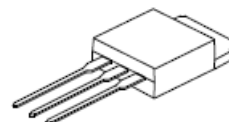


500V/8A Power MOSFET (N-Channel)

General Description

- MSU8N50Q is a N-Channel enhancement mode power MOSFET with advanced technology. It is designed to have Better characteristics, such as fast switching time, low gate charge, minimized on-state resistance and withstanding high energy pulse in the avalanche and commutation modes. These devices are well suited for high efficiency switching mode power supply applications.



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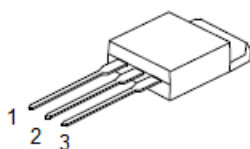


HALOGEN
FREE

Features

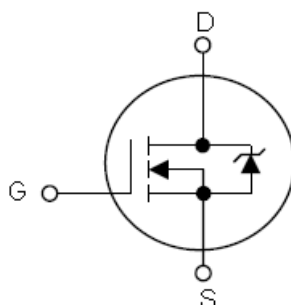
- $R_{DS(ON)} = 0.85\Omega @ V_{GS} = 10V$
- Single Pulse Avalanche Energy Rated
- Rugged - SOA is Power Dissipation Limited
- Fast switching capability
- Linear Transfer Characteristics
- High Input Impedance
- RoHS Compliance and Halogen free

Pin Configuration and Symbol



1: GATE 2: DRAIN 3: SOURCE

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500V/8A POWER MOSFET (N-Channel)

MSU8N50Q

Absolute Maximum Ratings *(T_C=25°C unless otherwise specified, Note)*

Symbol	Description	Ratings	Unit
V_{DSS}	Drain-Source Voltage (T _J =25°C ~125°C)	500	V
V_{DGR}	Drain to Gate Voltage (R _{GS} = 20KΩ, T _J =25°C ~125°C)	500	V
V_{GSS}	Gate-Source Voltage	± 30	V
I_D	Drain Current -Continuous	8.0	A
I_{DM}	Drain Current -Pulsed	32	A
E_{AS}	Single Pulsed Avalanche Energy	510	mJ
P_D	Power Dissipation	134	W
R_{θJA}	Thermal Resistance (Junction-to-Ambient)	62.5	°C/W
R_{θJC}	Thermal Resistance (Junction-to-Case)	0.93	°C/W
T_{OPR}	Operating Temperature	-55 to +150	°C
T_{STG}	Storage Temperature Range	-55 to +150	°C

Note: Absolute maximum ratings indicate limits beyond which damage to the device may occur.
For guarantee specification and test conditions, see the Electrical Characteristics.
The guaranteed specification apply only for the test conditions listed.

500V/8A POWER MOSFET (N-Channel)

MSU8N50Q

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

Symbol	Description		Min.	Typ.	Max.	Unit	Conditions
OFF CHARACTERISTICS							
V(BR)DSS	Drain-Source Breakdown Voltage		500	-	-	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-Source leakage Current		-	-	25	μA	$V_{DS}=\text{Rated } BV_{DSS}, V_{GS}=0V$
			-	-	250	μA	$V_{DS}=0.8 \times \text{Rated } BV_{DSS}, V_{GS}=0V, T_J=125^\circ\text{C}$
I_{GSS}	Gate-Source leakage Current	Forward	-	-	100	nA	$V_{GS}=30V$
		Reverse	-	-	-100	nA	$V_{GS}=-30V$
ON CHARACTERISTICS							
V_{GS(th)}	Gate-Source Threshold Voltage		2.0	-	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
I_{D(ON)}	On-State Drain Current (Note 1)		8.0	-	-	A	$V_{DS}>I_{D(ON)} \times R_{DS(ON)MAX}, V_{GS}=10V$
R_{DS(ON)}	Static Drain-Source On-State Resistance (Note 1)		-	0.8	0.85	Ω	$V_{GS}=10V, I_D=4.4A$
DYNAMIC CHARACTERISTICS							
C_{iss}	Input Capacitance		-	1225	-	pF	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{MHz}$
C_{oss}	Output Capacitance		-	200	-	pF	
C_{rss}	Reverse Transfer Capacitance		-	85	-	pF	
SWITCHING CHARACTERISTICS							
t_{d(on)}	Turn-on Delay Time		-	15	21	nS	$V_{DD}=250V, I_D \approx 8A, R_G=9.1\Omega, R_L=30\Omega$ (Note 2)
t_r	Turn-on Rise Time		-	21	35	nS	
t_{d(off)}	Turn-off Delay Time		-	50	74	nS	
t_f	Turn-off Fall Time		-	20	30	nS	
Q_g	Total Gate Charge		-	42	63	nC	$V_{DS}=0.8 \times \text{Rated } BV_{DSS}, I_D=8A, V_{GS}=10V, I_{G(REF)}=1.5\text{mA}$ (Note 3)
Q_{gs}	Gate-Source Charge		-	7	-	nC	
Q_{gd}	Gate-Drain Charge		-	22	-	nC	
INTERNAL PACKAGE INDUCTANCE							
L_b	Drain Inductance - From the contact screw on tab to center of die		-	3.5	-	nH	(Note 4)
	Drain Inductance - From the drain lead(6mm from package) to center of die		-	4.5	-	nH	
L_s	Source Inductance - Measured from the source lead(6mm from header) to source bond pad		-	7.5	-	nH	

500V/8A POWER MOSFET (N-Channel)

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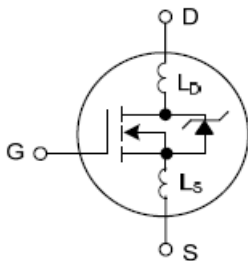
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
V_{SD}	Drain-Source Diode Forward Voltage (Note1)	-	-	2	V	T _J = 25°C, V _{GS} = 0V, I _{SD} = 8A
I_{SD}	Maximum Continuous Drain-Source Diode Forward Current	-	-	8	A	(Note 5)
I_{SDM}	Maximum Pulse Drain-Source Diode Forward Current	-	-	32	A	(Note 5)
t_{rr}	Reverse Recovery Time	210	475	970	nS	T _J = 25°C, I _{SD} = 8A dI _{SD} /dt = 100A/us
Q_{rr}	Reverse Recovery Charge	2.0	4.6	8.2	uC	

Note 1: Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%

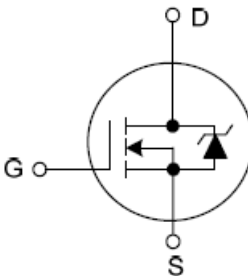
2: MOSFET Switching Times are Essentially Independent of Operating Temperature

3: Gate Charge is Essentially Independent of Operating Temperature

4: Modified MOSFET symbol showing the internal devices inductances as below.



5: Modified MOSFET symbol showing the integral reverse P-N junction diode as below



500V/8A POWER MOSFET (N-Channel)

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Typical Characteristics Curves

Fig.1-Normalized Power Dissipation vs. Case Temperature

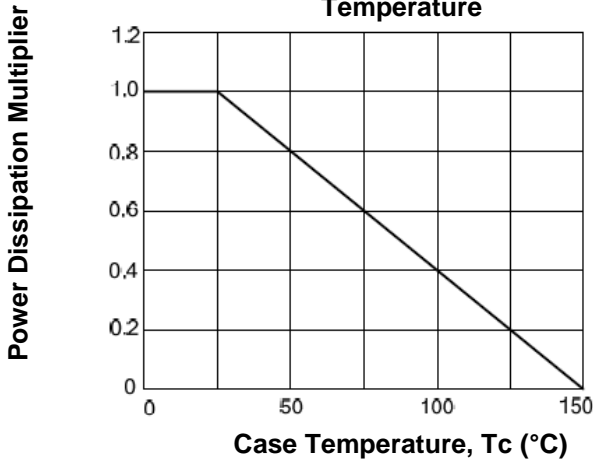


Fig.2-Maximum Continuous Drain Current vs. Case Temperature

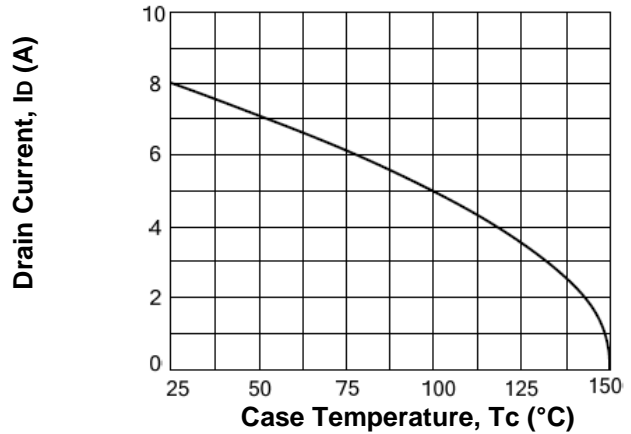


Fig.3-Normalized Maximum Transient Thermal Impedance

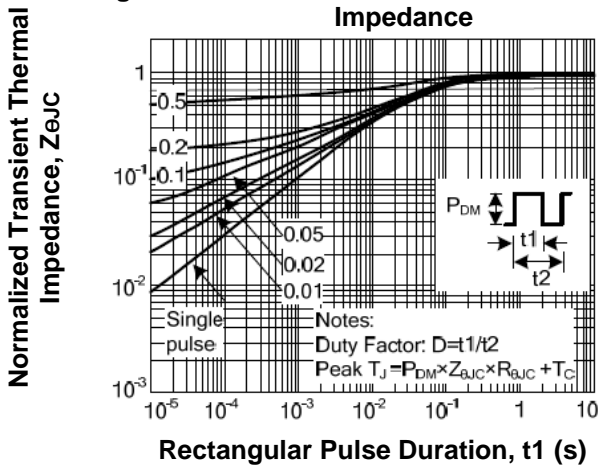


Fig.4-Forward Bias Safe Operating Area

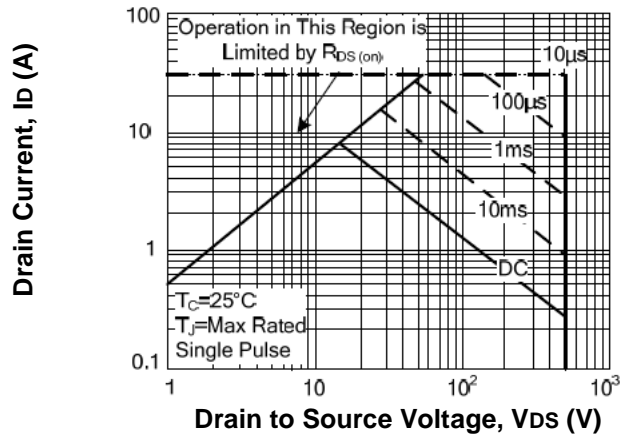


Fig.5-Output Characteristics

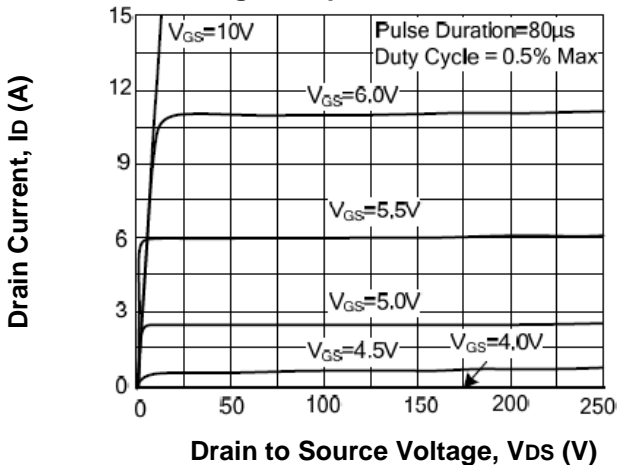
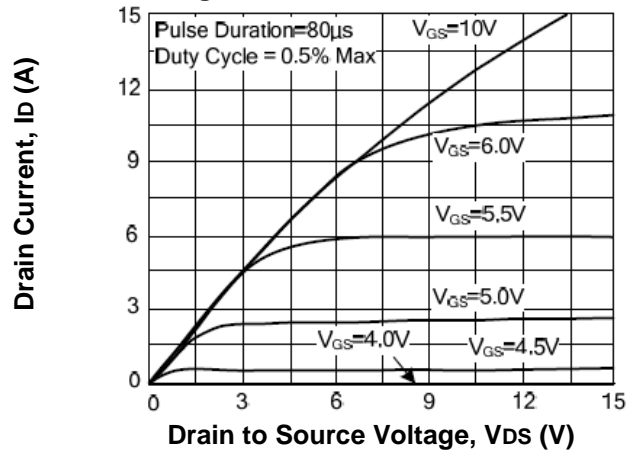


Fig.6-Saturation Characteristics



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Fig.7-Transfer Characteristics

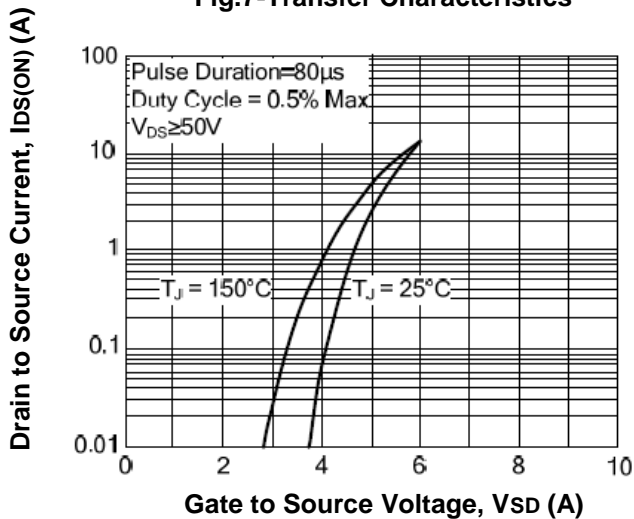


Fig.8- Drain to Source on Resistance vs. Voltage and Drain Current

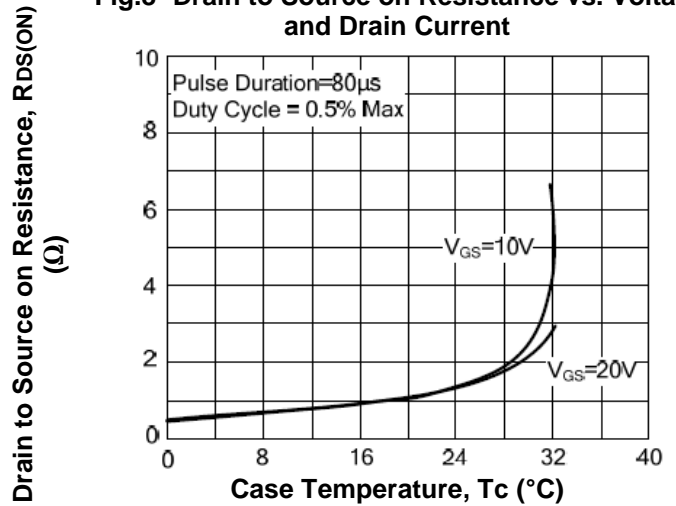


Fig.9-Normalized Drain to Source on Resistance vs. Junction Temperature

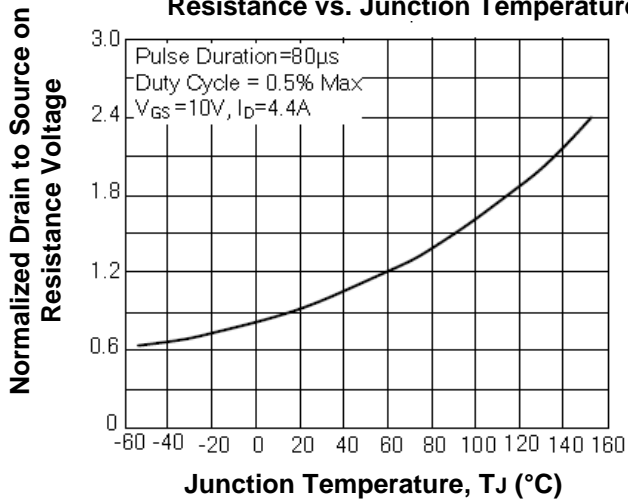


Fig.10- Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

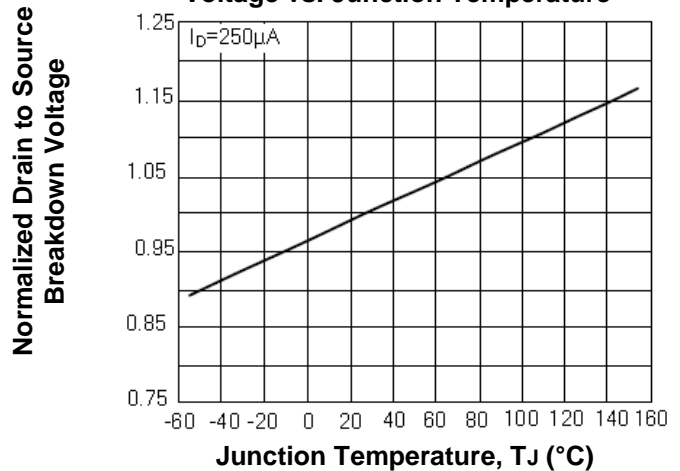


Fig.11-Capacitance vs. Drain to Source Voltage

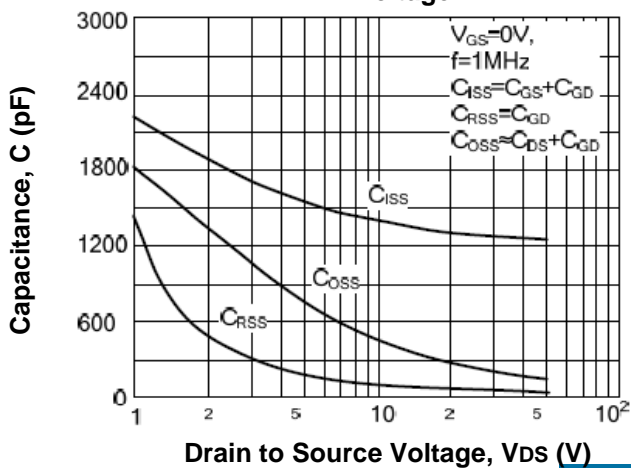
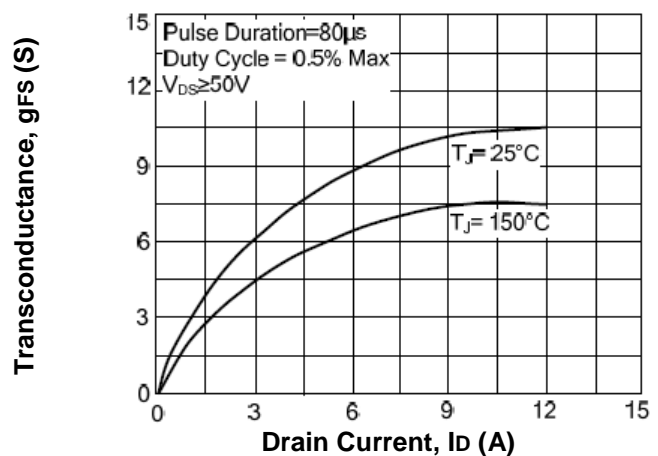


Fig.12- Transconductance vs. Drain Current



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Fig.13- Source to Drain Diode Voltage

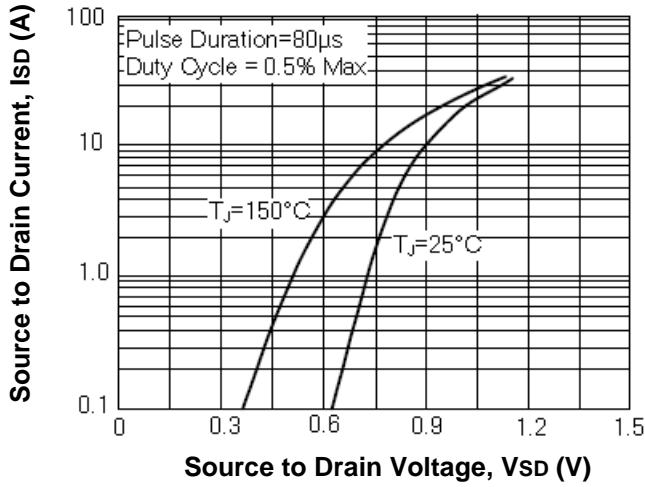
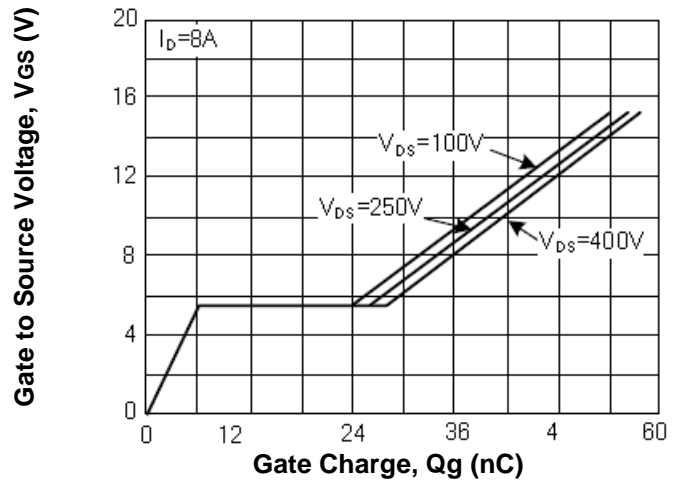


Fig.14- Gate to Source Voltage vs. Gate Charge



TEST CIRCUIT AND WAVEFORMS

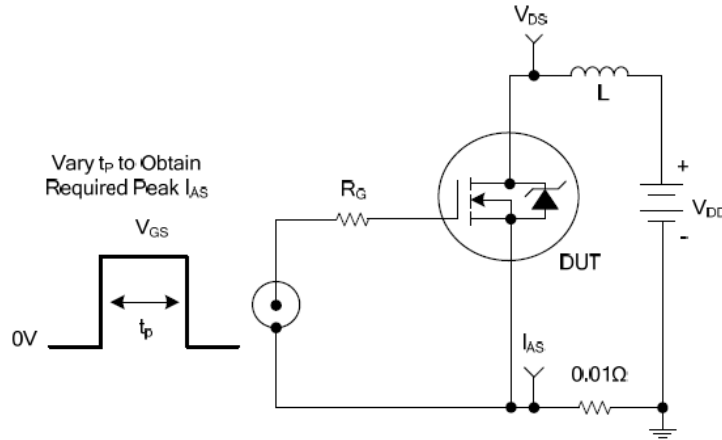


Fig.15- Unclamped Energy Test Circuit

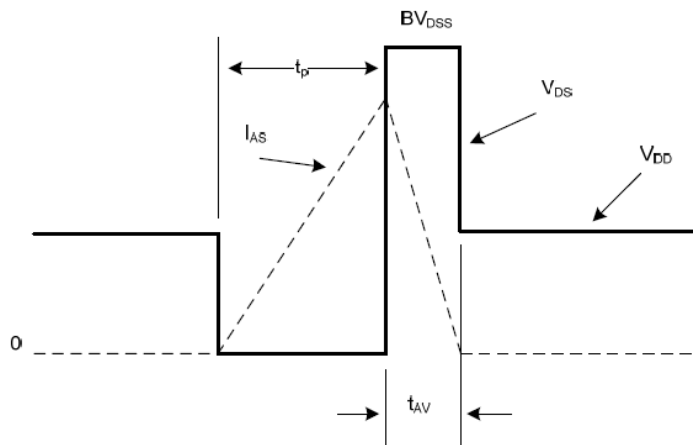


Fig.16- Unclamped Energy Waveforms

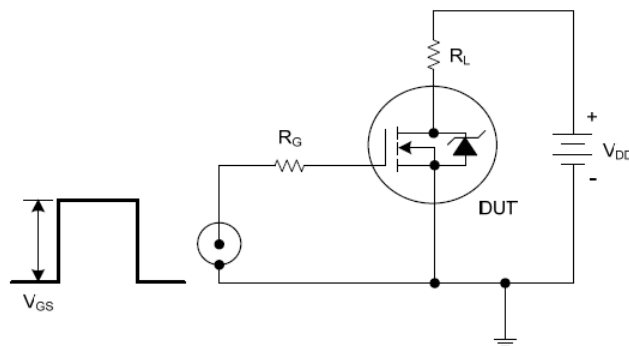


Fig.17- Switching Test Circuit

TEST CIRCUIT AND WAVEFORMS (Cont.)

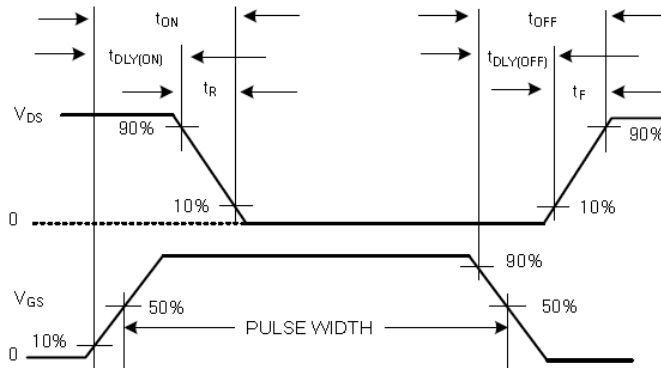


Fig.18- Resistive Switching Waveforms

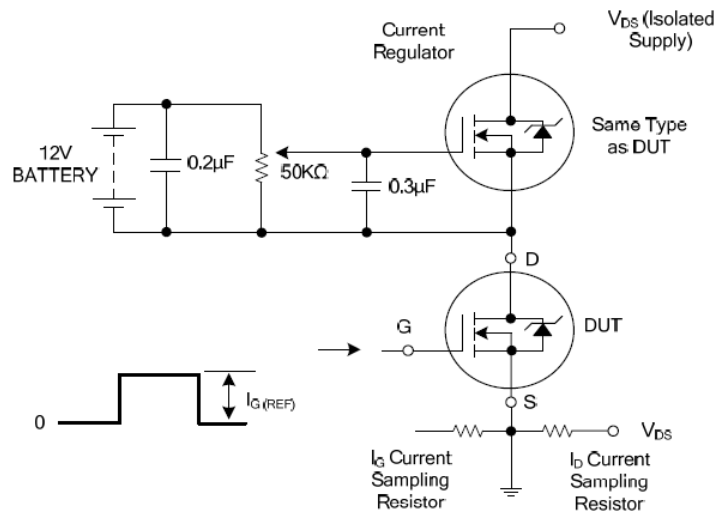


Fig.19- Gate Charge Test Circuit

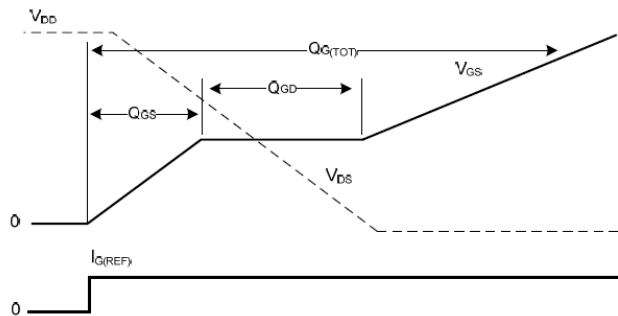


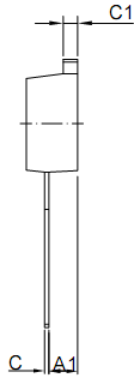
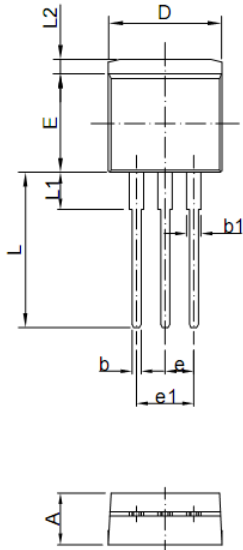
Fig.20- Gate Charge Waveforms

500V/8A POWER MOSFET (N-Channel)

MSU8N50Q

Dimensions in mm (inch)

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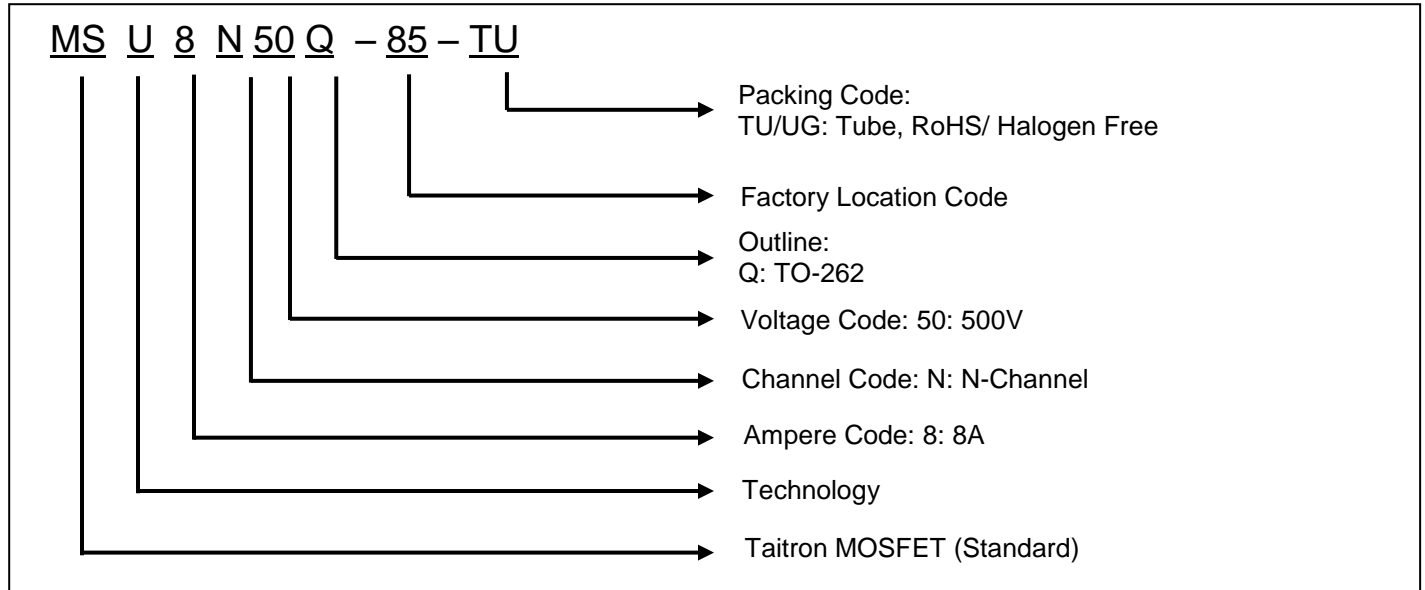


Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	4.06	4.83	0.160	0.190
A1	2.040	2.95	0.080	0.116
b	0.50	1.00	0.020	0.039
b1	1.14	1.78	0.045	0.070
C	0.33	0.74	0.013	0.029
C1	1.14	1.65	0.045	0.065
D	9.65	10.67	0.380	0.420
E	8.38	9.65	0.330	0.380
e	254 TYP		0.100 TYP	
L	12.90	13.98	0.508	0.550
L1	3.10	3.85	0.122	0.152
L2	1.17	1.68	0.046	0.066

500V/8A POWER MOSFET (N-Channel)

MSU8N50Q

Ordering Information



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