

General Description:

90N03, the silicon N-channel Enhanced VDMOSFETs, is obtained by the high density Trench technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. This device is suitable for use as a load switch and PWM applications. The package form is TO-220AB, which accords with the RoHS standard.

Features:

- I **Fast Switching**
- I **Low ON Resistance**($R_{dson} \leq 5.5 \text{ m}\Omega$)
- I **Low Gate Charge**
- I **Low Reverse transfer capacitances**
- I **100% Single Pulse avalanche energy Test**

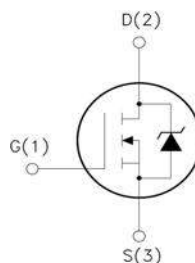
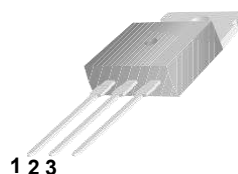
Applications:

Power switch circuit of adaptor and charger.

Absolute ($T_j = 25^\circ\text{C}$ unless otherwise specified)

V_{DSS}	30	V
I_D (Silicon limited current)	90	A
I_D (Package limited)	60	A
P_D	53	W
$R_{DS(ON)Typ}$	3.6	$\text{m}\Omega$

TO-220AB



1. Gate (G)
2. Drain (D)
3. Source (S)

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	30	V
I_D	Continuous Drain Current $T_C = 25^\circ\text{C}$	90	A
	Continuous Drain Current $T_C = 100^\circ\text{C}$	60	A
I_{DM}^{a1}	Pulsed Drain Current $T_C = 25^\circ\text{C}$	360	A
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}^{a2}	Avalanche Energy	240	mJ
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	53	W
	Derating Factor above 25°C	0.424	W/ $^\circ\text{C}$
T_J, T_{stg}	Operating Junction and Storage Temperature Range	150, -55 to 150	$^\circ\text{C}$
T_L	Maximum Temperature for Soldering	300	$^\circ\text{C}$

Electrical Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise specified):

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	--	--	V
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=30V, V_{GS}=0V, T_j=25^\circ\text{C}$	--	--	1	μA
		$V_{DS}=24V, V_{GS}=0V, T_j=125^\circ\text{C}$	--	--	100	
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS}=20V$	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS}=-20V$	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=19A$	--	3.6	5.5	$m\Omega$
		$V_{GS}=4.5V, I_D=19A$	--	5.0	7.5	$m\Omega$
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.0	V
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
R_g	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1\text{MHz}$	--	2.2	--	Ω
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=15V, f=1.0\text{MHz}$	--	2848	--	pF
C_{oss}	Output Capacitance		--	356	--	
C_{rss}	Reverse Transfer Capacitance		--	316	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$V_{GS}=10V, R_G=3\Omega, V_{DD}=15V, I_D=45A$	--	13	--	ns
t_r	Rise Time		--	8	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	56.5	--	
t_f	Fall Time		--	12	--	
Q_g	Total Gate Charge	$I_D=45A, V_{DD}=15V, V_{GS}=10V$	--	53.5	--	nC
Q_{gs}	Gate to Source Charge		--	8.2	--	
Q_{gd}	Gate to Drain ("Miller") Charge		--	12	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)	$T_c = 25\text{ }^\circ\text{C}$	--	--	90	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	360	A
V_{SD}	Diode Forward Voltage	$I_S=45\text{A}, V_{GS}=0\text{V}$	--	--	1.2	V
t_{rr}	Reverse Recovery Time	$di/dt=100\text{A}/\mu\text{s}$	--	12	--	ns
Q_{rr}	Reverse Recovery Charge	$I_F=45\text{A}$	--	4.2	--	nC
Pulse width $t_p \leq 300\mu\text{s}$, $\delta \leq 2\%$						

Symbol	Parameter	Max.	Units
$R_{\theta JC}$	Junction-to-Case	2.36	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-Ambient	62.5	$^\circ\text{C}/\text{W}$

^{a1}: Repetitive rating; pulse width limited by maximum junction temperature

^{a2}: $L=0.5\text{mH}, I_{as}=31\text{A}$ Start $T_j=25\text{ }^\circ\text{C}$

Characteristics Curve:

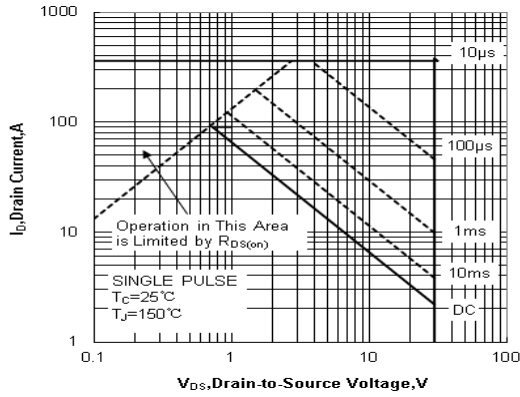


Figure 1. Maximum Safe Operating

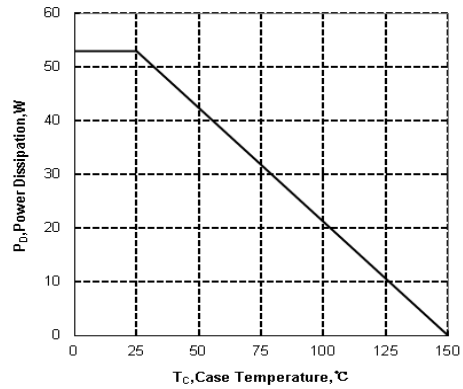


Figure 2. Maximum Power Dissipation vs Case Temperature

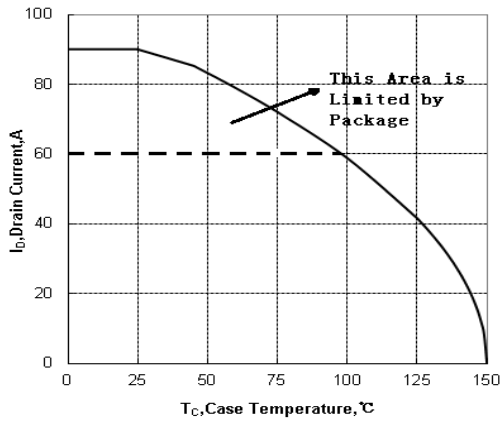


Figure3. Maximum Continuous Drain Current vs Case Temperature

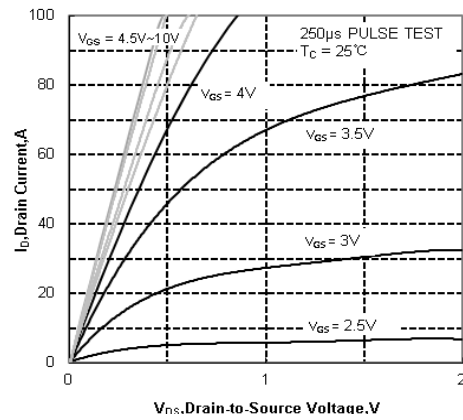


Figure4. Typical Output Characteristics

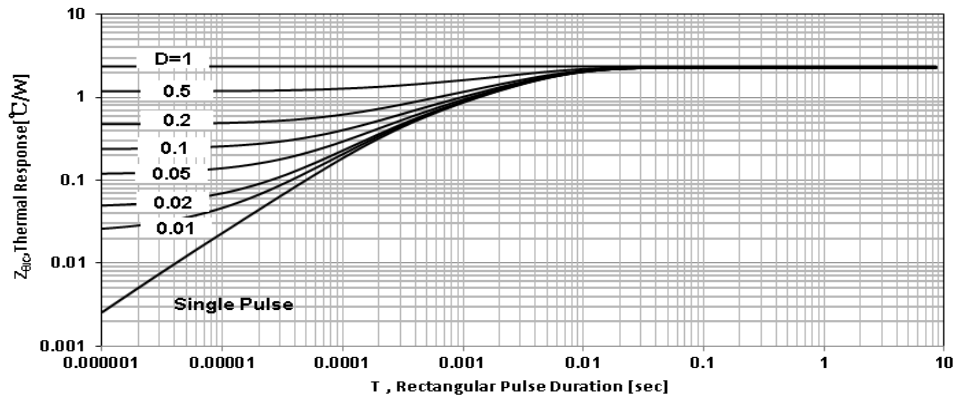


Figure 5. Maximum Effective Transient Thermal Impedance, Junction-to-Case

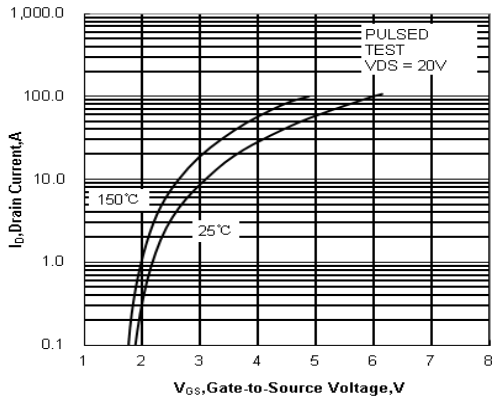


Figure 6. Typical Transfer Characteristics

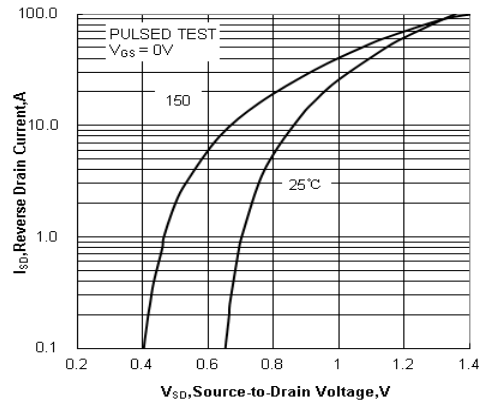


Figure 7. Typical Body Diode Transfer Characteristics

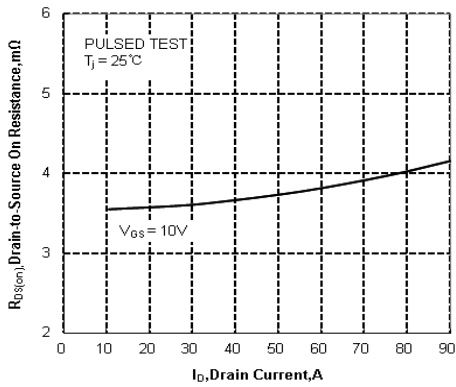


Figure 8. Drain-to-Source On Resistance vs Drain Current

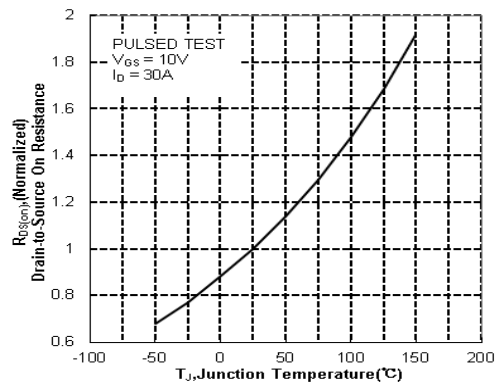


Figure 9. Typical Drain to Source on Resistance vs Junction Temperature

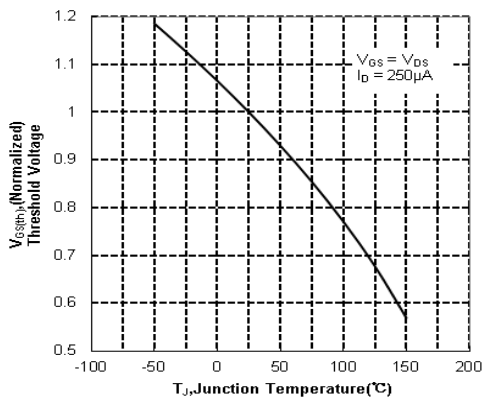


Figure 10. Typical Theshold Voltage vs Junction Temperature

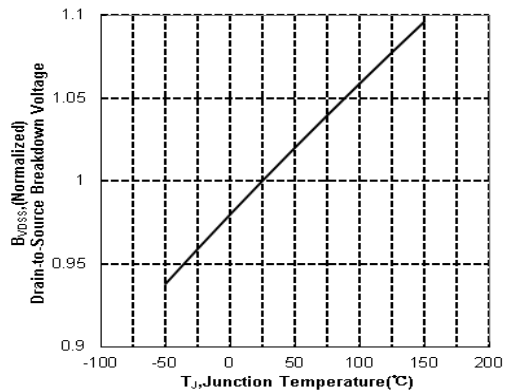


Figure 11. Typical Breakdown Voltage vs Junction Temperature

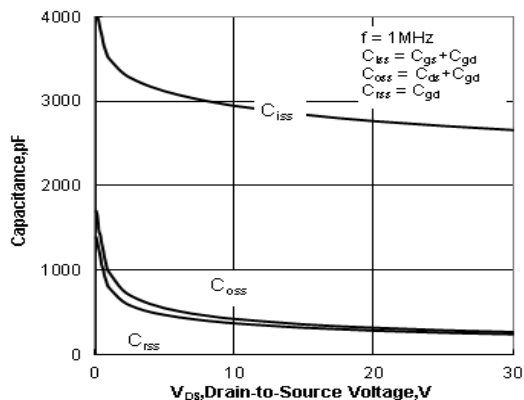


Figure 12. Typical Capacitance vs Drain to Source Voltage

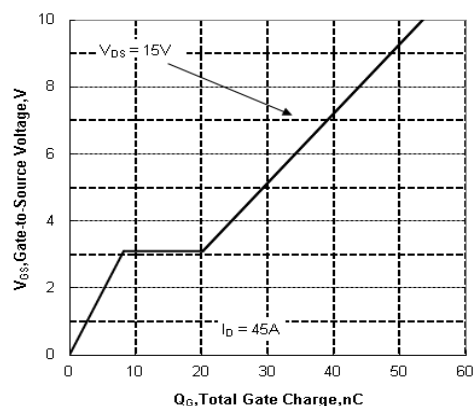


Figure13. Typical Gate Charge vs Gate to Source Voltage

Test Circuit and Waveform

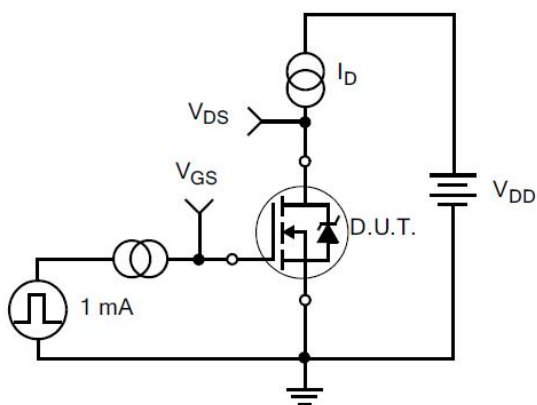


Figure 14. Gate Charge Test Circuit

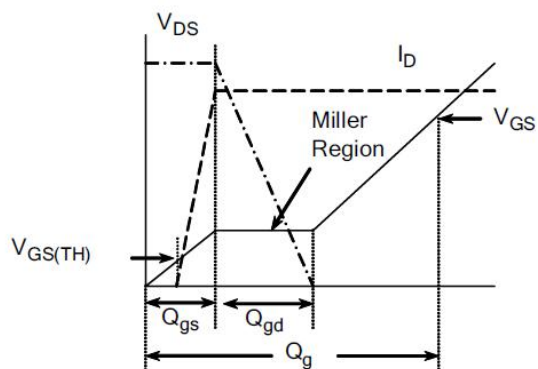


Figure 15. Gate Charge Waveforms

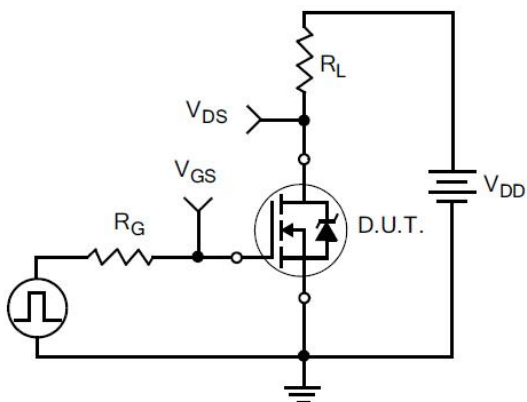


Figure 16. Resistive Switching Test Circuit

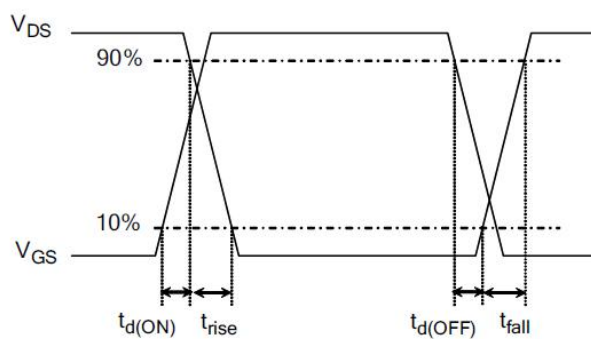


Figure 17. Resistive Switching Waveforms

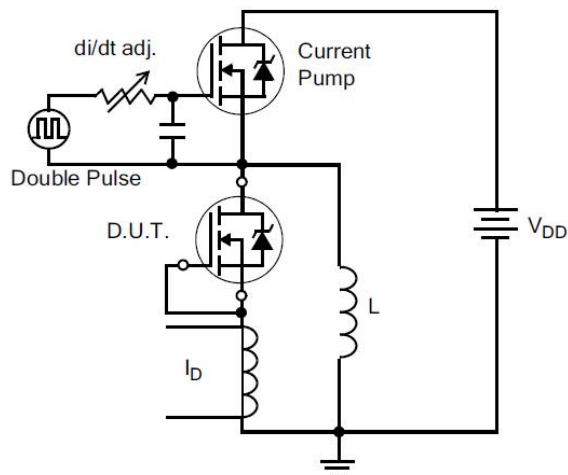


Figure 18. Diode Reverse Recovery Test Circuit

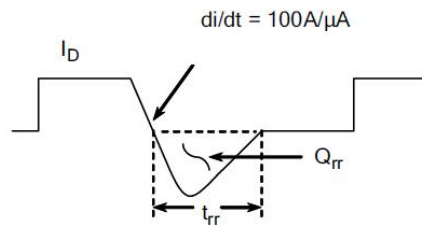


Figure 19. Diode Reverse Recovery Waveform

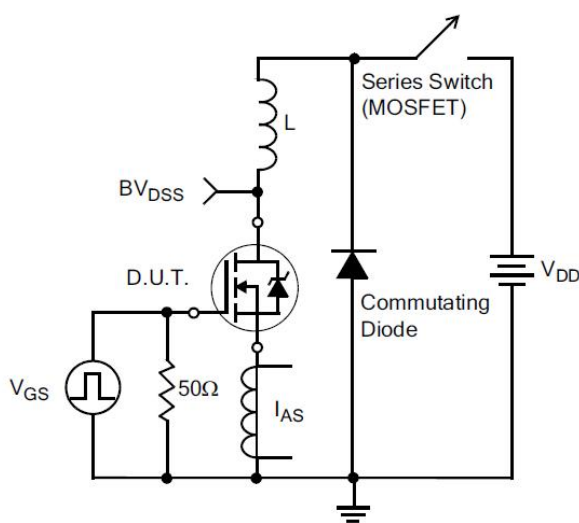


Figure 20. Unclamped Inductive Switching Test Circuit

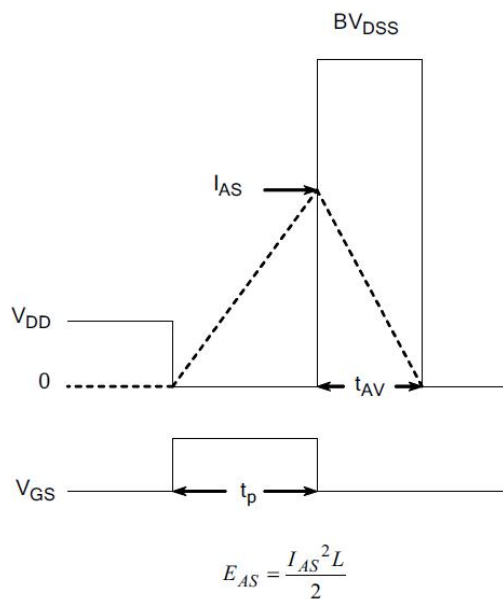
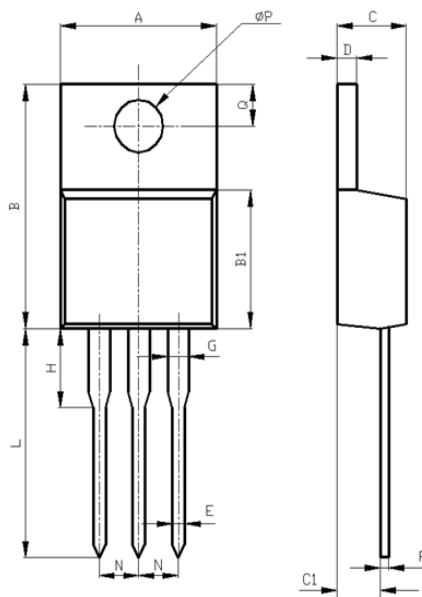


Figure 21. Unclamped Inductive Switching Waveform

Package Information:


Items	Values(mm)	
	MIN	MAX
A	9.60	10.6
B	15.0	16.0
B1	8.90	9.50
C	4.30	4.80
C1	2.30	3.10
D	1.20	1.40
E	0.70	0.90
F	0.30	0.60
G	1.17	1.37
H	2.70	3.80
L*	12.6	14.8
N	2.34	2.74
Q	2.40	3.00
φ P	3.50	3.90

*adjustable

TO-220AB Package