

General Description:

230N06, 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:

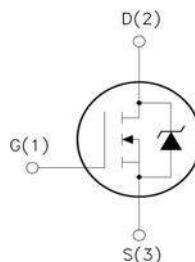
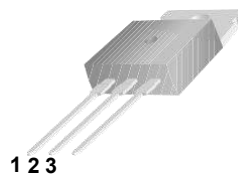
- I **Fast Switching**
- I **Low ON Resistance**($R_{DS(ON)} \leq 3.6 \text{ m}\Omega$)
- I **Low Gate Charge**
- I **Low Reverse transfer capacitances**
- I **100% Single Pulse avalanche energy Test**

Applications:

Power switch circuit of adaptor and charger.

V_{DSS}	60	V
I_D (Silicon limited current)	230	A
$P_D(T_C=25^\circ\text{C})$	284	W
$R_{DS(ON)Typ}$	3	$\text{m}\Omega$

TO-220AB



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

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

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	60	V
I_D	Continuous Drain Current(Silicon Limited)	230	A
	Continuous Drain Current $T_C = 100^\circ\text{C}$	145	A
I_{DM}^{a1}	Pulsed Drain Current	920	A
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}^{a2}	Avalanche Energy	1024	mJ
I_{AS}^{a2}	Avalanche Current	64	A
P_D	Power Dissipation	284	W
	Derating Factor above 25°C	2.272	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_i= 25°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 =250μA	60	--	--	V
I _{DSS}	Drain to Source Leakage Current	V _{DS} = 60V, V _{GS} = 0V, T _a = 25°C	--	--	1	μA
		V _{DS} =48V, V _{GS} = 0V, T _a = 125°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 =95A	--	3.0	3.6	mΩ
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	2.0		4.0	V
Pulse width tp ≤ 300μs, δ ≤ 2%						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	--	1.3	--	Ω
C _{iss}	Input Capacitance	V _{GS} = 0V V _{DS} =25V f = 1.0MHz	--	5681	--	pF
C _{oss}	Output Capacitance		--	734.8	--	
C _{rss}	Reverse Transfer Capacitance		--	371.5	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
t _{d(ON)}	Turn-on Delay Time	V _{GS} =10V, V _{DS} =30V, I _D =115A, R _g =6Ω	--	41.9	--	ns
t _r	Rise Time		--	47.0	--	
t _{d(OFF)}	Turn-Off Delay Time		--	70.9	--	
t _f	Fall Time		--	29.3	--	
Q _g	Total Gate Charge	V _{DS} =48V, I _D =115A, V _{GS} =10V	--	98.4	--	nC
Q _{gs}	Gate to Source Charge		--	29.0	--	
Q _{gd}	Gate to Drain ("Miller")Charge		--	33.2	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)		--	--	230	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	920	A
V_{SD}	Diode Forward Voltage	$I_S=95A, V_{GS}=0V$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$I_S=115A, T_j = 25^\circ C$	--	38.1	--	ns
Q_{rr}	Reverse Recovery Charge	$dI_F/dt=100A/us, V_{GS}=0V$	--	51.9	--	nC
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						

Symbol	Parameter	Max.	Units
$R_{\theta JC}$	Junction-to-Case	0.44	$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient	62.5	$^\circ C/W$

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

^{a2}: $L=0.5mH, I_D=64A, Start T_j=25^\circ C$

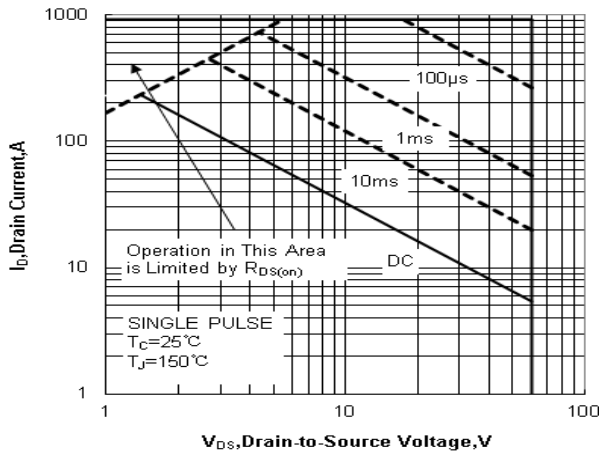
Characteristics Curve:


Figure 1 Maximum Forward Bias Safe Operating Area

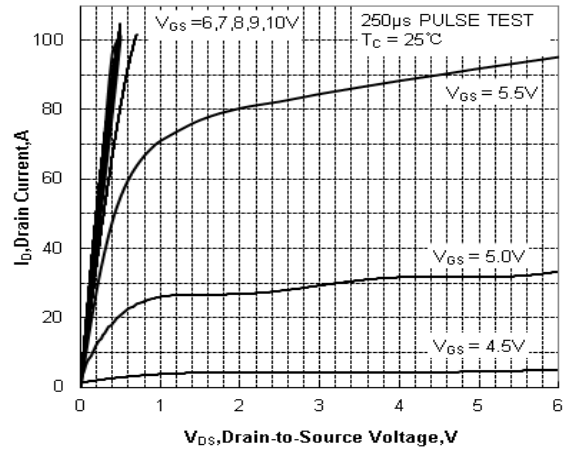


Figure 2 Typical Output Characteristics

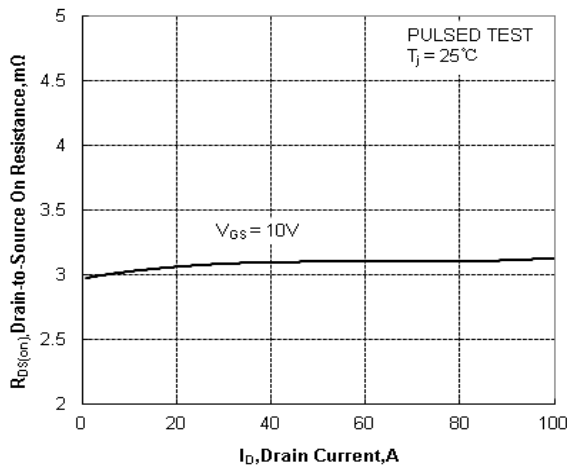


Figure 3 Typical Drain to Source ON Resistance vs Drain Current

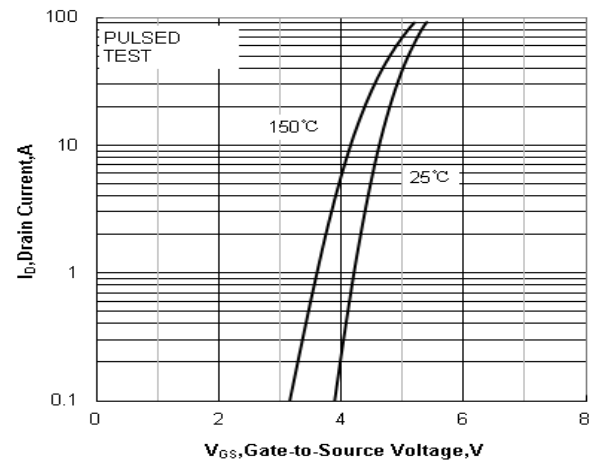


Figure 4 Typical Transfer Characteristics

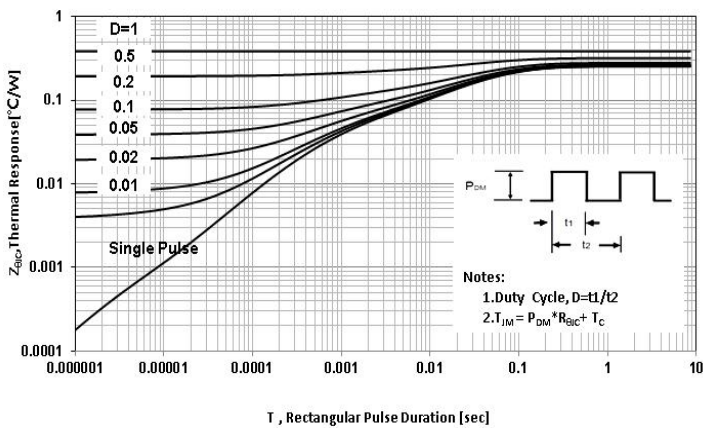


Figure 5 Maximum Effective Thermal Impedance, Junction to Case

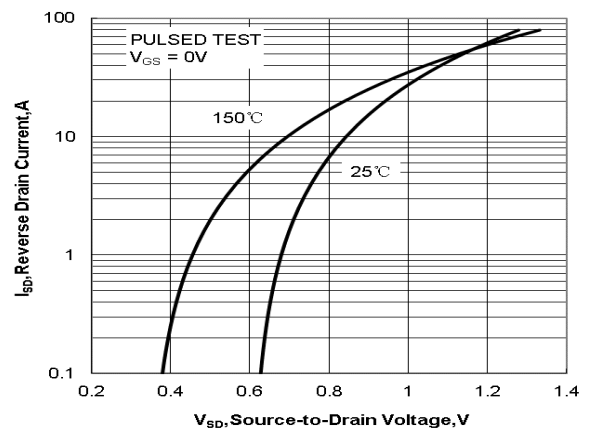


Figure 6 Body Diode Forward Voltage vs. Source Current and Temperature

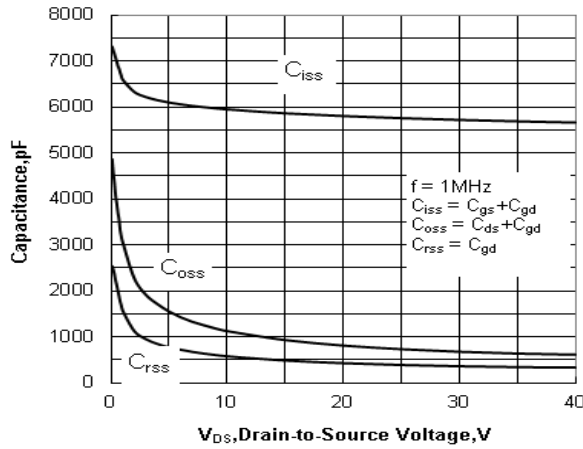


Figure 7 Typical Capacitance vs Drain to Source Voltage

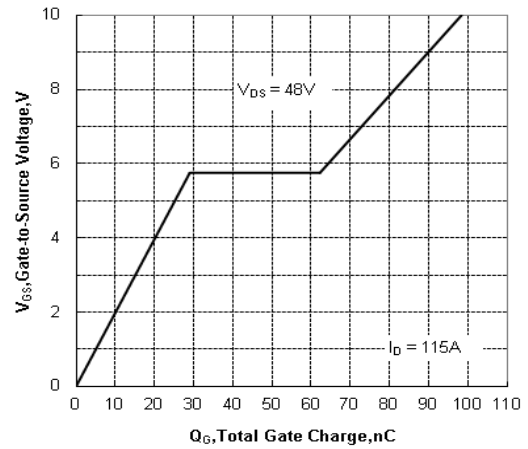


Figure 8 Typical Gate Charge vs Gate to Source Voltage

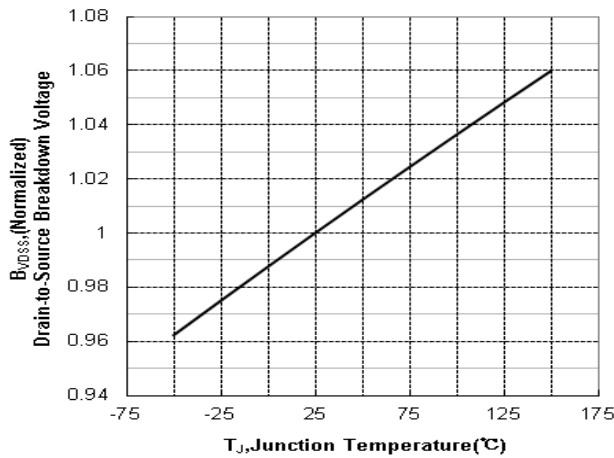


Figure 9 Typical Breakdown Voltage vs Junction Temperature

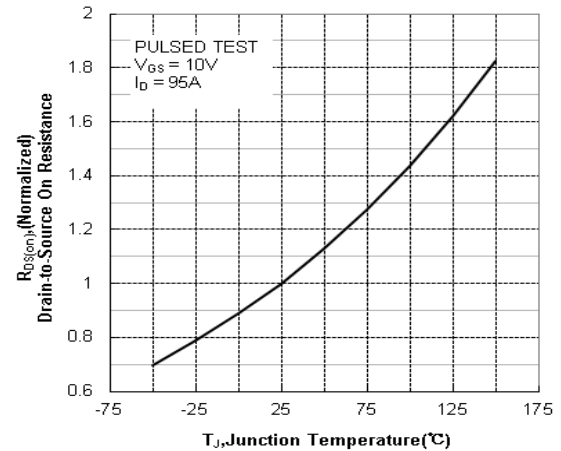


Figure 10 Typical Drain to Source on Resistance vs Junction Temperature

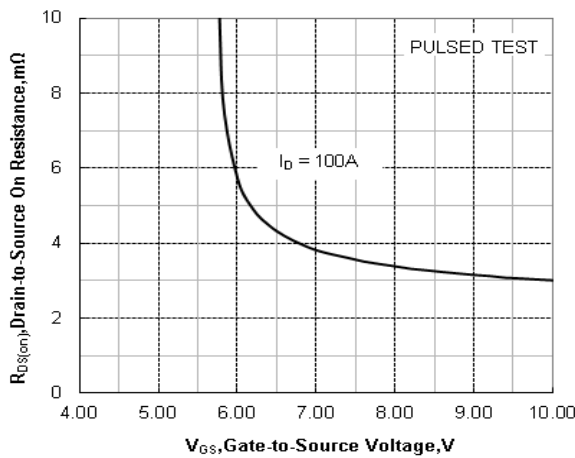


Figure 11 Drain-to-Source On Resistance vs Gate Voltage and Drain Current

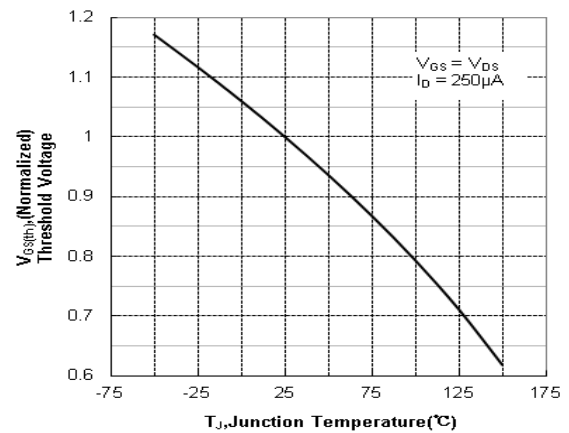


Figure 12 Typical Threshold Voltage vs Junction Temperature

Test Circuit and Waveform

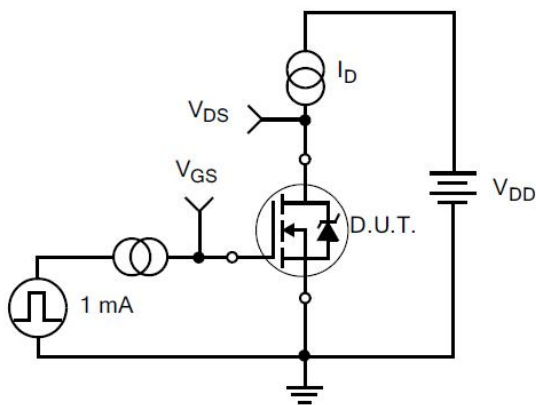


Figure 13. Gate Charge Test Circuit

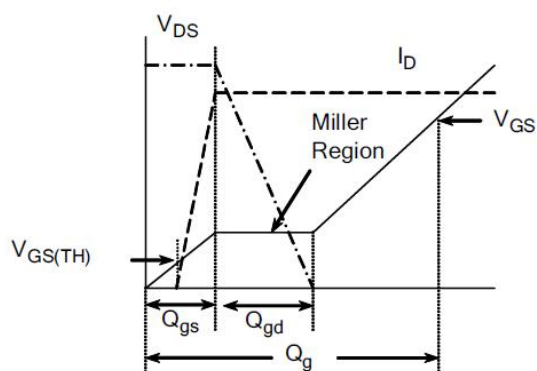


Figure 14. Gate Charge Waveforms

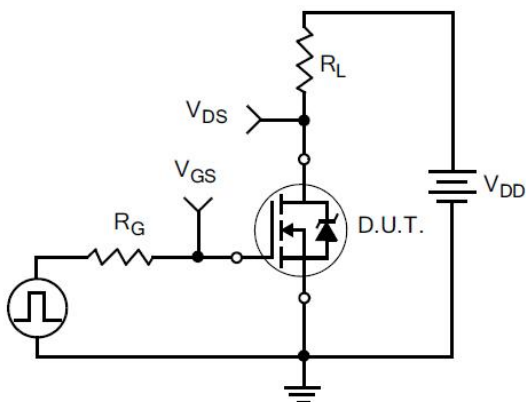


Figure 15. Resistive Switching Test Circuit

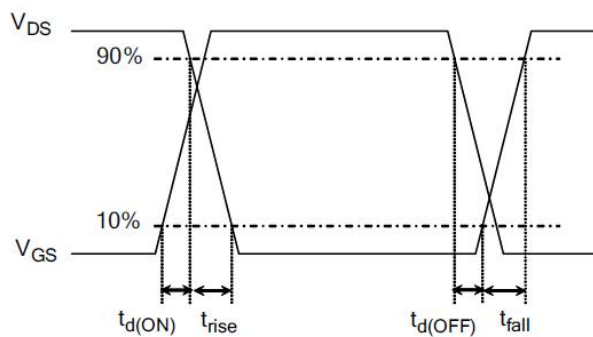


Figure 16. Resistive Switching Waveforms

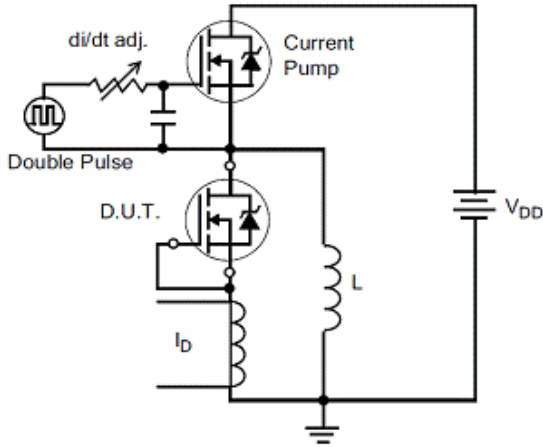


Figure 17. Diode Reverse Recovery Test Circuit

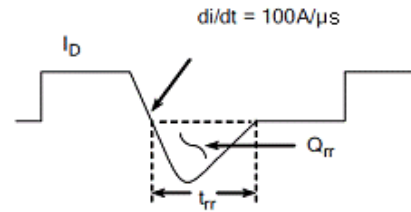


Figure 18. Diode Reverse Recovery Waveform

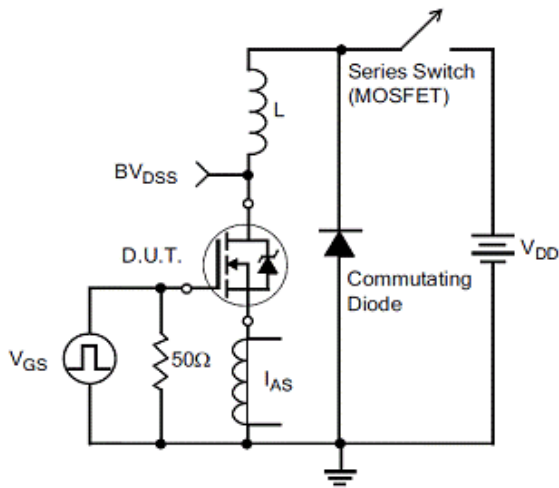


Figure 19. Unclamped Inductive Switching Test Circuit

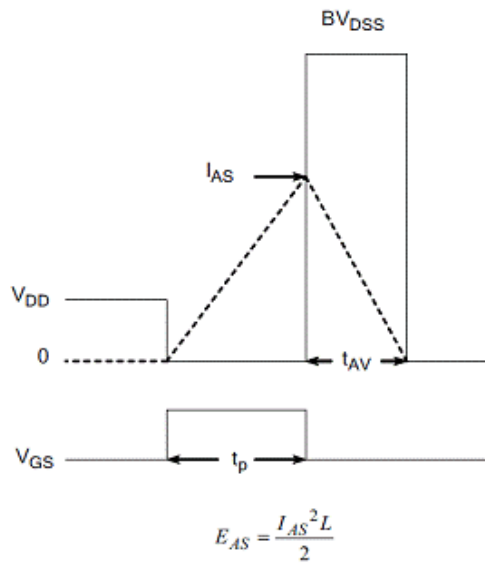
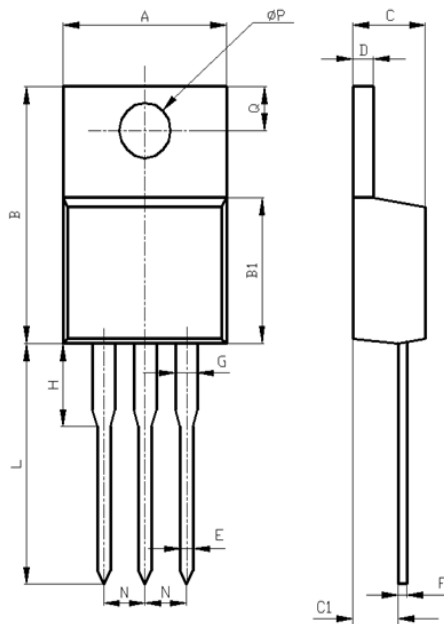


Figure 20. Unclamped Inductive Switching Waveform

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