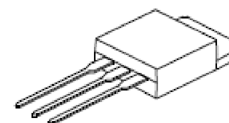
500V/4.5A MOSFET (N-Channel)

General Description

- The N-Channel enhancement mode silicon gate power MOSFET is designed for high voltage, high speed power switching applications such as switching regulators, switching converters, solenoid, motor drivers, relay drivers.



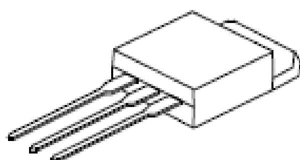
TO-262

HALOGEN FREE

Features

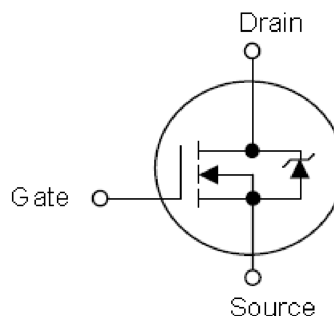
- $R_{DS(ON)}$ ≤1.5Ω@V_{GS}=10V
- Single Pulse Avalanche Energy Rated
- Rugged- SOA is Power Dissipation Limited
- Fast switching capability
- Linear Transfer Characteristics
- High Input Impedance
- RoHS Compliance and Halogen free

Pin Configuration and Symbol



1: GATE 2: DRAIN 3: SOURCE

TO-262



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

Symbol	Description	Ratings	Unit
V_{DSS}	Drain-Source Voltage (TJ=25°C ~125°C)	500	V
V_{DGR}	Drain to Gate Voltage (R_{GS}=20kΩ, TJ=25°C ~125°C)	500	V
V_{GSS}	Gate-Source Voltage	± 30	V
I_D	Drain Current Continuous	4.5	A
I_{DM}	Drain Current Pulsed	18	A
E_{AS}	Avalanche Energy (note2)	300	mJ
P_D	Power Dissipation	73	W
$R_{\theta JA}$	Thermal Resistance (Junction-to-Ambient)	62.5	°C/ W
$R_{\theta JC}$	Thermal Resistance (Junction-to-Case)	1.71	°C/ W
T_J, T_{STG}	Junction Temperature & Storage Temperature Range	-55 to +150	°C

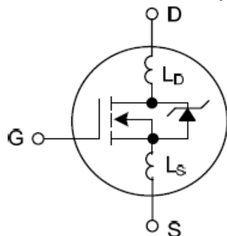
Note 1: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2: V_{DD}=50V, starting T_J =25°C, L=25mH, R_G=25Ω, peak I_{AS}=4.5A.

Electrical Characteristics *(T_C=25ºC unless otherwise specified)*

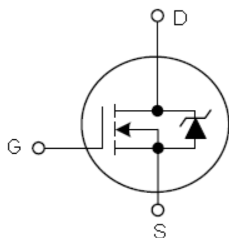
Symbol	Description		Min.	Typ.	Max.	Unit	Conditions
OFF CHARACTERISTICS							
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage		500	-	-	V	V_{GS}=0V, I_D=250μA
I_{DSS}	Drain-Source leakage Current		-	-	25	μA	V_{DS}= Rated BV_{DSS}, V_{GS}=0V
			-	-	250	μA	V_{DS}= 0.8xRated BV_{DSS}, V_{GS}=0V Tj=125°C
I_{GSS}	Gate-Source leakage Current	Forward	-	-	100	nA	V_{GS}=30V, V_{DS}=0V
		Reverse	-	-	-100	nA	V_{GS}=-30V, V_{DS}=0V
ON CHARACTERISTICS							
$V_{GS(th)}$	Gate-Source Threshold Voltage		2.0	-	4.0	V	V_{DS}=V_{GS}, I_D=250μA
$I_{D(ON)}$	On-State Drain Current (Note 3)		4.5	-	-	A	V_{DS}>$I_{D(ON)}$×$R_{DS(ON)MAX}$, V_{GS} =10V
$R_{DS(ON)}$	Static Drain-Source On-State Resistance (Note 4)		-	1.3	1.5	Ω	V_{GS}=10V, I_D=2.5A
g_{fs}	Forward Transconductance (Note 3)		2.5	4.2	-	S	V_{DS}≥10V, I_D=2.7A
DYNAMIC CHARACTERISTICS							
C_{iss}	Input Capacitance		-	600	-	pF	V_{DS}=25V, V_{GS}=0V, f=1.0MHz
C_{oss}	Output Capacitance		-	100	-	pF	
C_{rss}	Reverse Transfer Capacitance		-	20	-	pF	
SWITCHING CHARACTERISTICS							
t_d(on)	Turn-on Delay Time (Note 4)		-	10	17	nS	V_{DD} =250V, R_L=54Ω, I_D≈4.5A, R_{GS}=12Ω
t_r	Turn-on Rise Time (Note 4)		-	15	23	nS	
t_d(off)	Turn-off Delay Time (Note 4)		-	33	53	nS	
t_f	Turn-off Fall Time (Note 4)		-	16	23	nS	
Qg	Total Gate Charge (Note 5)		-	22	32	nC	V_{DS} =0.8$V_{(BR)DSS}$, I_D=4.5A, V_{GS} =10V, $I_{G(REF)}$=1.5mA
Qgs	Gate-Source Charge (Note 5)		-	3.5	-	nC	
Qgd	Gate-Drain Charge (Note 5)		-	11	-	nC	
INTERNAL PACKAGE INDUCTANCE (Note 6)							
L_D	Internal Drain Inductance - contact screw on tab to center of die)		-	3.5	-	nH	-
	Internal Drain Inductance - drain lead(6mm from package) to center of die		-	4.5	-	nH	-

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
Ls	Internal Source Inductance - source lead(6mm from header) to source bond pad	-	7.5	-	nH	-
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
V_{SD}	Drain-Source Diode Forward Voltage (Note 3)	-	-	1.6	V	T_J=25°C, I_{SD}=4.5A, V_{GS} =0V
I_{SD}	Continuous Source to Drain Current (Note 7)	-	-	5.5	A	-
I_{SDM}	Pulse Source to Drain Current (Note 7)	-	-	18	A	-
trr	Reverse Recovery Time	180	350	760	ns	T_J=25°C, I_{SD}=4.5A, dI/dt=100A/μs
Qrr	Reverse Recovery Charge	0.96	2.2	4.3	μC	

Note 3: Pulse test: Pulse width ≤300us, Duty cycle≤2%
4: MOSFET Switching Times are Essentially Independent of Operating Temperature
5: Gate Charge is Essentially Independent of Operating Temperature
6: Modified MOSFET symbol showing the internal devices inductances as below



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



Typical Characteristics Curves

Fig.1- Normalized Power Dissipation vs. Case Temperature

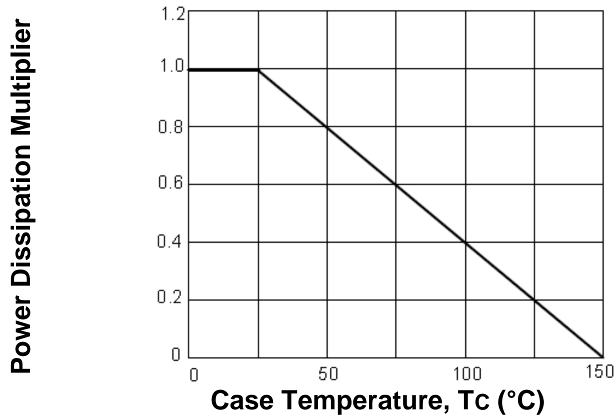


Fig.2- Maximum Contionuous Drain Current vs. Case Temperature

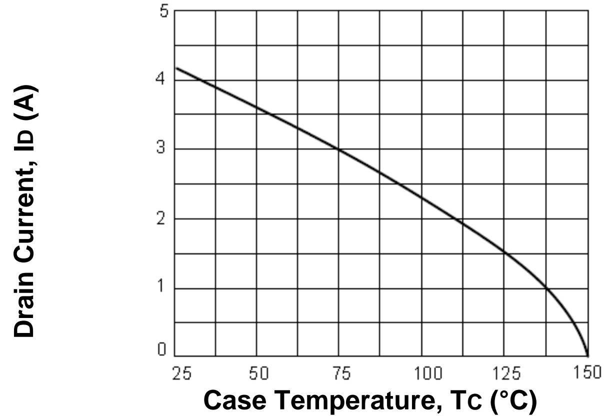


Fig.3- Normalized Maximum Transient Thermal Impedance

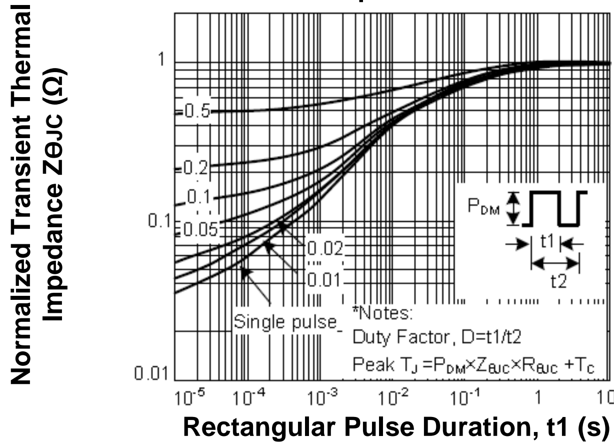


Fig.4- Forward Bias Safe Operating Area

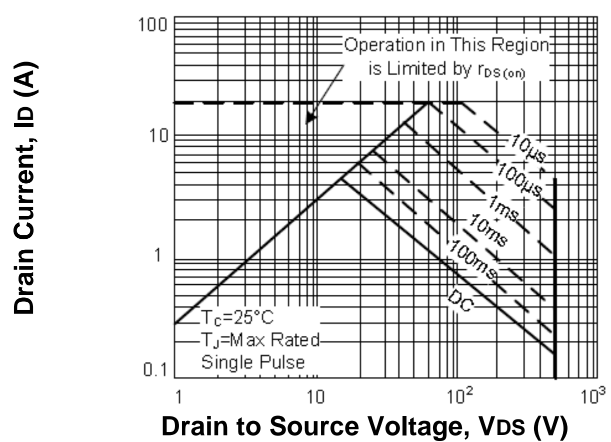


Fig.5- Output Characteristics

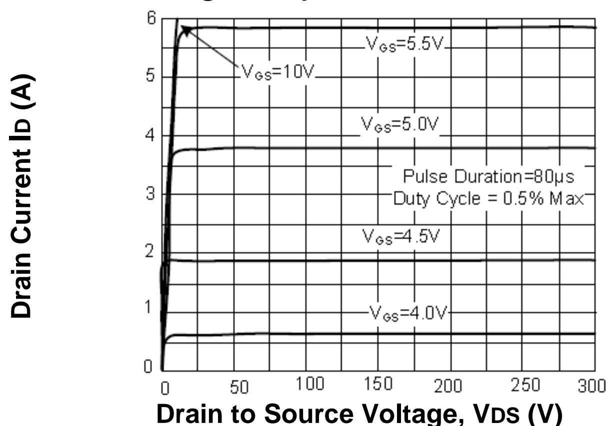
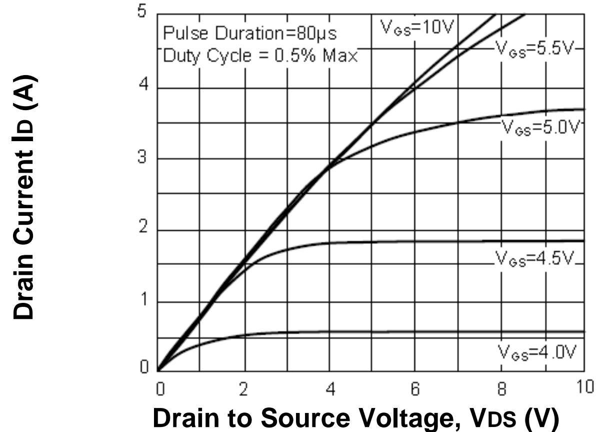


Fig.6- Saturation Characteristics



Typical Characteristics Curves (Cont.)

Fig.7- Transfer Characteristics

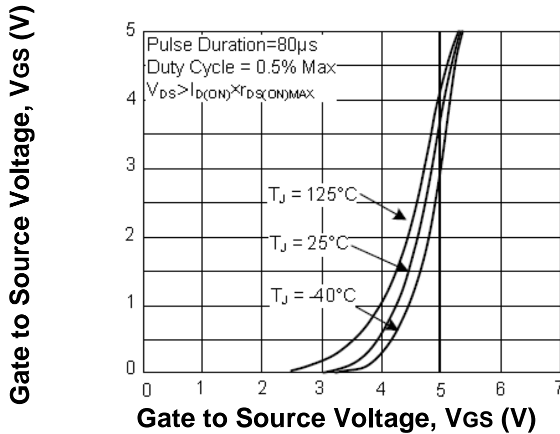


Fig.8- Drain to Source on Resistance vs. Gate Voltage and Drain Current

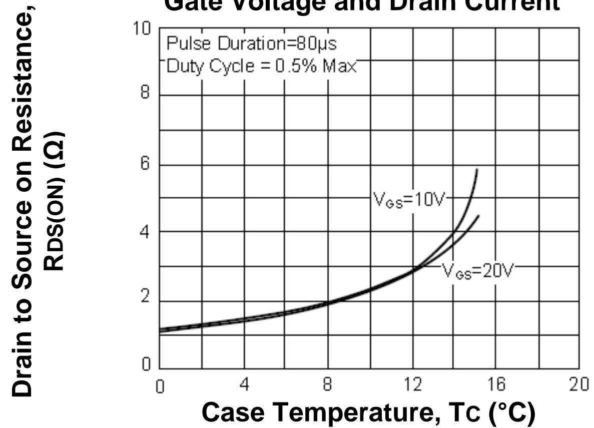


Fig.9- Normalized Drain to Source on Resistance vs. Junction Temperature

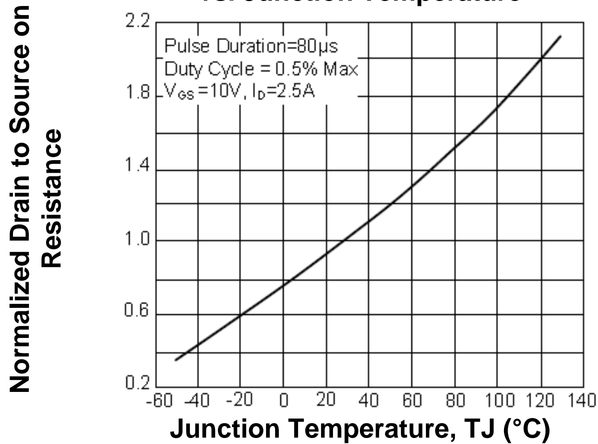


Fig.10- Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

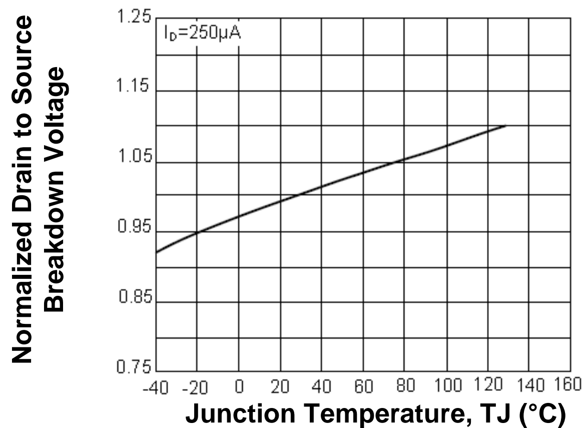


Fig.11- Capacitance vs. Drain to Source Voltage

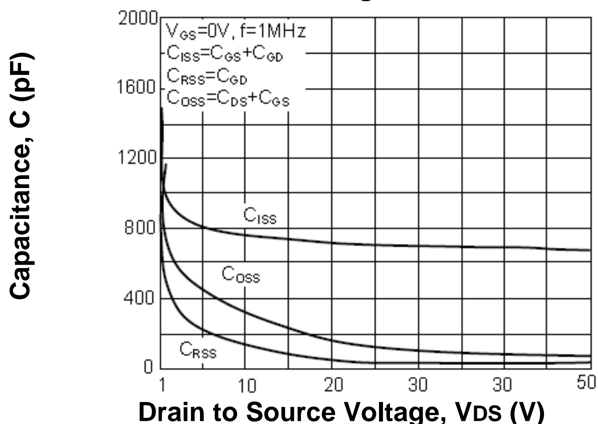


Fig.12- Transconductance vs. Drain Current

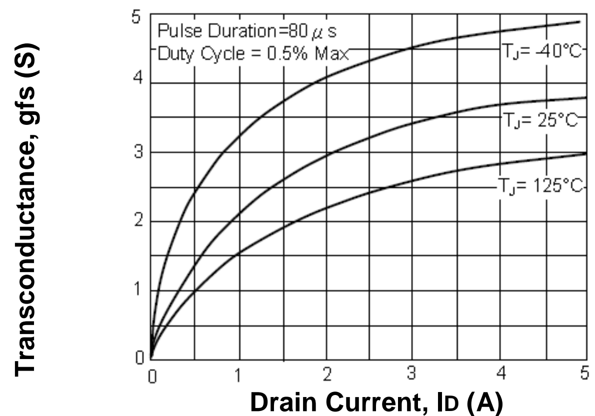


Fig.13- Source to Drain Diode Voltage

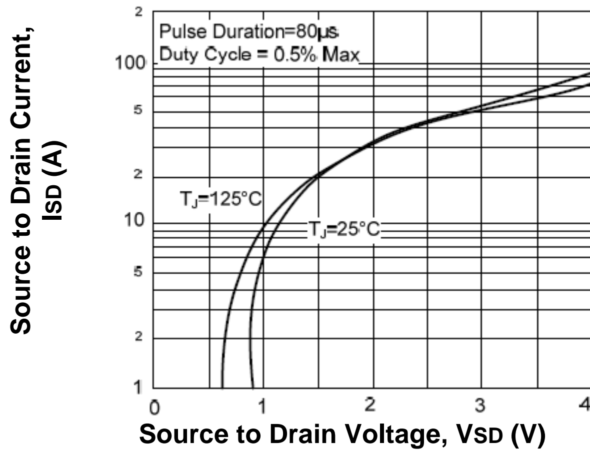
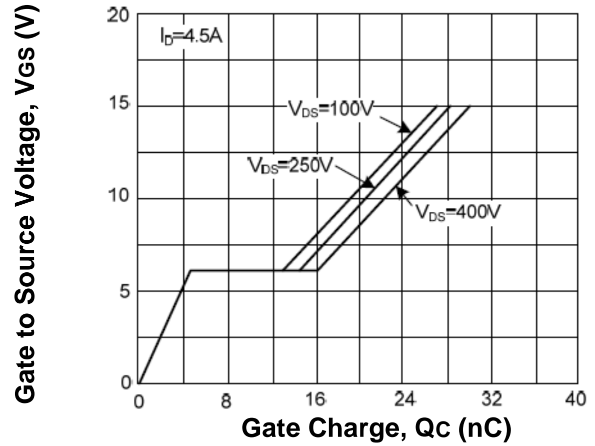


Fig.14- Gate to Source Voltage vs. Gate Charge



TEST CIRCUIT AND WAVEFORMS

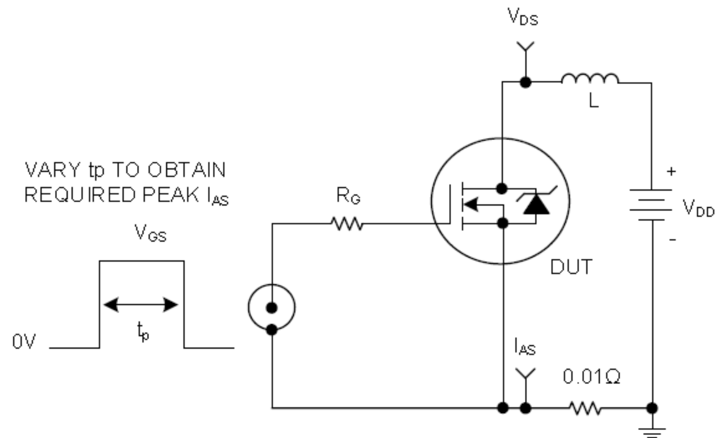


Fig.15-Unclamped energy test circuit

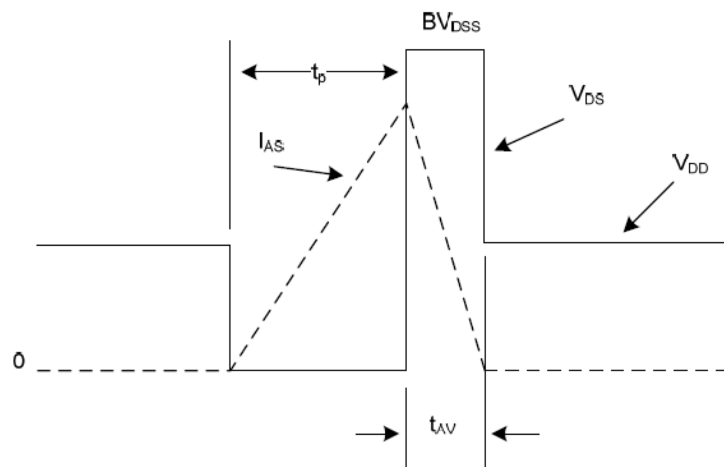


Fig.16-Unclamped energy waveforms

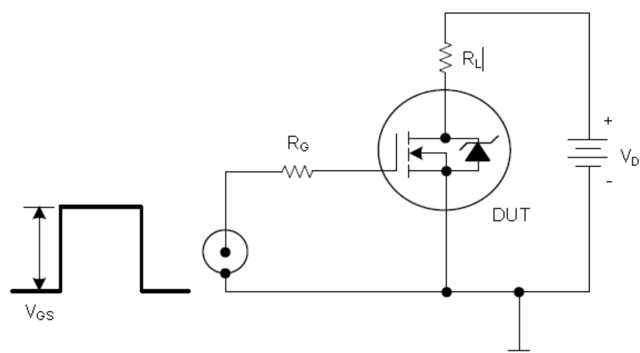


Fig.17-Switch time test circuit

TEST CIRCUIT AND WAVEFORMS (Cont.)

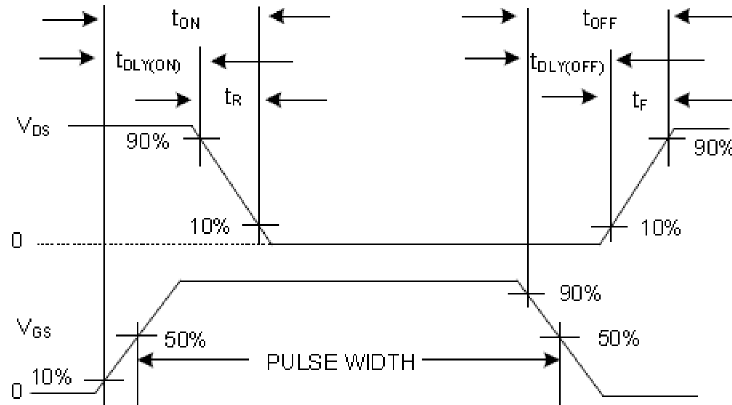


Fig.18-Resistive Switch Waveforms

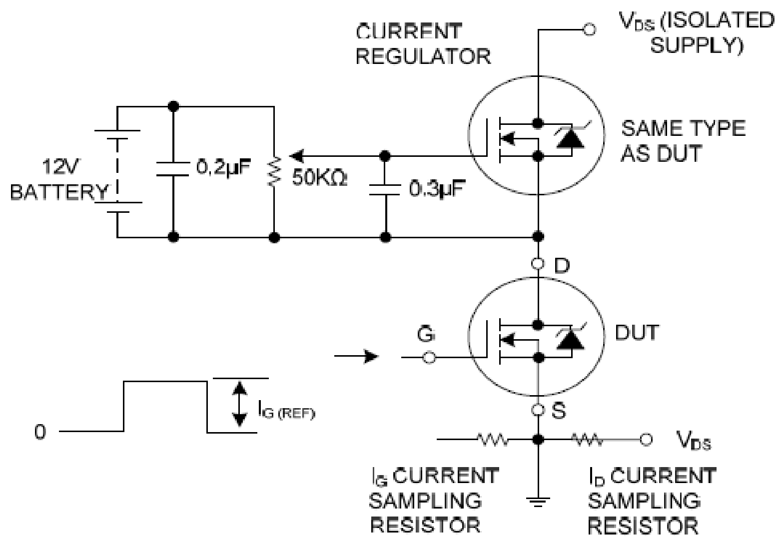


Fig.19-Gate charge test circuit

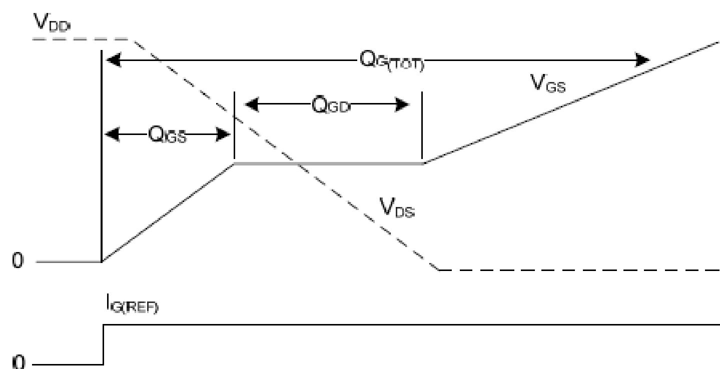
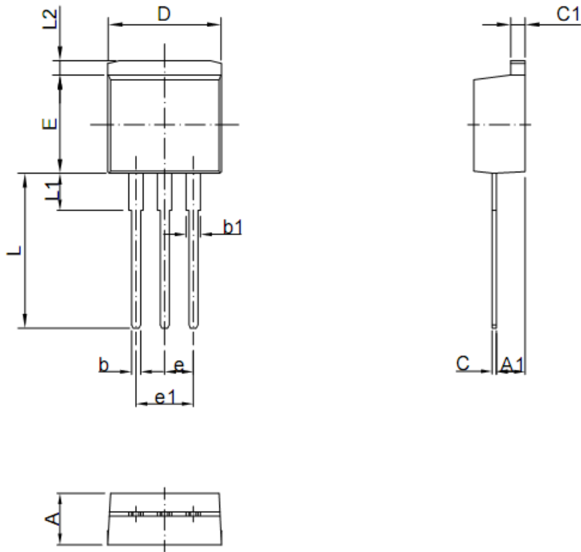


Fig.20-Gate charge waveforms

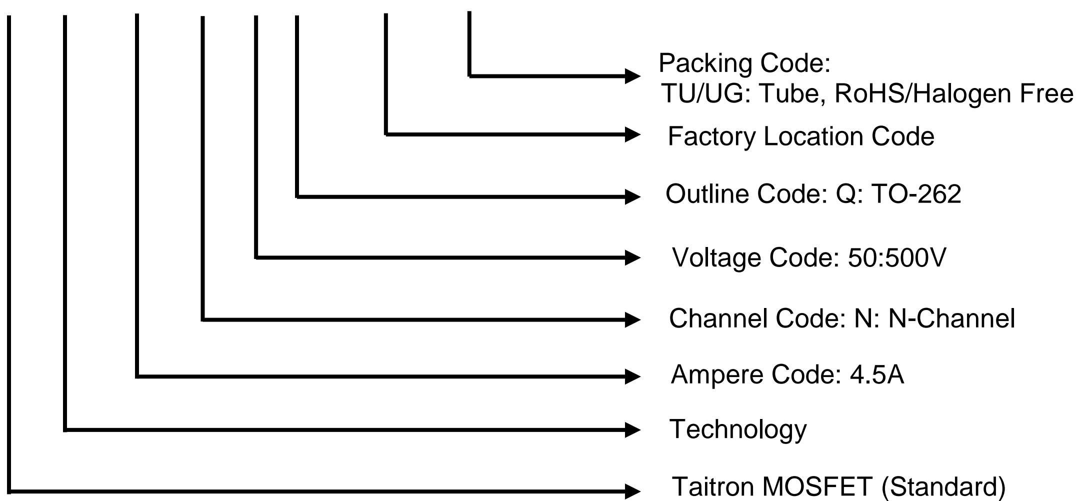
Dimensions in mm



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	2.54 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

TO-262

Ordering Information



How to contact us

US HEADQUARTERS
28040 WEST HARRISON PARKWAY, VALENCIA, CA 91355-4162
Tel: (800)-TAITRON (800)-824-8766 (661)-257-6060
Fax: (800)-TAITFAX (800)-824-8329 (661)-257-6415
Email: taitron@taitroncomponents.com
Http://www.taitroncomponents.com

TAITRON COMPONENTS MEXICO, S.A .DE C.V.
BOULEVARD CENTRAL 5000 INTERIOR 5 PARQUE INDUSTRIAL ATITALAQUIA, HIDALGO
C.P. 42970 MEXICO
Tel: +52-55-5560-1519
Fax: +52-55-5560-2190

TAITRON COMPONENTS INCORPORATED TAIWAN, TAIPEI
6F., No.190, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 23146, Taiwan R.O.C.
Tel: 886-2-2913-6238
Fax: 886-2-2913-6239

TAITRON COMPONENT TECHNOLOGY, SHANGHAI CORPORATION
METROBANK PLAZA,1160 WEST YAN'AN ROAD, SUITE 1503, SHANGHAI,200052, CHINA
Tel: +86-21-5424-9942
Fax: +86-21-2302-5027