

Main Product Characteristics

I_D	4A
V_{DSS}	650V
$P_D(T_C=25^\circ C)$	75W
$R_{DS(ON)Typ}$	2.3Ω

Features

- Fast switching.
- ESD improved capability.
- Low gate charge. (Typical Data:13nC)
- Low reverse transfer capacitances. (Typical:2.2pF)
- 100% single pulse avalanche energy test.

Application

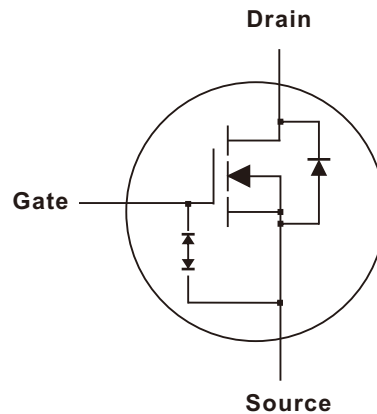
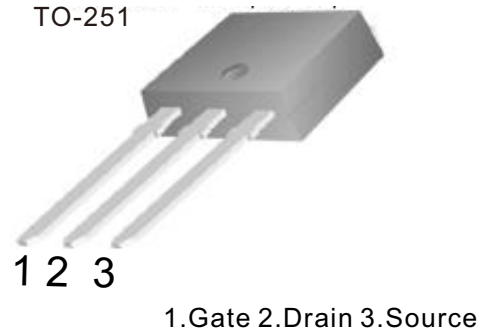
- Power switch circuit of adaptor and charger.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : JEDEC TO-251 molded plastic body over passivated chip
- Lead : Axial leads, solderable per MIL-STD-202, Method 208 guranteed.

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

Outline



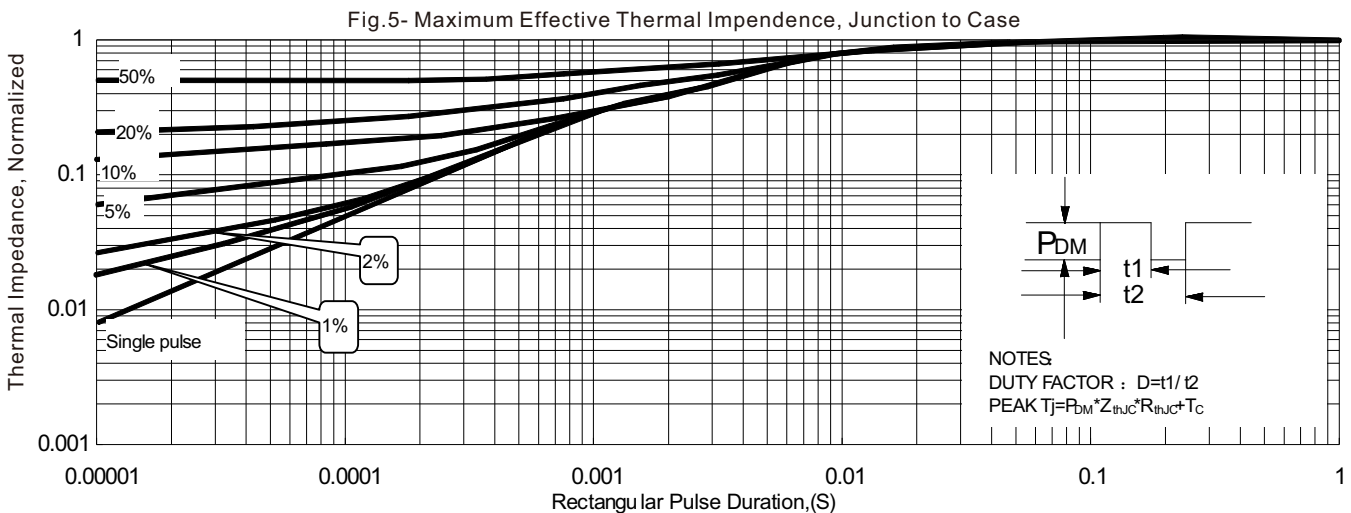
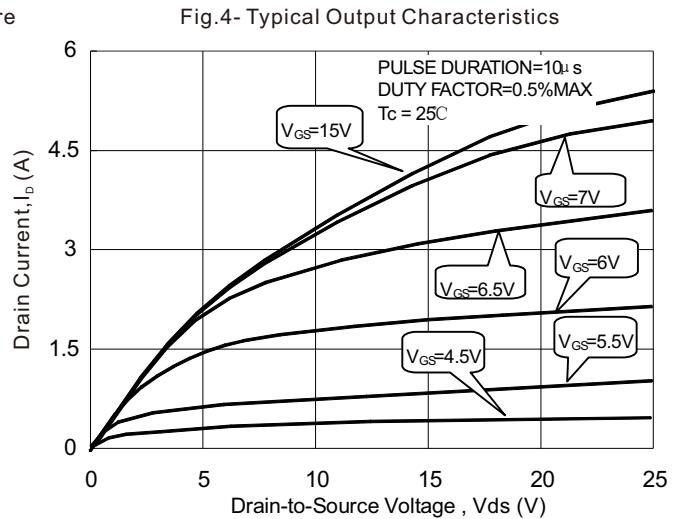
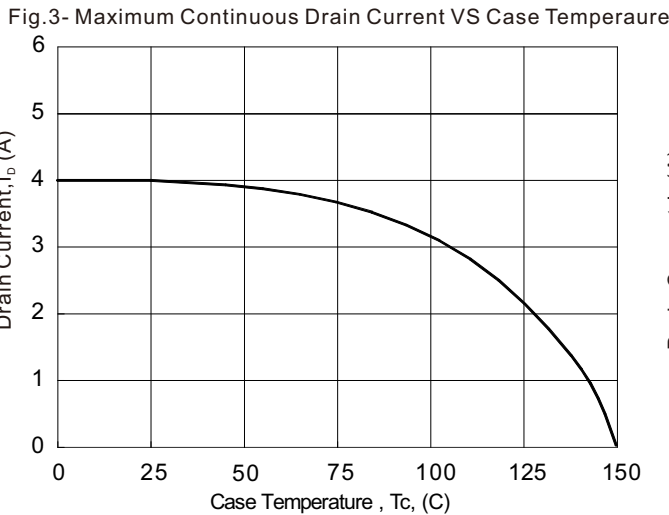
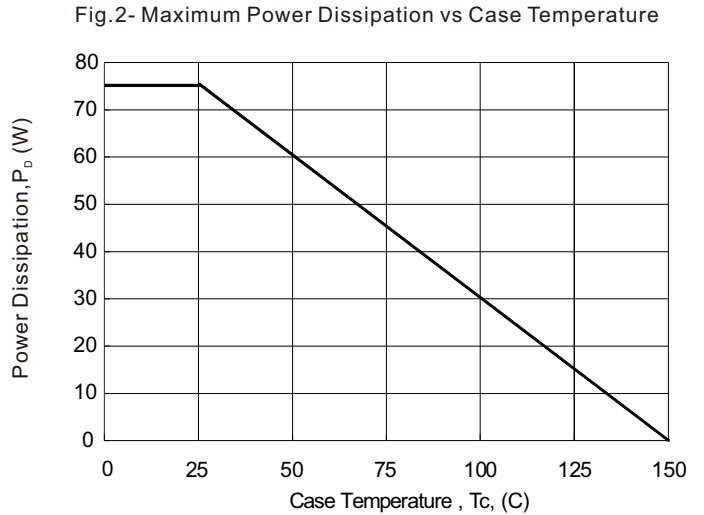
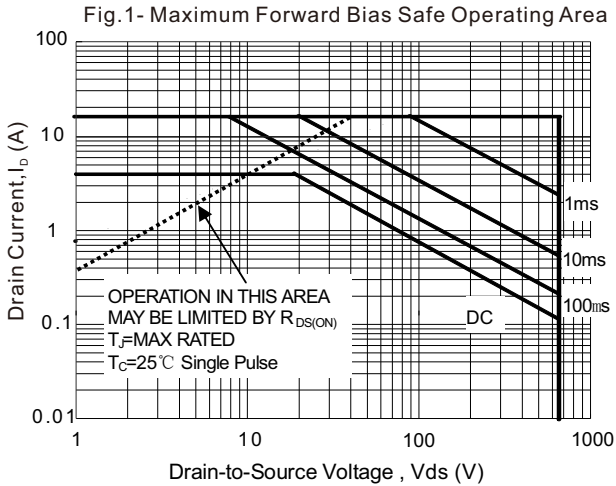
Inner Equivalent principle Chart

PARAMETER	CONDITIONS	Symbol	MHU04N65	UNIT
Drain-Source Voltage		V_{DSS}	650	V
Continuous Drain Current		I_D	4	A
Continuous Drain Current	$T_C = 100^\circ C$		3.2	
Pulsed Drain Current(Note:1)			16	
Gate-Source Voltage		V_{GS}	±30	V
Single Pulse Avalanche Energy(Note:2)		E_{AS}	150	mJ
Avalanche Current(Note:1)		I_{AR}	2.5	A
Repetitive Avalanche Energy(Note:1)		E_{AR}	30	mJ
Power Dissipation	Power Dissipation	P_D	75	W
	Derating factor above 25°C		0.6	W/°C
Peak Diode Recovery dv/dt(Note:3)		dv/dt	5.0	V/ns
Gate source ESD	HBM-C = 100pF, R = 1.5kΩ	$V_{ESD(G-S)}$	3000	V
Operating Junction and Storage Temperature Range		T_J, T_{STG}	150, -55 ~ +150	°C
Maximum temperature for soldering		T_L	300	°C

NOTE : 1.Repetitive rating; pulse width limited by maximum junction temperature.
 2.L=10.0mH, $I_0 = 5.5A$, Start $T_J = 25^\circ C$.
 3. $I_{SD} = 4A$, $di/dt \leq 100A/us$, $V_{DD} \leq BV_{DS}$, Start $T_J = 25^\circ C$.

■ Electrical characteristics($T_c = 25^\circ\text{C}$ unless otherwise specified)						
■ OFF Characteristics						
PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu\text{A}$	V_{DSS}	650			V
Bvdss Temperature Coefficient	$I_D = 250\mu\text{A}$, Reference 25°C	$\Delta BV_{DSS} / \Delta T_j$		0.67		V/ $^\circ\text{C}$
Drain-Source Leakage Current	$V_{DS} = 650V, V_{GS} = 0V, T_a = 25^\circ\text{C}$	I_{DSS}			1	μA
	$V_{DS} = 520V, V_{GS} = 0V, T_a = 125^\circ\text{C}$				100	
Gate to Source Forward Leakage	$V_{GS} = +20V$	$I_{GSS(F)}$			10	
Gate to Source Reverse Leakage	$V_{GS} = -20V$	$I_{GSS(R)}$			-10	
■ ON Characteristics						
PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	$V_{GS(th)}$	2.0		4.0	V
Drain-to-Source On-Resistance	$V_{GS} = 10V, I_D = 2A$	$R_{DS(on)}$		2.3	2.8	Ω
Pulse Width $t_p \leq 300\mu\text{s}, \delta \leq 2\%$						
■ Dynamic Characteristics						
PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Forward Trans conductance	$V_{DS} = 15V, I_D = 2A$	g_{fs}		3.5		S
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V, f = 1.0\text{MHz}$	C_{iss}		560		pF
Output Capacitance		C_{oss}		50		
Reverse Transfer Capacitance		C_{rss}		2.2		
■ Resistive Switching Characteristics						
PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Turn-on Delay Time	$I_D = 4A, V_{DD} = 325V, R_G = 10\Omega$	$t_{d(ON)}$		14		ns
Rise Time		t_r		22		
Turn-off Delay Time		$t_{d(OFF)}$		29		
Fail Time		t_f		15		
Total Gate Charge	$I_D = 4A, V_{DD} = 520V, V_{GS} = 10V$	Q_g		13		nC
Gate-Source Charge		Q_{gs}		2.7		
Gate-Drain ("Miller") Charge		Q_{gd}		5.5		
■ Source-Drain Diode Characteristics						
PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	Boby Diode	I_S			4	A
Maximum Pulse Current	Boby Diode	I_{SM}			16	
Diode Forward Voltage	$I_S = 4.0A, V_{GS} = 0V$	V_{SD}			1.5	V
Reverse recovery time	$I_S = 4A, T_j = 25^\circ\text{C}, di_f/dt = 100A/\mu\text{s}, V_{GS} = 0V$	t_{rr}		250		ns
Reverse recovery charge		Q_{rr}			1200	
Pulse Width $t_p \leq 380\mu\text{s}, \delta \leq 2\%$						
■ Thermal characteristics						
PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Thermal Resistance	Junction to Case	$R_{\theta JC}$		1.67		$^\circ\text{C/W}$
	Junction to Ambient	$R_{\theta JA}$		62.5		
■ Gate-source Zener Diode						
PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Gate-Source Breakdown Voltage	$I_{GS} = \pm 1\text{mA}(\text{open Drain})$	V_{GSO}	30			V

Rating and characteristic curves



Rating and characteristic curves

Fig.6- Maximum Peak Current Capability

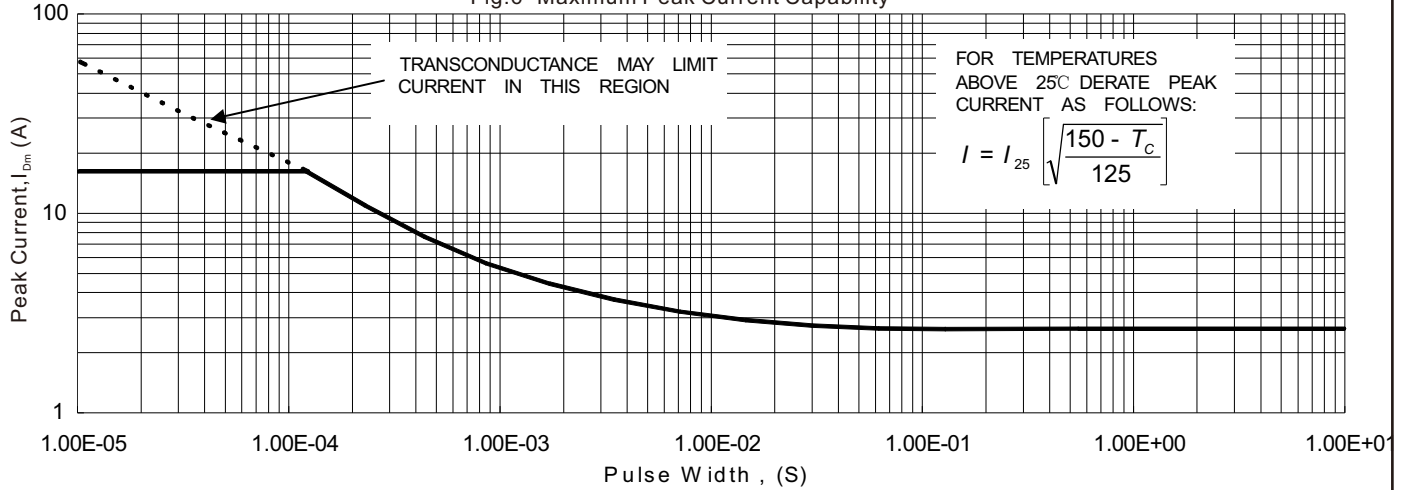


Fig.7- Typical Transfer Characteristics

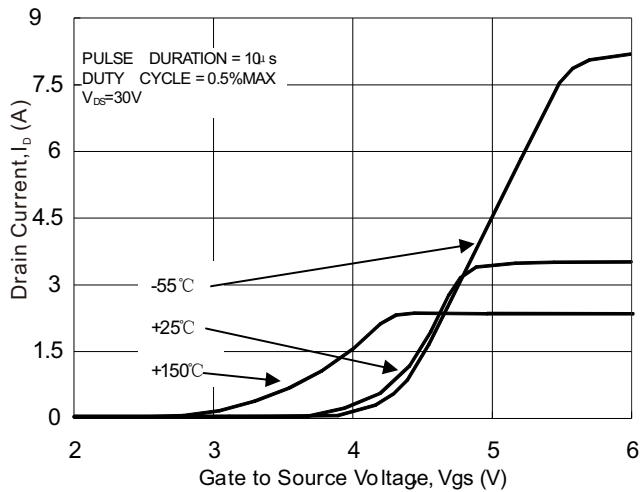


Fig.8- Typical Drain to Source ON Resistance vs Gate Voltage and Drain Current

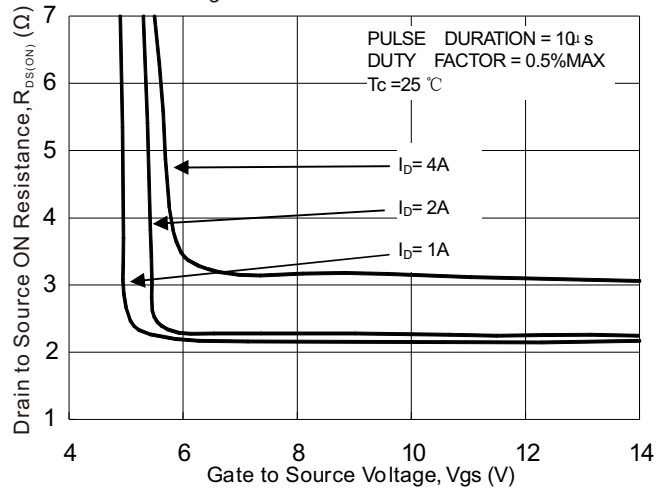


Fig.9- Typical Drain to Source ON resistance vs Drain Current

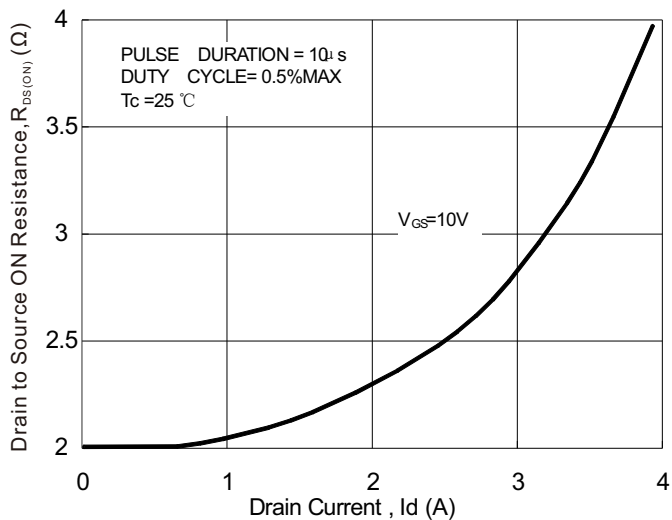
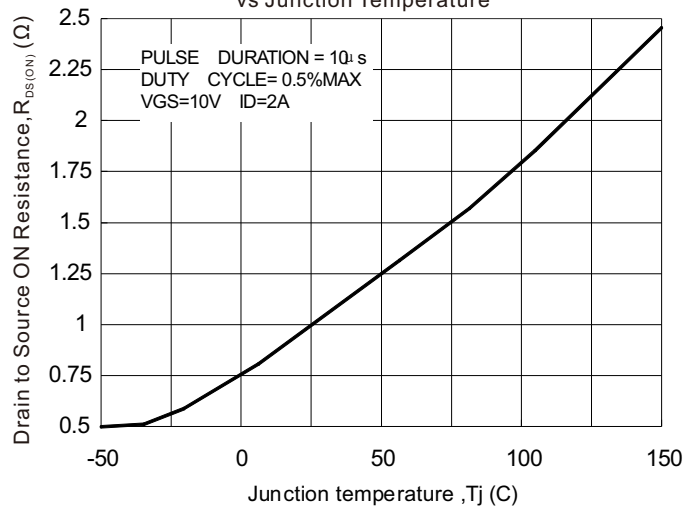


Fig.10- Typical Drain to Source ON resistance vs Junction Temperature



Rating and characteristic curves

Fig. 11- Typical Threshold Voltage vs Junction Temperature

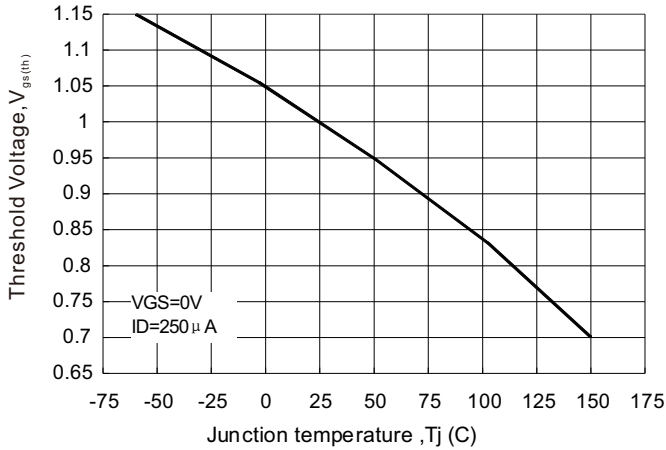


Fig. 12- Typical Breakdown Voltage vs Junction Temperature

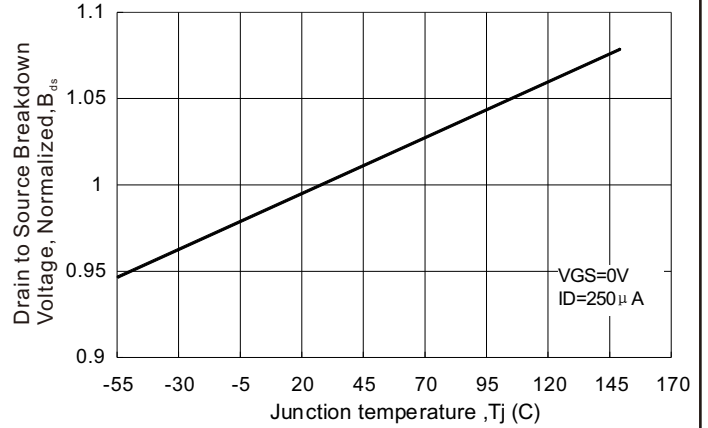


Fig. 13- Typical Capacitance vs Drain to Source Voltage

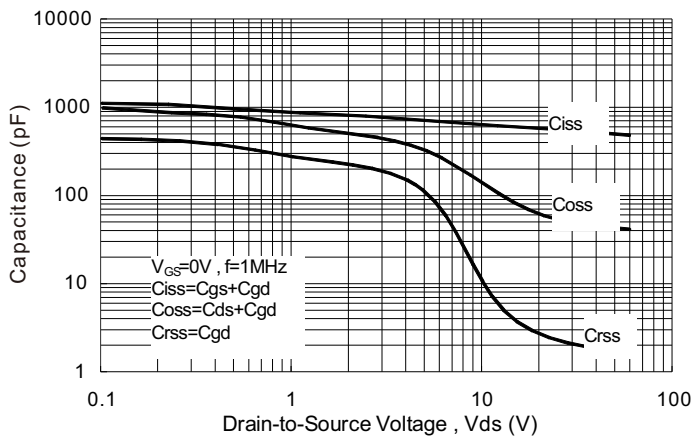


Fig. 14- Typical Gate Charge vs Gate to Source Voltage

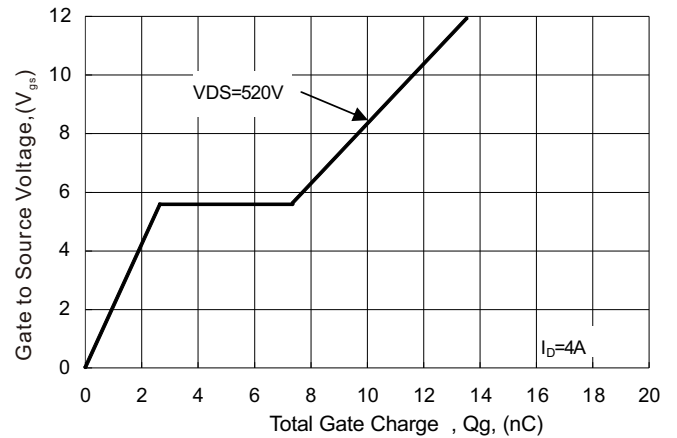


Fig. 15- Typical Body Diode Transfer Characteristics

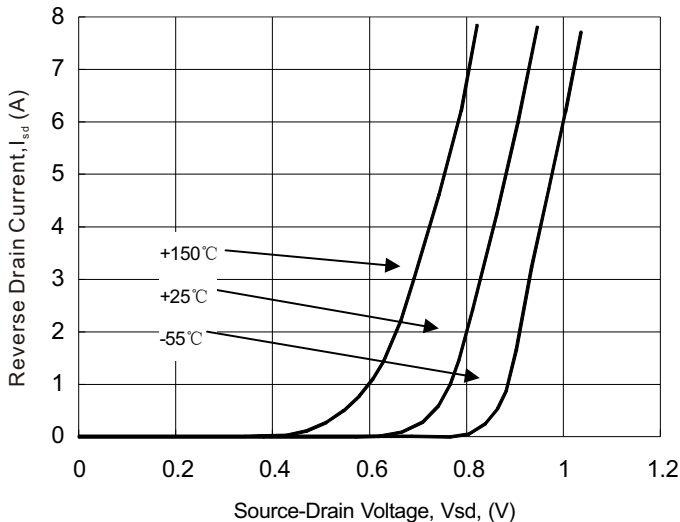
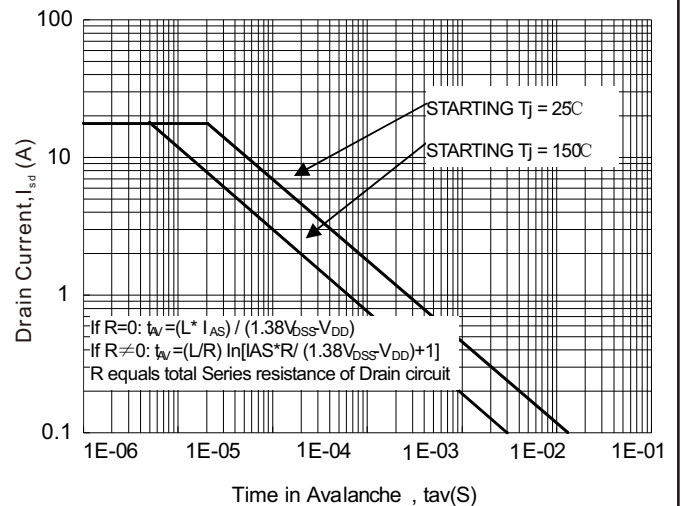


Fig. 16- Unclamped Inductive Switching Capability



■ Test circuit and waveform

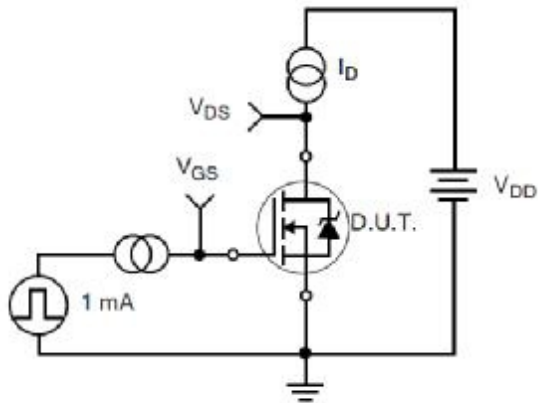


Figure 17. Gate Charge Test Circuit

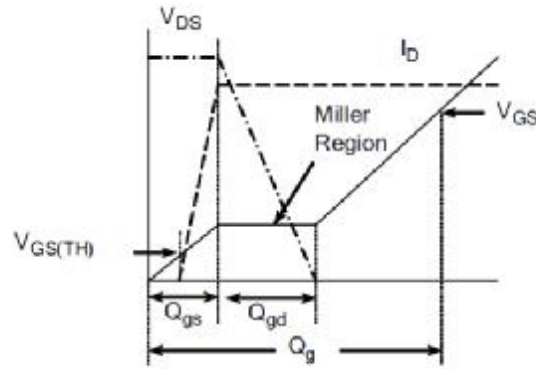


Figure 18. Gate Charge Waveform

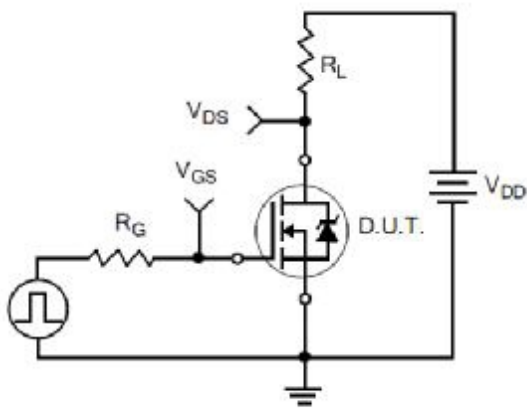


Figure 19. Resistive Switching Test Circuit

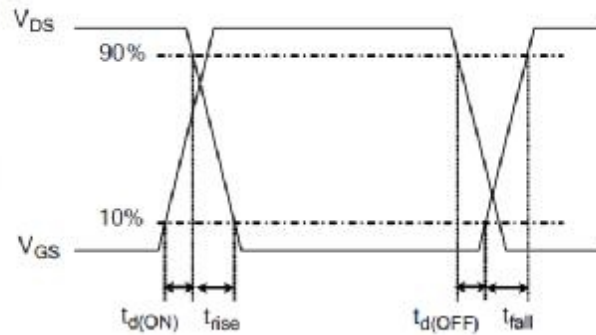


Figure 20. Resistive Switching Waveforms

■ Test circuit and waveform

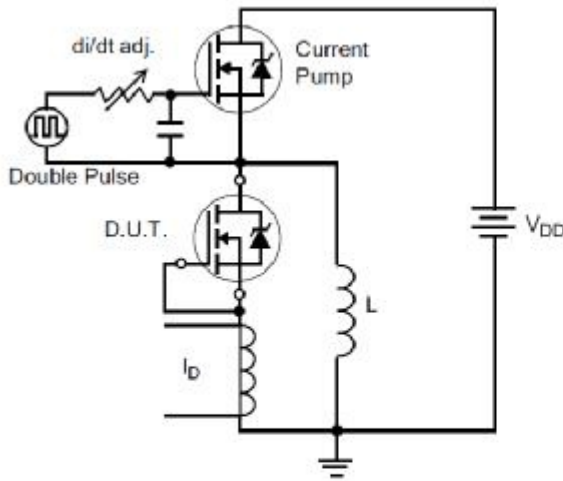


Figure 21. Diode Reverse Recovery Test Circuit

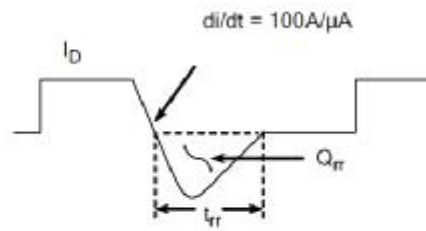


Figure 22. Diode Reverse Recovery Waveform

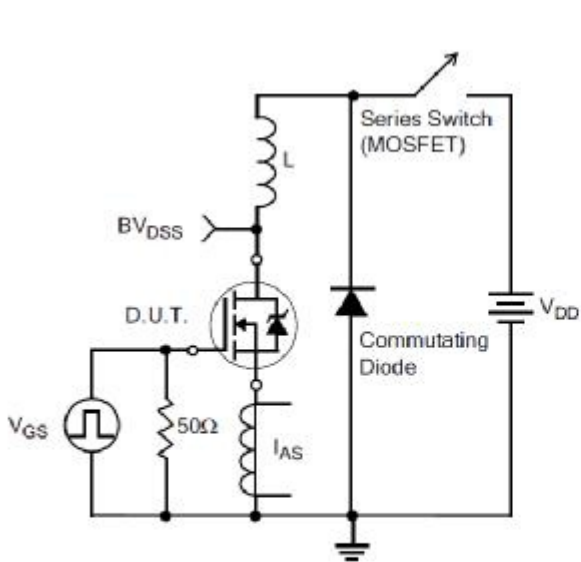


Figure 23. Unclamped Inductive Switching Test Circuit

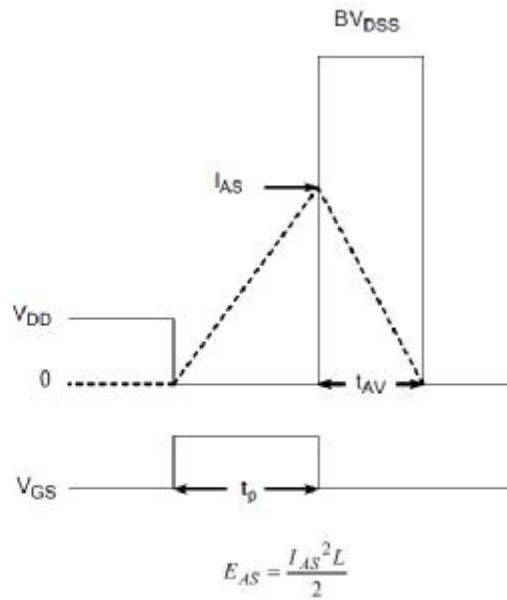
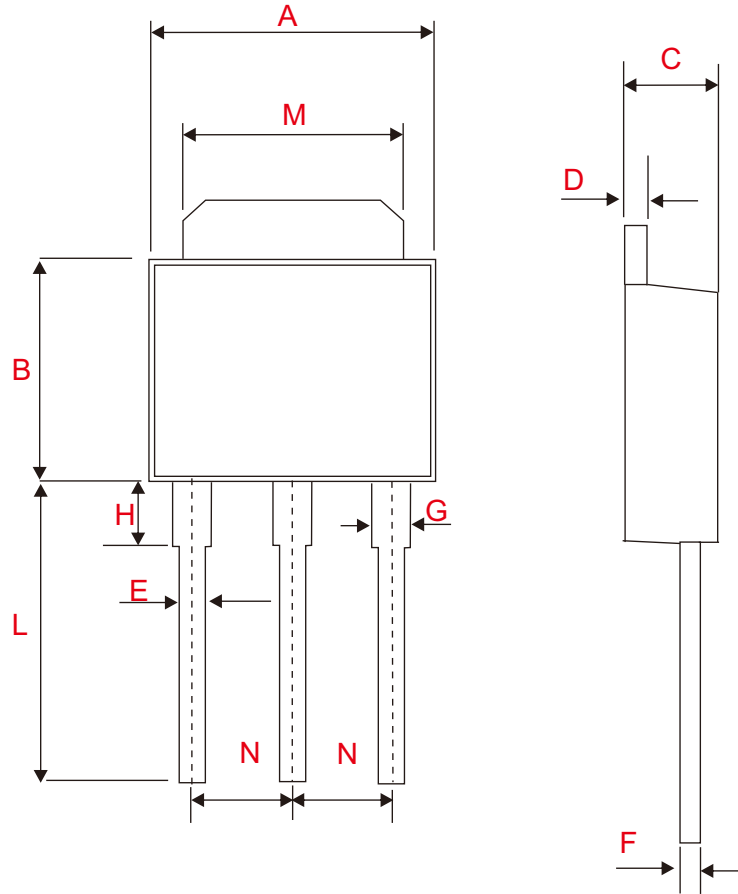


Figure 24. Unclamped Inductive Switching Waveforms

■ Package Information



Item	Values (mm)	
	Min	Max
A	6.30	6.90
B	5.70	6.30
C	2.10	2.50
D	0.30	0.60
E	0.50	0.70
F	0.30	0.60
G	0.70	1.00
H	1.60	2.40
L	7.70	9.80
	6.00	6.30
	4.50	5.80
	2.10	3.70
M	5.10	5.50
N	2.09	2.49

TO-251 Package

The name and content of poisonous and harmful material in products

Parts Name	Hazardous Substance					
	Pb	Hg	Cd	Cr(VI)	PBB	PBDE
Limit	≤0.1%	≤0.1%	≤0.01%	≤0.1%	≤0.1%	≤0.1%
Lead Frame	○	○	○	○	○	○
Molding Compound	○	○	○	○	○	○
Chip	○	○	○	○	○	○
Wire Bonding	○	○	○	○	○	○
Solder	×	○	○	○	○	○
Note	○: means the hazardous material is under the criterion of SJ/T11363-2006. ×: means the hazardous material exceeds the criterion of SJ/T11363-2006. The plumbum element of solder exist in products presently, but within the allowed range of Eurogroup RoHS.					

Warnings

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. It is suggested to be used under 80 percent of the maximum ratings of the device.
2. When installing the heatsink, please pay attention to the torsional moment and the smoothness of the heatsink.
3. VDMOSFETs 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
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