

100V N-Channel Power MOSFET

DESCRIPTION

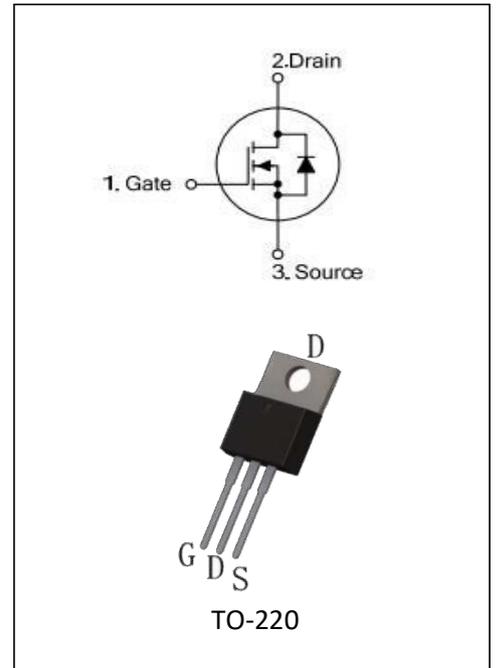
The IRF540N-MNS uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. It can be used in a wide variety of applications.

Application

- ① Power switching application
- ② Hard switched and High frequency circuits
- ③ Uninterruptible power supply

KEY CHARACTERISTICS

- ① $V_{DS} = 100V, I_D = 35A$
 $R_{DS(ON)} < 30m\Omega @ V_{GS} = 10V$
- ② High density cell design for lower R_{dson}
- ③ Fully characterized avalanche voltage and current
- ④ Good stability and uniformity with high EAS
- ⑤ Excellent package for good heat dissipation



Package Marking And Ordering Information:

Ordering Codes	Package	Product Code	Packing
IRF540N-MNS	TO-220	IRF540N	Reel

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	35	A
Drain Current-Pulsed ^(Note 1)	I_{DM}	100	A
Maximum Power Dissipation (Tc=25°C)	P_D	70	W
Single pulse avalanche energy ^(Note 2)	E_{AS}	96	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	°C

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta J}$	3.5	°C/W
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Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	$B_{V_{DS}}$	$V_{GS}=0V, I_D=250\mu A$	100	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=100V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3	4	V
Drain-Source On-State Resistance ^(Note 3)	$R_{DS(ON)}$	$V_{GS}=10V, I_D=12A$	-	25	30	m Ω
Forward Trans conductance	g_{FS}	$V_{DS}=5V, I_D=15A$	-	11	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=25V, V_{GS}=0V, f=1.0MHz$	-	2550	-	pF
Output Capacitance	C_{oss}		-	225	-	pF
Reverse Transfer Capacitance	C_{rss}		-	205	-	pF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=50V, I_D=20A, V_{GS}=10V, R_{GEN}=10\Omega$	-	29	-	nS
Turn-on Rise Time	t_r		-	13	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	58.2	-	nS
Turn-Off Fall Time	t_f		-	13.4	-	nS
Total Gate Charge	Q_g	$V_{DS}=80V, I_D=20A, V_{GS}=10V$	-	55	-	nC
Gate-Source Charge	Q_{gs}		-	15	-	nC
Gate-Drain Charge	Q_{gd}		-	20	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=20A$	-	-	1.2	V
Reverse Recovery Time	T_{rr}	$T_j=25^\circ\text{C}, I_F=10A, di/dt=100A/\mu S$ ^(note3)	-	58	-	nS
Reverse Recovery Charge	Q_{rr}		-	110	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. E_{AS} condition : $T_j=25^\circ\text{C}, V_{DD}=50V, V_{GS}=10V, L=0.5mH, R_g=25\Omega$
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production.

Characteristics Curves

Figure 1 Output Characteristics

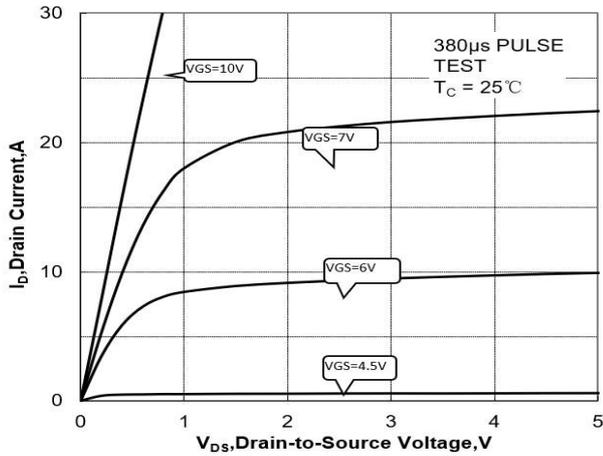


Figure 2 Transfer Characteristics

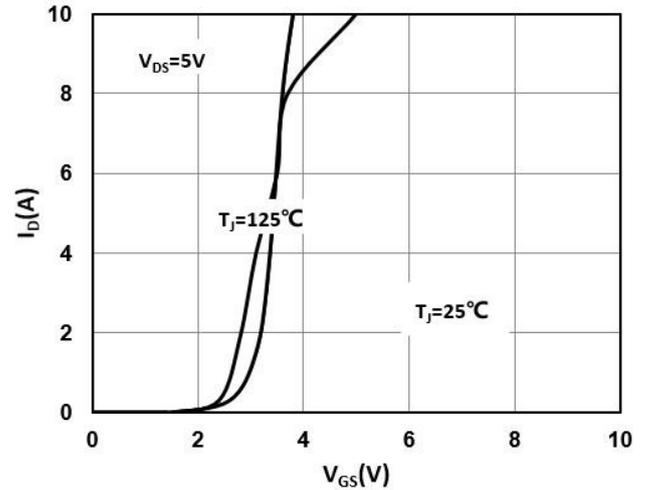


Figure 3 On-Resistance vs. ID and VGS

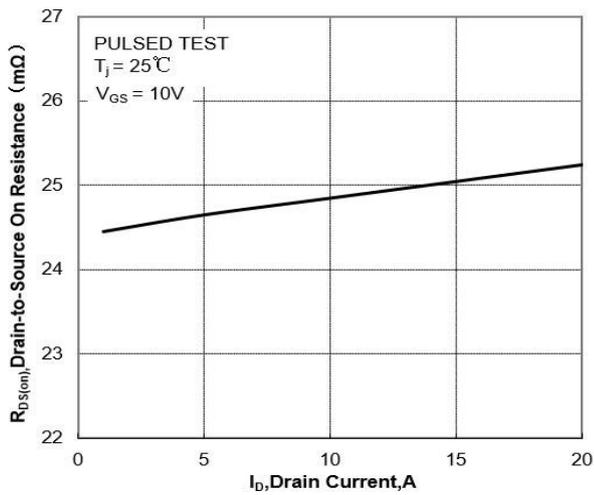


Figure 4 On-Resistance vs. Junction Temperature

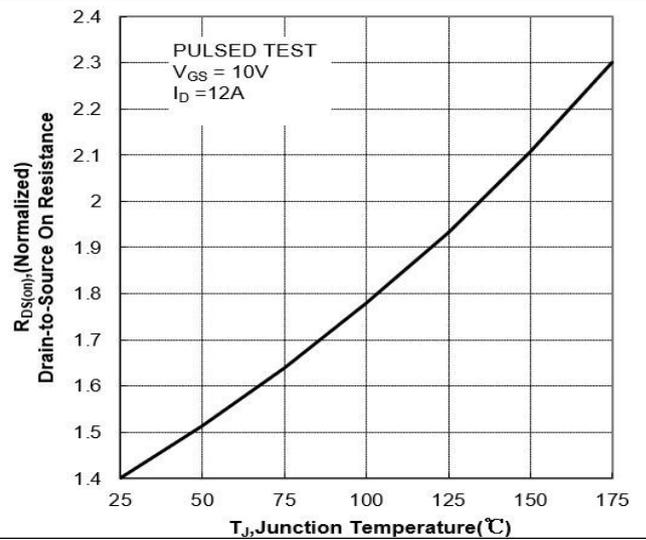


Figure 5 On-Resistance vs. VGS

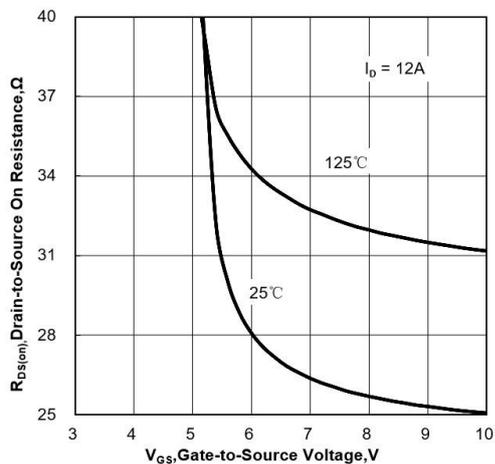


Figure 6 Body Diode Forward Voltage

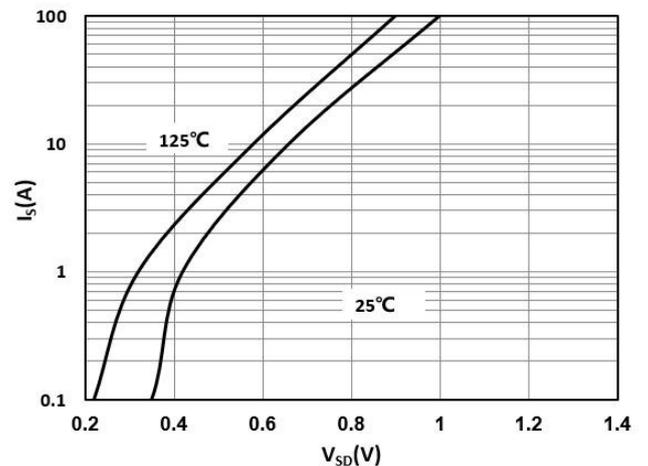


Figure 7 Gate-Charge Characteristics

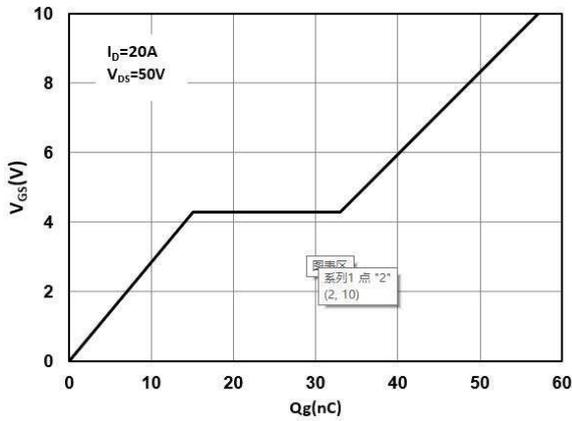


Figure 8 Capacitance Characteristics

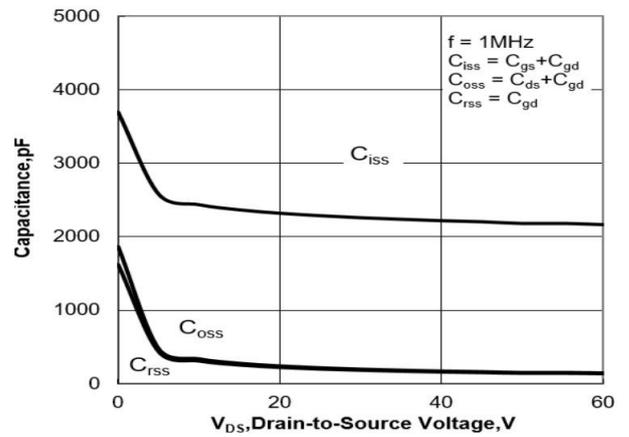


Figure 9 Maximum Forward Biased Safe Operation Area

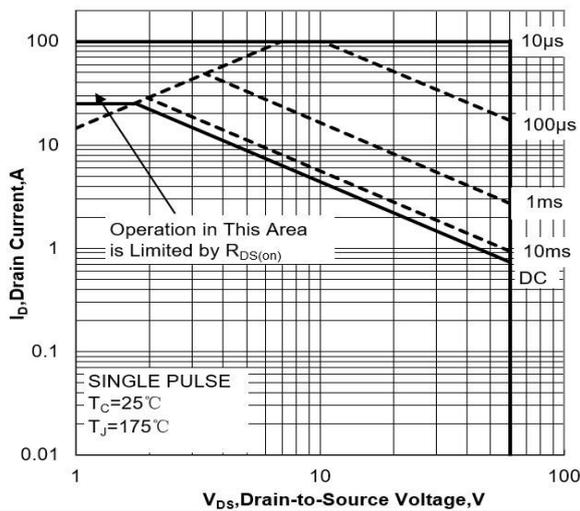


Figure 10 Single Pulse Power Rating Junction-to-Ambient

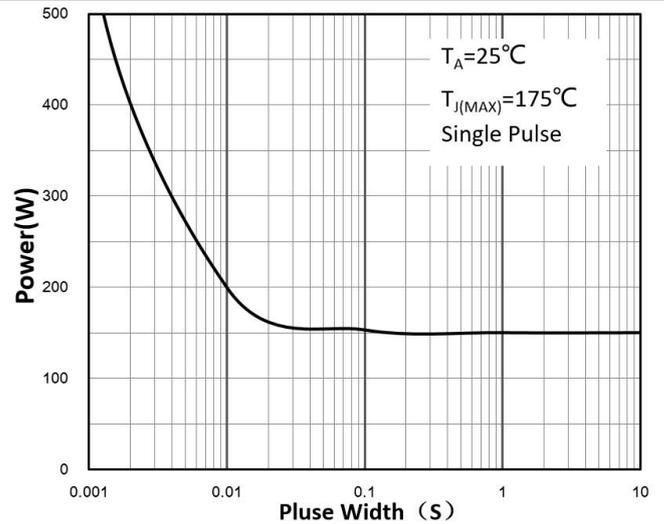
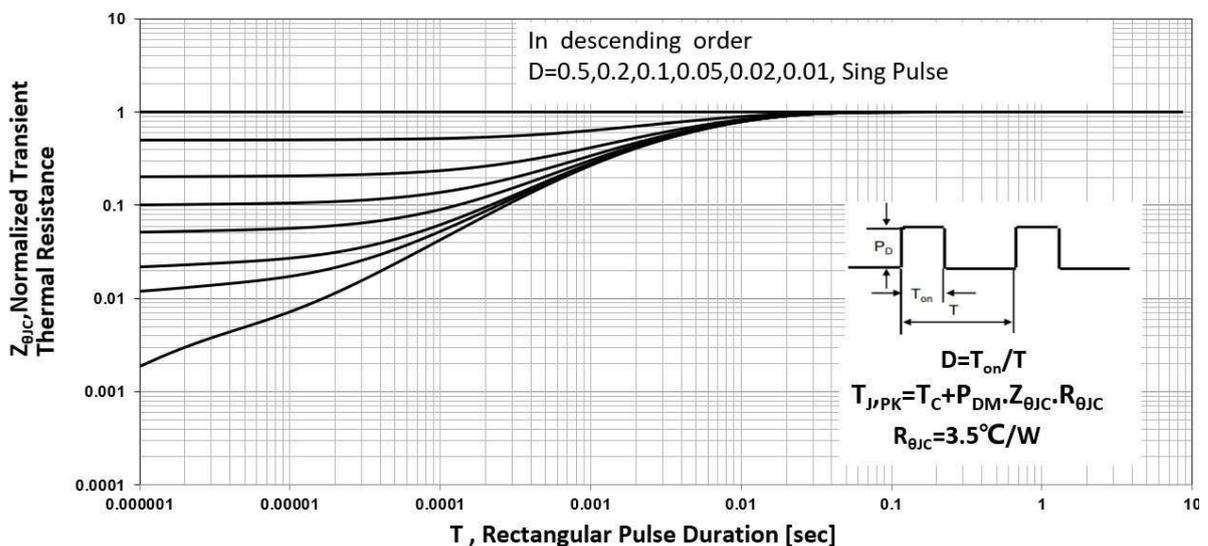
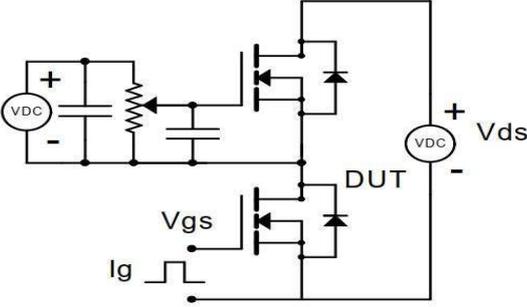
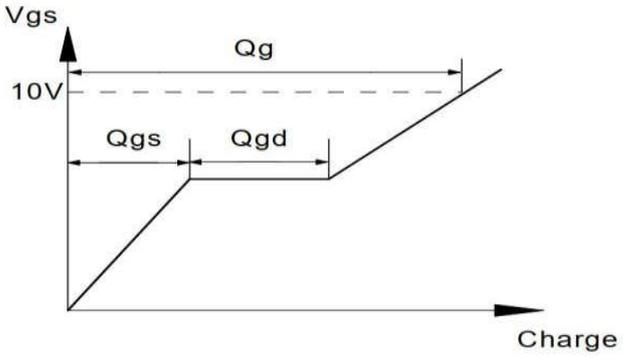
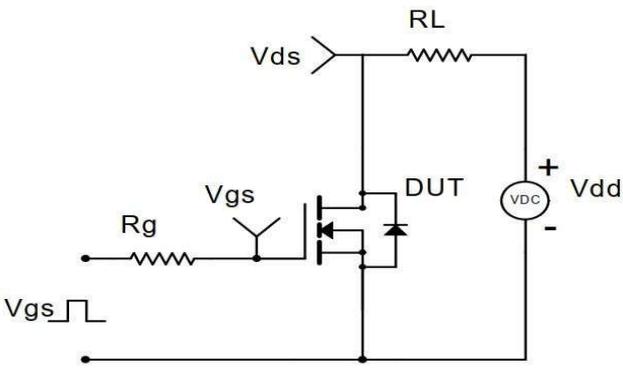
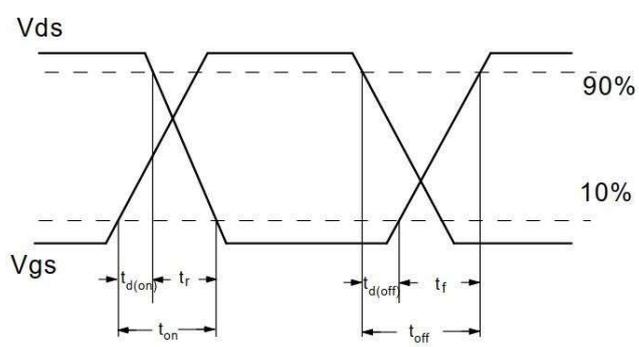
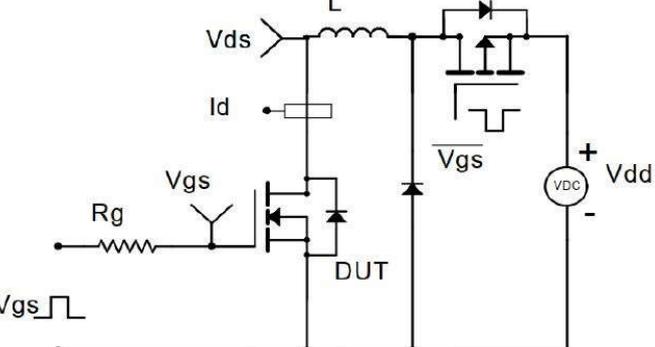
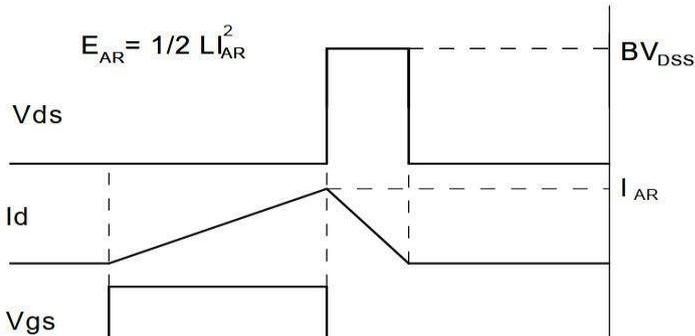
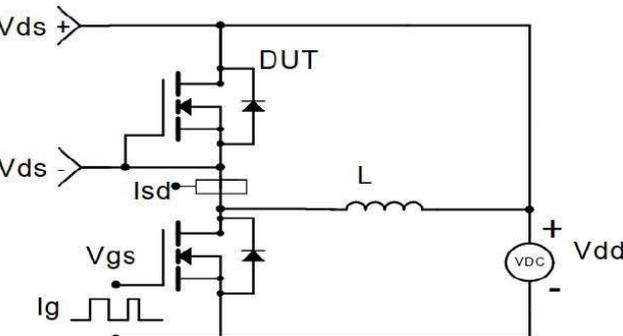
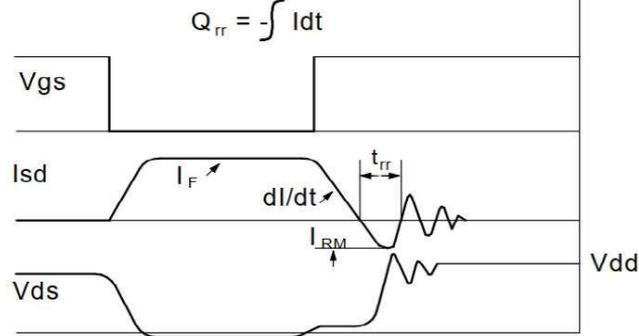


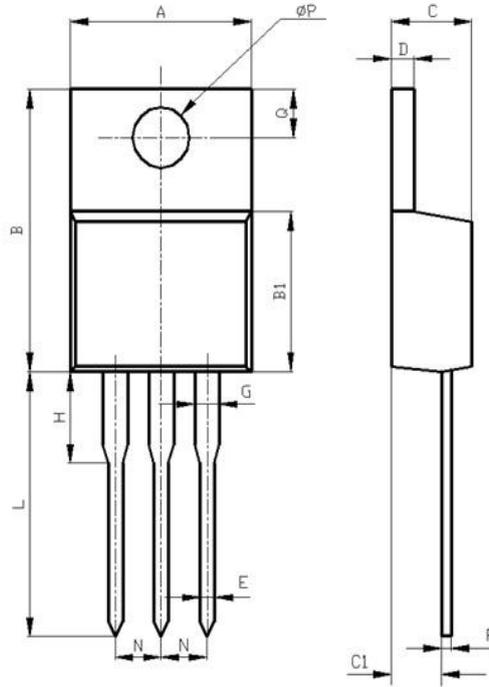
Figure 11 Normalized Maximum Transient Thermal Impedance



Test Circuit and Waveform

Gate Charge Test Circuit	Gate Charge Test Waveform
 <p>The diagram shows a MOSFET (DUT) with its gate connected to a pulse generator (Vgs) through a resistor (Rg). The drain is connected to a load resistor (RL) and a DC source (Vds). The gate current (Ig) is also indicated.</p>	 <p>The graph plots Vgs against Charge. It shows a linear ramp up to 10V, a flat plateau, and a linear ramp down. The total area under the curve is labeled Qg. The area under the rising ramp is Qgs, and the area under the falling ramp is Qgd.</p>
Resistive Switching Test Circuit	Resistive Switching Test Waveforms
 <p>The diagram shows a MOSFET (DUT) with its gate connected to a pulse generator (Vgs) through a resistor (Rg). The drain is connected to a load resistor (RL) and a DC source (Vdd). The drain-source voltage (Vds) is measured across the load resistor.</p>	 <p>The graph shows Vds and Vgs waveforms. Vgs is a square wave. Vds is a trapezoidal wave. Key timing parameters are labeled: t_{d(on)}, t_{tr}, t_{on}, t_{d(off)}, t_f, and t_{off}. The 90% and 10% voltage levels are also indicated.</p>
Unclamped Inductive Switching (UIS) Test Circuit	Unclamped Inductive Switching (UIS) Test Waveforms
 <p>The diagram shows a MOSFET (DUT) with its gate connected to a pulse generator (Vgs) through a resistor (Rg). The drain is connected to an inductor (L) and a diode. The drain-source voltage (Vds) and drain current (Id) are measured.</p>	 <p>The graph shows Vds, Id, and Vgs waveforms. Vgs is a square wave. Id is a triangular wave. Vds is a trapezoidal wave. The energy stored in the inductor is given by the equation: $E_{AR} = 1/2 L I_{AR}^2$. The peak drain-source voltage is labeled BV_{DSS} and the peak drain current is I_{AR}.</p>
Diode Recovery Test Circuit	Diode Recovery Test Waveforms
 <p>The diagram shows a MOSFET (DUT) with its gate connected to a pulse generator (Vgs) through a resistor (Rg). The drain is connected to a diode and an inductor (L). The drain-source voltage (Vds) and drain current (Isd) are measured.</p>	 <p>The graph shows Vgs, Isd, and Vds waveforms. Vgs is a square wave. Isd is a trapezoidal wave. Vds is a trapezoidal wave. The reverse recovery time (t_{rr}) is indicated. The equation for reverse recovery charge is given as: $Q_{rr} = \int Idt$. Other parameters shown include I_F, dI/dt, and I_{RM}.</p>

Package Description



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
ϕp	3.50	3.90

TO-220 Package



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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