

Silicon N-Channel Power MOSFET

1.Description

MP40N30, the silicon N-channel Enhanced MOSFETs, is obtained by advanced MOSFET technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor is suitable device for SMPS, high speed switching and general purpose applications.

KEY CHARACTERISTICS

Parameter	Value	Unit
V_{DS}	300	V
I_D	40	A
$R_{DS(ON).Typ}$	0.09	Ω

FEATURES

- ① Fast Switching
- ② Low C_{rss}
- ③ 100% avalanche tested
- ④ Improved dv/dt capability
- ⑤ RoHS product

APPLICATIONS

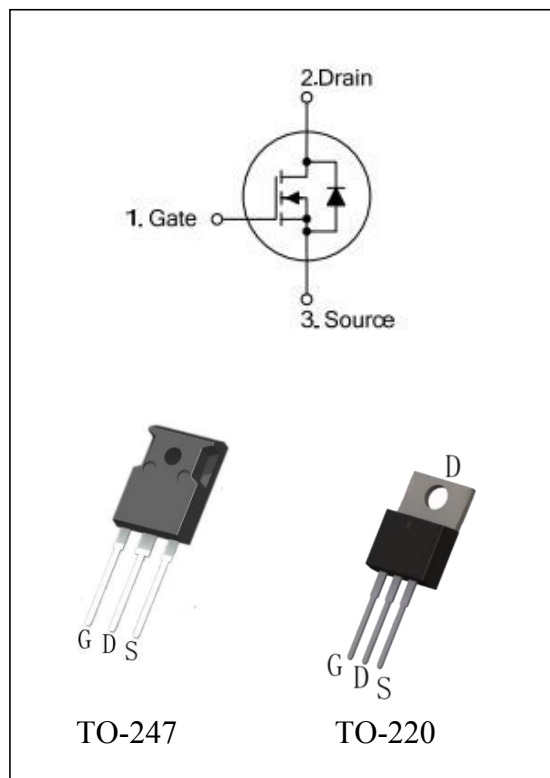
- ① High frequency switching mode power supply

ORDERING INFORMATION

Ordering Codes	Package	Product Code	Packing
MP40N30-P	TO-220	40N30	Tube
MD40N30-W	TO-247		Tube

2.ABSOLUTE RATINGS at $T_C = 25^{\circ}\text{C}$, unless otherwise specified

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	300	V
I_D	Continuous Drain Current	40	A
	Continuous Drain Current $T_C = 100^{\circ}\text{C}$	26	A
I_{DM}	Pulsed Drain Current(Note1)	160	A
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy(Note2)	1800	mJ



dv/dt	Peak Diode Recovery dv/dt(Note3)	5.0	V/ns
PD	Power Dissipation	390	W
	Derating Factor above 25°C	3.1	W/°C
T _J , T _{stg}	Operating Junction and Storage Temperature Range	150, -55 to 150	°C
T _L	Maximum Temperature for Soldering	300	°C

3. Thermal characteristics

Symbol	Parameter	RATINGS	Units
R _{θJC}	Junction-to-Case	0.32	°C/W
R _{θJA}	Junction-to-Ambient	62.5	°C/W

4. Electrical Characteristics at T_c = 25°C, unless otherwise specified

OFF Characteristics						
Symbol	Parameter	Test Conditions	Values			Units
			Min	Typ.	Max.	
V _{DSS}	Drain to Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	300	--	--	V
ΔBV _{DSS} /ΔT _J	Bvdss Temperature Coefficient	I _D =250uA, Reference 25°C	--	0.24	--	V/°C
I _{DSS}	Drain to Source Leakage Current	V _{DS} =300V, V _{GS} = 0V, T _j = 25°C	--	--	1	μA
		V _{DS} =240V, V _{GS} = 0V, T _j = 125°C	--	--	10	μA
I _{GSS(F)}	Gate to Source Forward Leakage	V _{GS} =+30V	--	--	100	nA
I _{GSS(R)}	Gate to Source Reverse Leakage	V _{GS} =-30V	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
R _{DS(ON)}	Drain-to-Source On- Resistance	V _{GS} =10V, I _D =20A(Note4)	--	0.09	0.11	Ω
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA(Note4)	2	3	4	V

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	



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R_g	Gate resistance	$f = 1.0\text{MHz}$	--	1.6	--	Ω
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0\text{MHz}$	--	3650	--	PF
C_{oss}	Output Capacitance		--	350	--	
C_{rss}	Reverse Transfer Capacitance		--	4.3	--	

Switching Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D = 40A$ $V_{DD} = 125V$ $V_{GS} = 10V$ $R_G = 15\Omega$	--	81	--	ns
t_r	Rise Time		--	618	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	137	--	
t_f	Fall Time		--	180	--	
Q_g	Total Gate Charge	$I_D = 40A$ $V_{DD} = 240V$ $V_{GS} = 10V$	--	63	--	nC
Q_{gs}	Gate to Source Charge		--	20.5	--	
Q_{gd}	Gate to Drain ("Miller") Charge		--	16.5	--	

Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)	$TC = 25^\circ C$	--	--	40	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	160	A
V_{SD}	Diode Forward Voltage	$I_S = 40A$, $V_{GS} = 0V$ (Note4)	--	--	1.2	V
T_{rr}	Reverse Recovery Time	$I_S = 40A$, $T_J = 25^\circ C$ $dI/dt = 100A/\mu s$, $V_{GS} = 0V$	--	225	--	ns
Q_{rr}	Reverse Recovery Charge		--	2148	--	nC

Note1: Pulse width limited by maximum junction temperature Note2:

$L = 10mH$, $V_{DS} = 50V$, Start $T_J = 25^\circ C$

Note3: $I_{SD} = 40A$, $dI/dt \leq 100A/\mu s$, $V_{DD} \leq BV_{DS}$, Start $T_J = 25^\circ C$ Note4: Pulse

width $t_p \leq 300\mu s$, $\delta \leq 2\%$

5. Characteristics Curves

Figure 1 Safe Operating Area

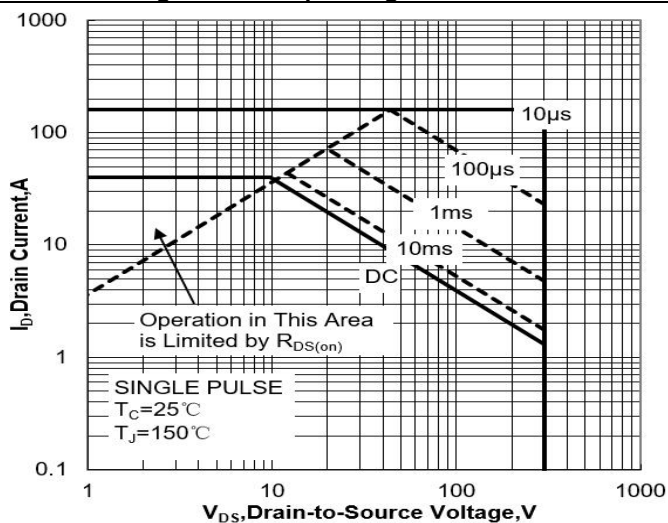


Figure 2 Power Dissipation

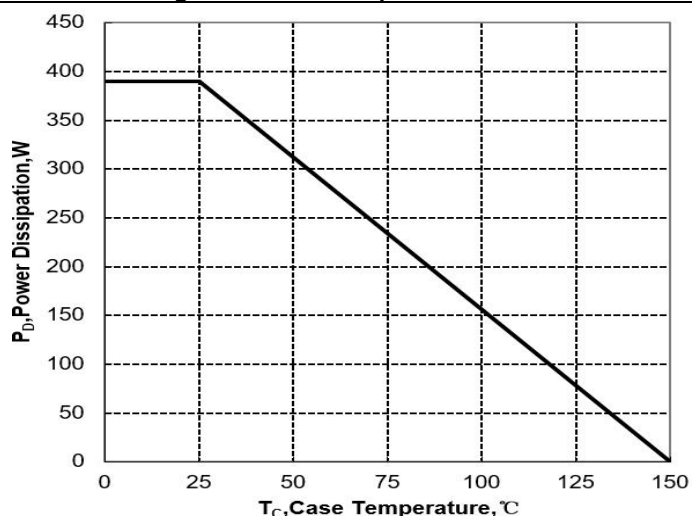


Figure 3 Max Thermal Impedance

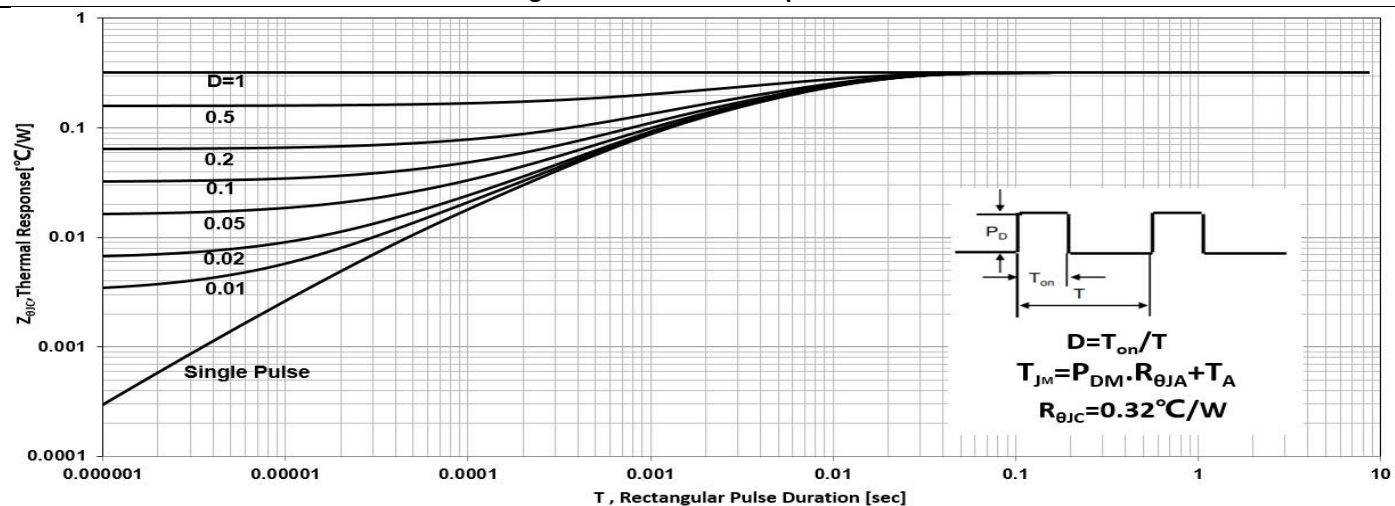


Figure 4 Typical Output Characteristics

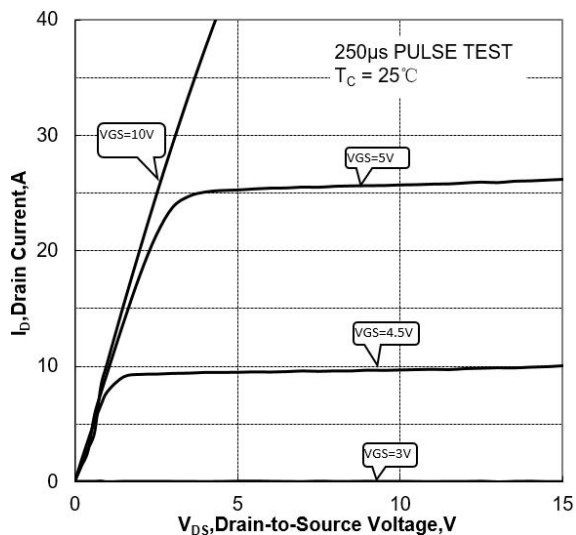


Figure 5 Typical Transfer Characteristics

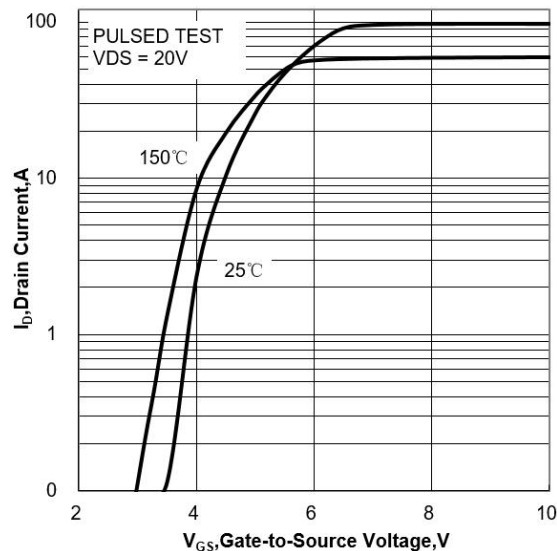


Figure 6 Typical Drain to Source ON Resistance vs Drain Current

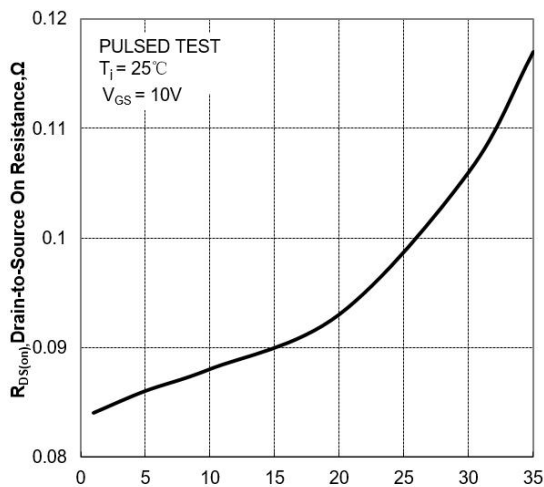


Figure 7 Typical Drain to Source on Resistance vs Junction Temperature

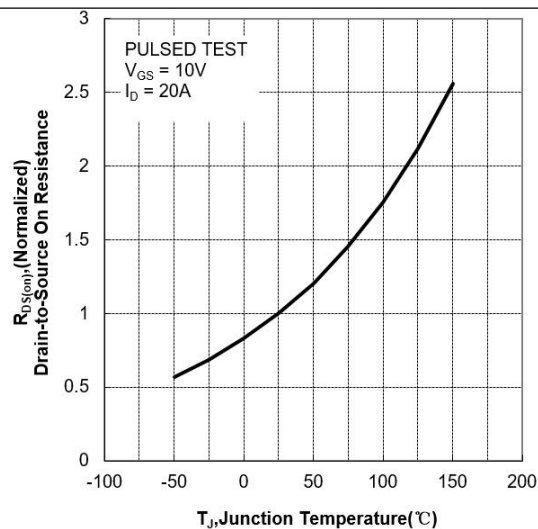


Figure 8 Typical Threshold Voltage vs Junction Temperature

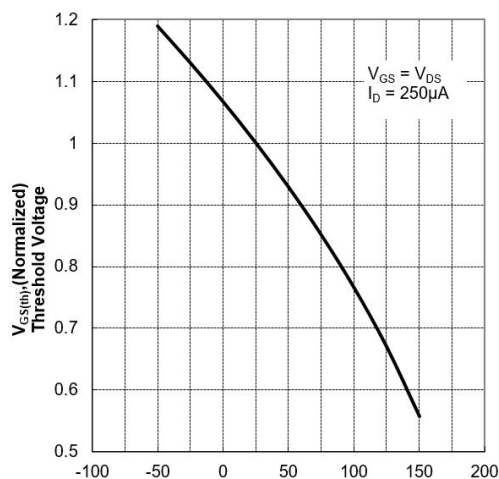


Figure 9 Typical Breakdown Voltage vs Junction Temperature

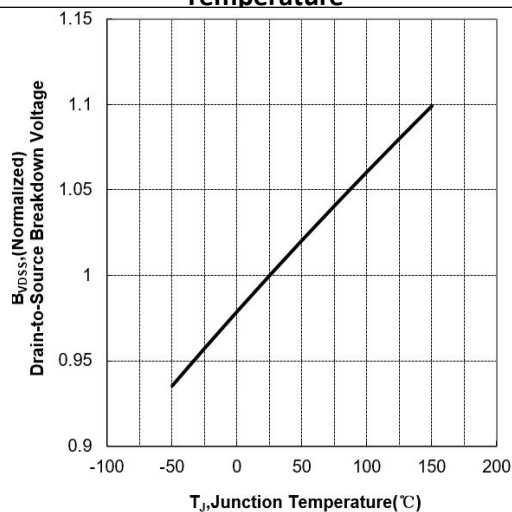


Figure 10 Typical Capacitance vs Drain to Source Voltage

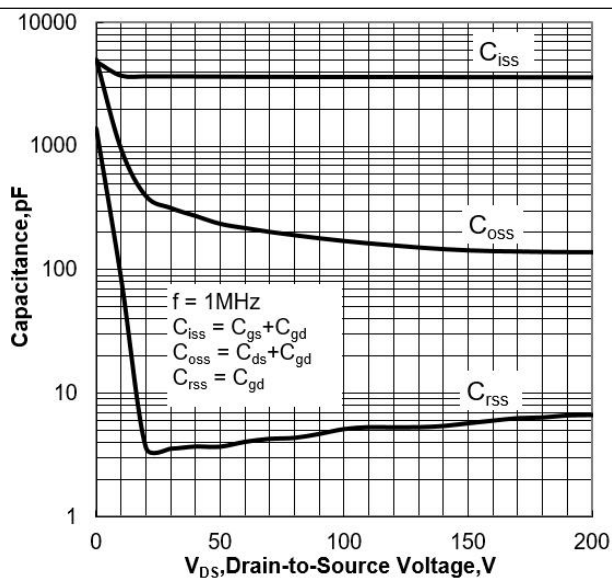
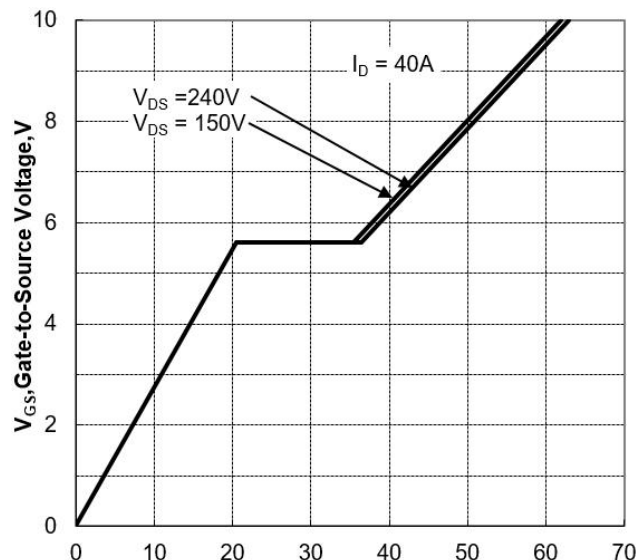
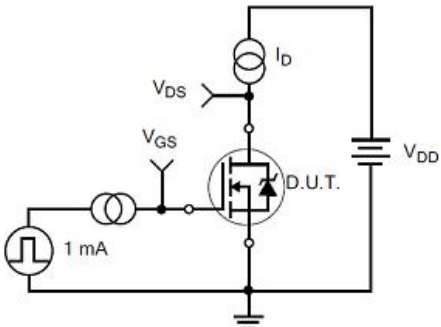
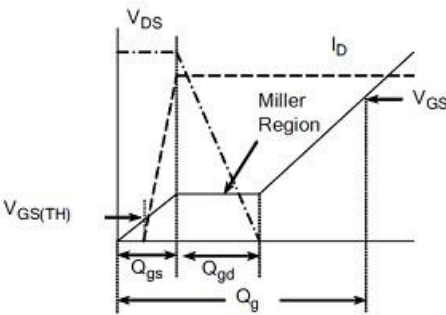
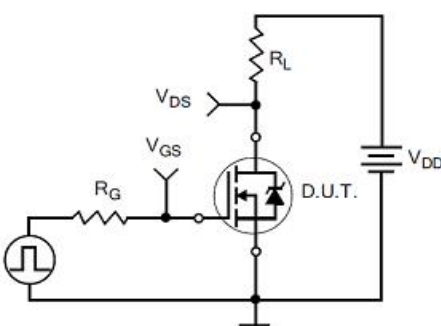
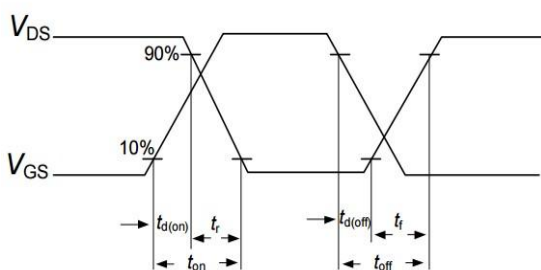
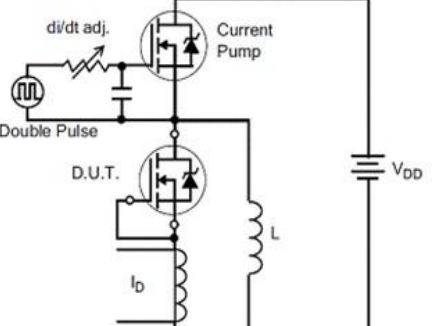
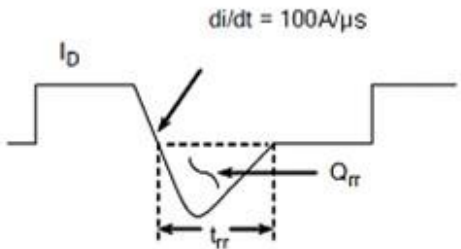
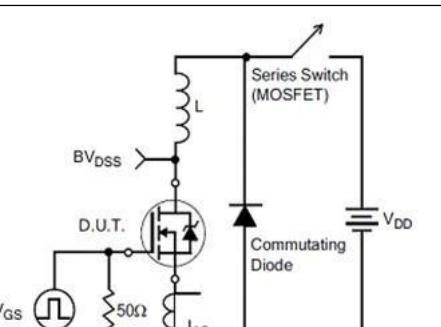
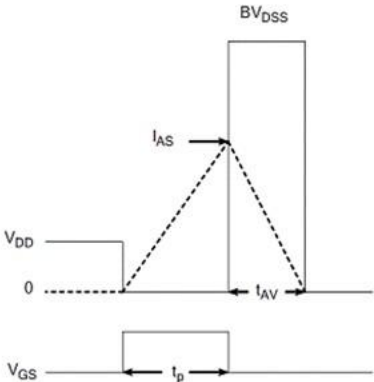


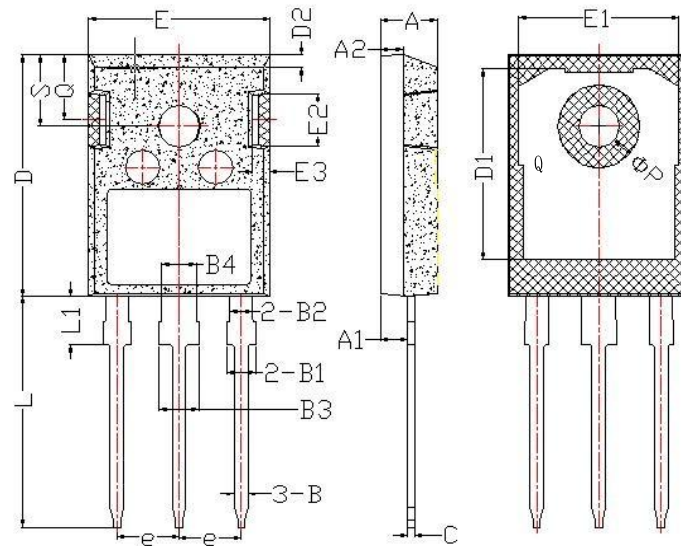
Figure 11 Typical Gate Charge vs Gate to Source Voltage



6. Test Circuit and Waveform

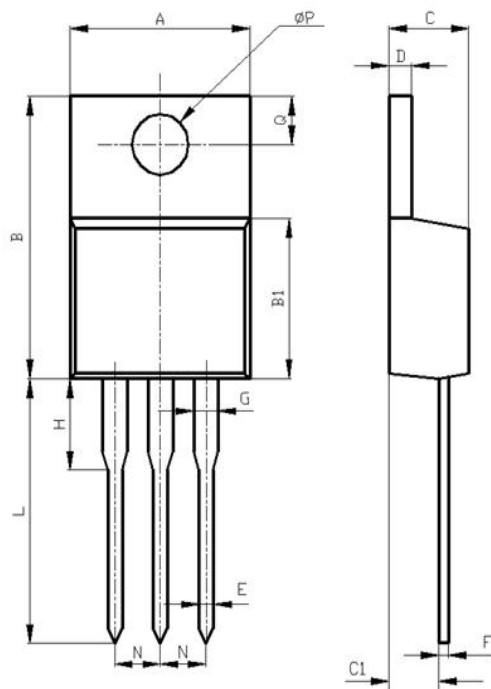
Gate Charge Test Circuit	Gate Charge Waveforms
	
Resistive Switching Test Circuit	Resistive Switching Waveforms
	
Diode Reverse Recovery Test Circuit	Diode Reverse Recovery Waveform
	
Unclamped Inductive Switching Test Circuit	Unclamped Inductive Switching Waveform
	

Package Description



Items	Values(mm)	
	MIN	MAX
A	4.90	5.16
A1	2.27	2.53
A2	1.85	2.11
B	1.07	1.33
B1	1.90	2.41
B2	1.75	2.15
B3	2.87	3.38
B4	2.87	3.13
C	0.55	0.68
D	20.82	21.10
D1	16.25	17.65
D2	1.05	1.35
E	15.70	16.03
E1	13.10	14.15
E2	3.68	5.10
E3	1.68	2.60
e	5.44	
L	19.80	20.31
L1	4.17	4.47
ΦP	3.50	3.70
Q	5.49	6.00
S	6.04	6.30

TO-247 Package



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
Ø P	3.50	3.90

TO-220 Package



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NOTE:

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. Please do not exceed the absolute maximum ratings of the device when circuit designing.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. MOSFETs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. Shenzhen Minos reserves the right to make changes in this specification sheet and is subject to change without prior notice.

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