T_C=100^\circ\text{C}$)	$I_D(100^\circ\text{C})$	85	A
Pulsed Drain Current	I_{DM}	480	A
Maximum Power Dissipation	P_D	200	W
Derating factor		1.33	W/°C
Single pulse avalanche energy (Note 5)	E_{AS}	871	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	°C

Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	0.75	°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 =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	3	4	V	
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =60A	TO-220	-	5.2	5.5	mΩ
			TO-263		5.0	5.5	
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =60A		120	-	S	
Dynamic Characteristics (Note4)							
Input Capacitance	C _{iss}	V _{DS} =60V, V _{GS} =0V, F=1.0MHz	-	5250	-	PF	
Output Capacitance	C _{oss}		-	380	-	PF	
Reverse Transfer Capacitance	C _{rss}		-	27	-	PF	
Switching Characteristics (Note 4)							
Turn-on Delay Time	t _{d(on)}	V _{DD} =60V, I _D =60A, V _{GS} =10V, R _G =3Ω	-	21	-	nS	
Turn-on Rise Time	t _r		-	13	-	nS	
Turn-Off Delay Time	t _{d(off)}		-	40	-	nS	
Turn-Off Fall Time	t _f		-	12	-	nS	
Total Gate Charge	Q _g	V _{DS} =60V, I _D =60A, V _{GS} =10V	-	99	-	nC	
Gate-Source Charge	Q _{gs}		-	30		nC	
Gate-Drain Charge	Q _{gd}		-	32		nC	
Drain-Source Diode Characteristics							
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =60A	-		1.2	V	
Diode Forward Current (Note 2)	I _S		-	-	120	A	
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =60A di/dt = 100A/μs(Note3)	-	72	-	nS	
Reverse Recovery Charge	Q _{rr}		-	140	-	nC	

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=50V, V_G=10V, L=0.5mH, R_g=25\Omega$

Typical Electrical and Thermal Characteristics

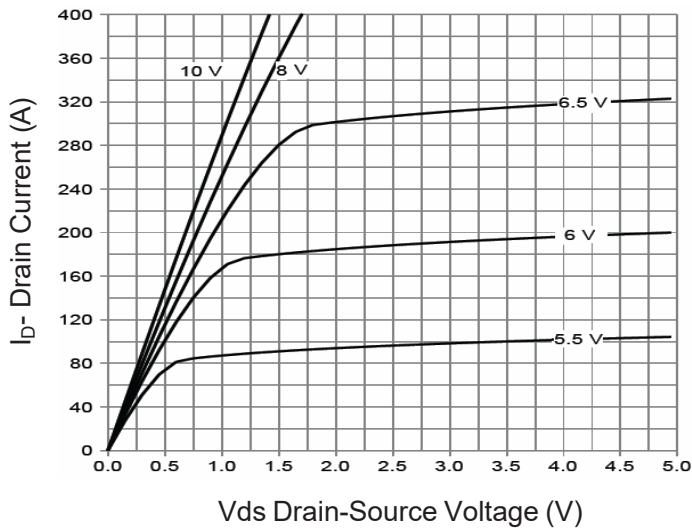


Figure 1 Output Characteristics

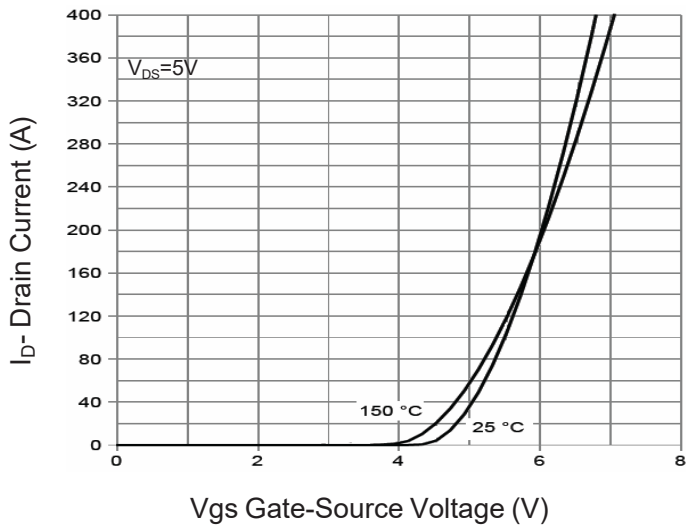


Figure 2 Transfer Characteristics

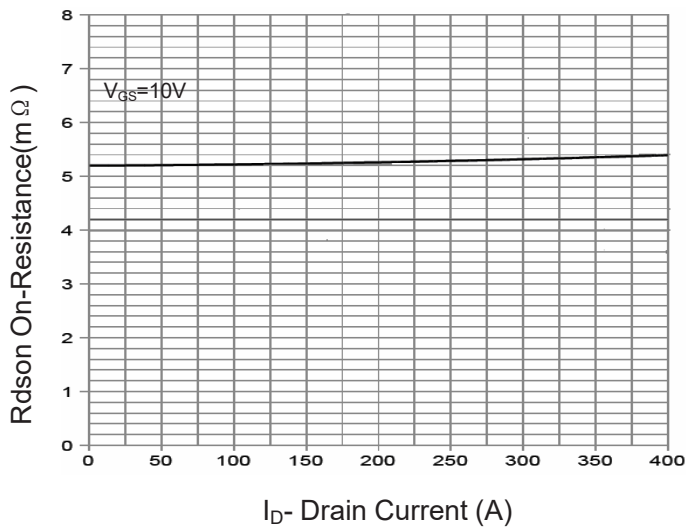


Figure 3 $R_{DS(on)}$ - Drain Current

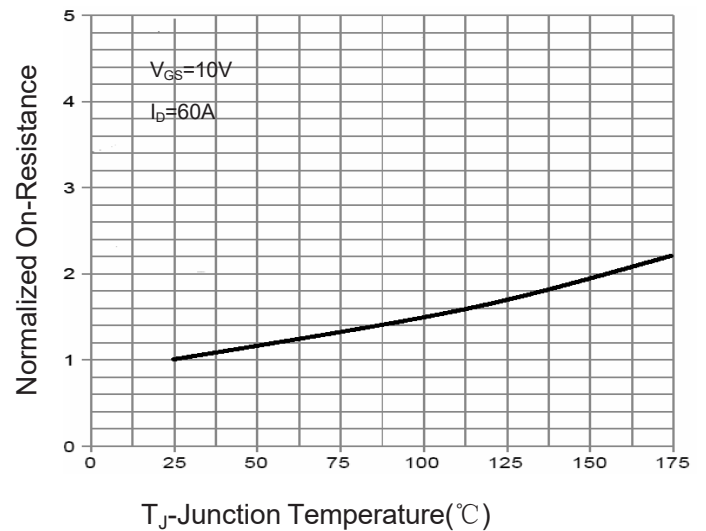


Figure 4 $R_{DS(on)}$ -Junction Temperature

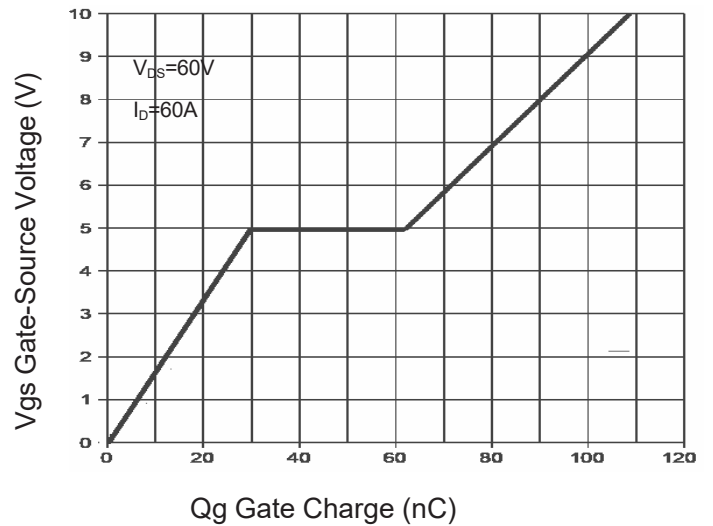


Figure 5 Gate Charge

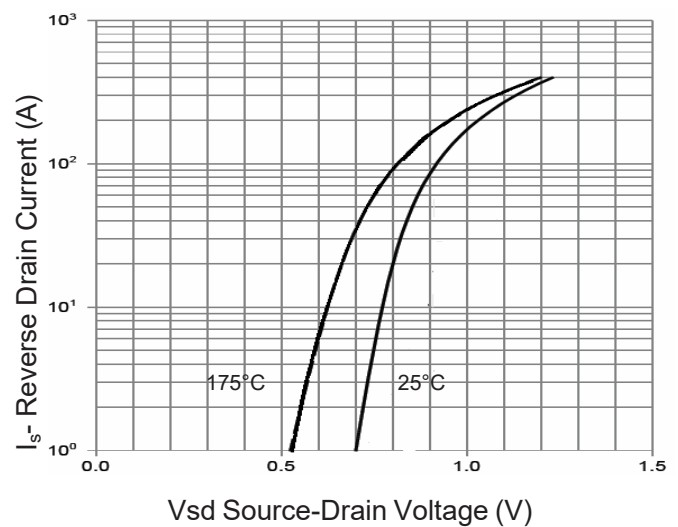
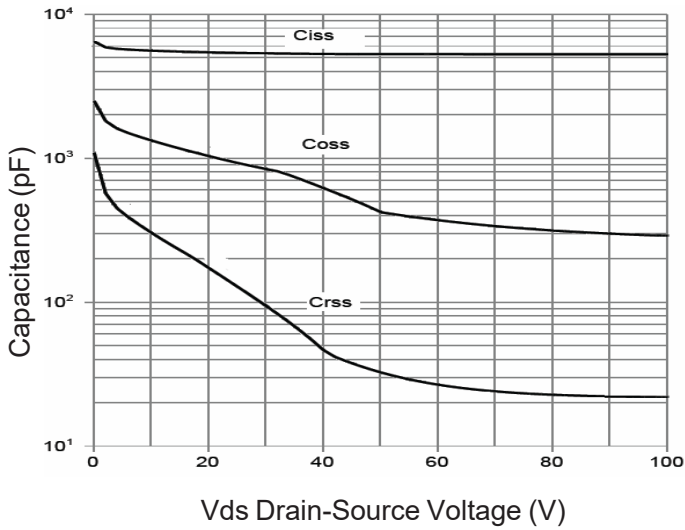
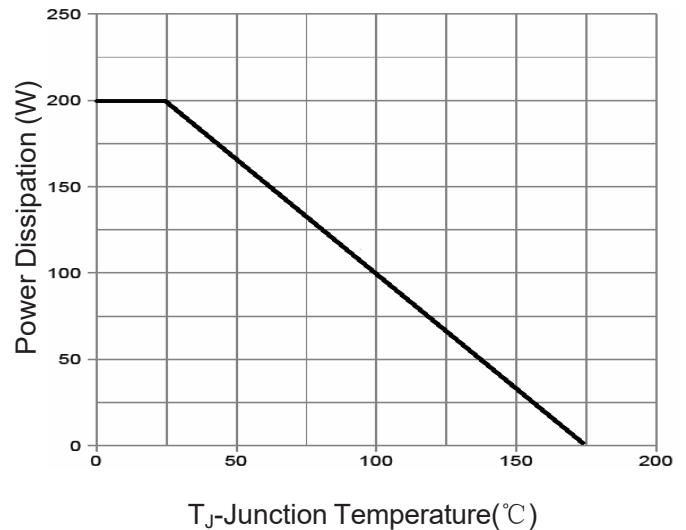
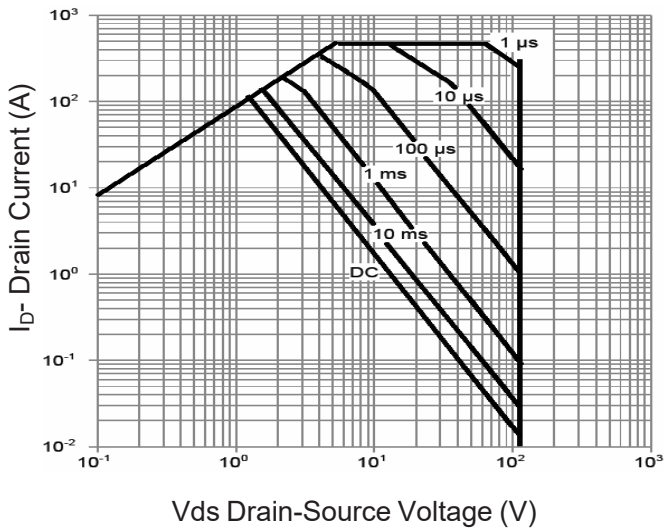
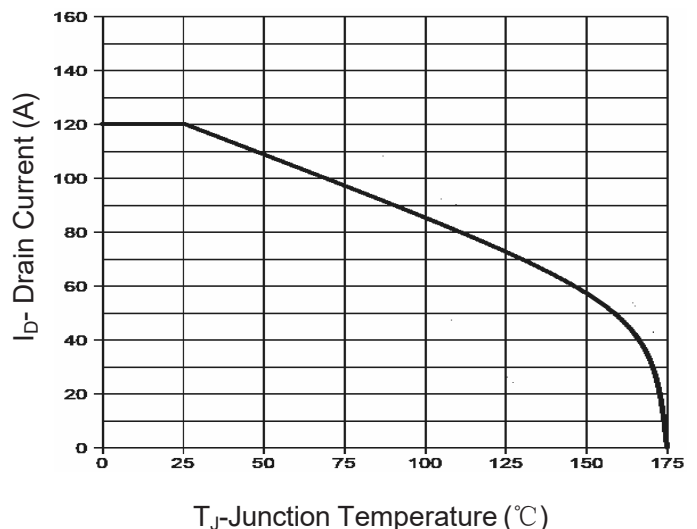
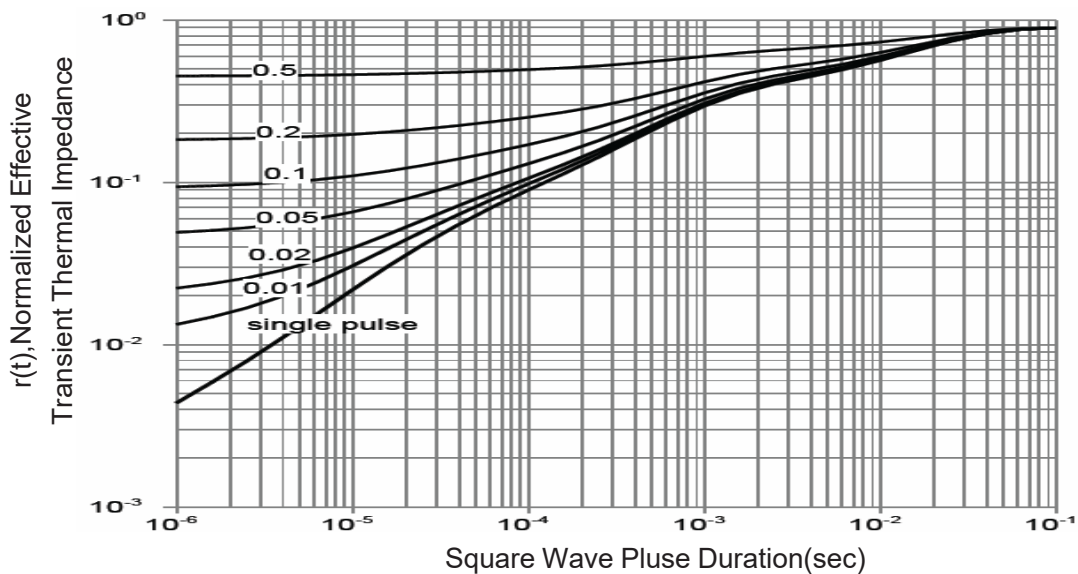


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Power De-rating

Figure 8 Safe Operation Area

Figure 10 Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance