

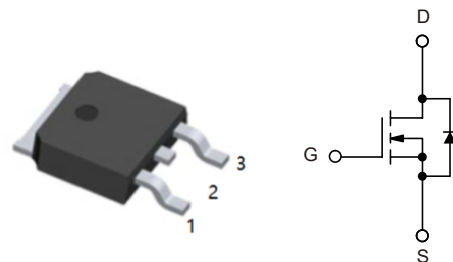
1.Features

- $V_{DS(V)}=60V$
- $I_D=11A$
- $R_{DS(ON)}<40m\Omega(V_{GS}=10V)$
- $R_{DS(ON)}<50m\Omega(V_{GS}=5V)$
- Low Gate Charge (Typ. 4.8 nC)
- Low Crss (Typ.17pF)
- Direct Operation form Logic Drivers
- Low Level Gate Drive Requirements Allowing

2.Pinning information

Pin	Symbol	Description
1	G	GATE
3	S	SOURCE
2	D	DRAIN

TO-252(DPAK)
top view



3.Absolute Maximum Ratings $T_c=25^{\circ}C$

Parameter	Symbol	Rating	Units
Drain - Source Voltage	V_{DSS}	60	V
Drain Current - Continuous $T_c=25^{\circ}C$	I_D	11	A
- Continuous $T_c=100^{\circ}C$		7	A
- Pulsed (Note 1)	I_{DM}	44	A
Gate-Source Voltage	V_{GSS}	± 20	V
Single Pulse Avalanche Energy (Note 2)	E_{AS}	90	mJ
Avalanche Current (Note 1)	I_{AR}	11	A
Repetitive Avalanche Energy (Note 1)	E_{AR}	2.8	mJ
Peak Diode Recovery dv/dt (Note 3)	dv/dt	7	V/ns



Power Dissipation ($T_A=25^{\circ}\text{C}$) *	P_D	2.5	W
Power Dissipation ($T_C=25^{\circ}\text{C}$)		28	W
- Derate above 25°C		0.22	W/ $^{\circ}\text{C}$
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^{\circ}\text{C}$
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	T_L	300	$^{\circ}\text{C}$

4. Thermal Characteristics

Parameter	Symbol	Rating	Units
Thermal Resistance, Junction to Case, Max	$R_{\theta JC}$	2.5	$^{\circ}\text{C/W}$
Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max	$R_{\theta JA}$	110	$^{\circ}\text{C/W}$
Thermal Resistance, Junction to Ambient (*1 in ² Pad of 2-oz Copper), Max	$R_{\theta JA}$	50	$^{\circ}\text{C/W}$



5. Electrical Characteristic (T_c=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =250μA, V _{GS} =0V	60			V
Breakdown Voltage Temperature Coefficient	$\frac{\Delta BV_{DSS}}{\Delta T_J}$	I _D =250μA Referenced to 25°C		0.05		V/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V			1	μA
		V _{GS} =48V, T _C =150°C			10	μA
Gate-Body Leakage Current, Forward	I _{GSSF}	V _{GS} =20V, V _{DS} =0V			100	nA
Gate-Body Leakage Current, Reverse	I _{GSSR}	V _{GS} =-20V, V _{DS} =0V			-100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1		2.5	V
Static Drain-Source	R _{DS(ON)}	V _{GS} =10V, I _D =5.5A		30	40	mΩ
On-Resistance		V _{GS} =5V, I _D =5.5A		35	50	mΩ
Forward Transconductance	g _{FS}	V _{DS} =25V, I _D =5.5A		6		S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1MHz		270	350	pF
Output Capacitance	C _{oss}			95	125	pF
Reverse Transfer Capacitance	C _{rss}			17	23	pF
Switching Characteristics						
Turn-On DelayTime	t _{D(on)}	V _{DD} =30V, I _D =6.8A R _G =25Ω (Note 4)		8	25	ns
Turn-On Rise Time	t _r			90	190	ns
Turn-Off DelayTime	t _{D(off)}			20	50	ns
Turn-Off Fall Time	t _f			40	90	ns
Total Gate Charge	Q _g	V _{DS} =48V, I _D =13.6A V _{GS} =5V (Note 4)		4.8	6.4	nC
Gate to Source Charge	Q _{gs}			1.6		nC
Gate to Drain Charge	Q _{gd}			2.7		nC



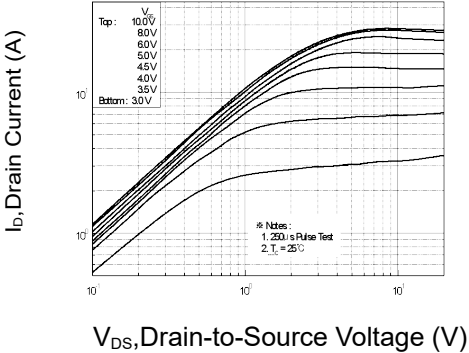
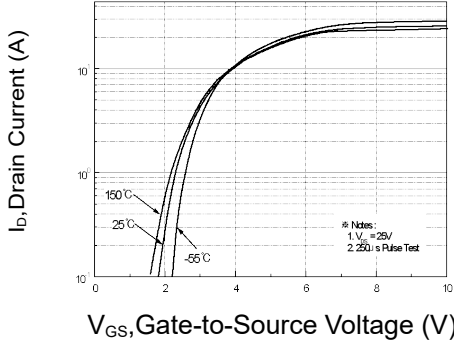
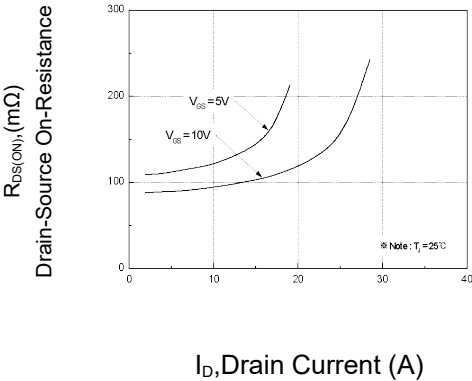
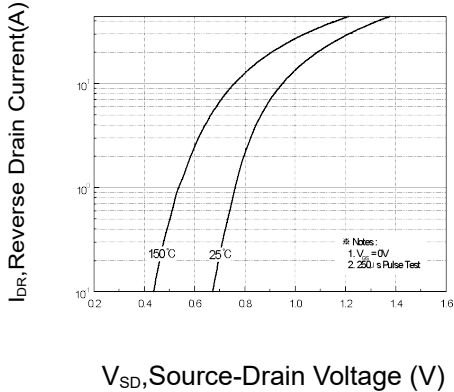
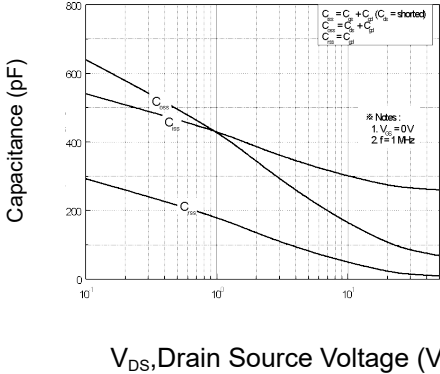
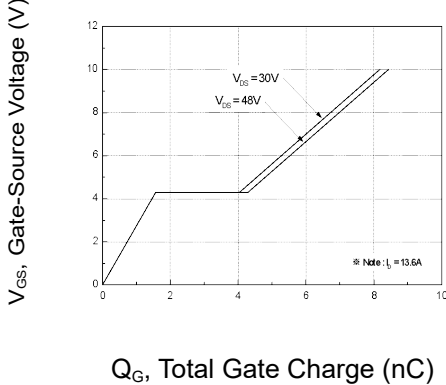
Drain-Source Diode Characteristics						
Maximum Continuous Drain-Source Diode Forward Current	I_S				11	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				44	A
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=11A$			1.5	V
Reverse Recovery Time	t_{rr}	$V_{GS}=0V, I_S=13.6A$		45		ns
Reverse Recovery Charge	Q_{rr}			45		nC

Notes:

- 1. Repetitive rating : pulse-width limited by maximum junction temperature.
- 2. $L=870\mu H, I_{AS}=11\text{ A}, V_{DD}=25\text{ V}, R_G=25\text{ }\Omega$, starting $T_J=25^\circ\text{C}$.
- 3. $I_{SD} \leq 13.6\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, starting $T_J=25^\circ\text{C}$.
- 4. Essentially independent of operating temperature.



6.1Typical characteristic

 I_D, Drain Current (A) V_{DS}, Drain-to-Source Voltage (V) Figure 1: Output Characteristics	 I_D, Drain Current (A) V_{GS}, Gate-to-Source Voltage (V) Figure 2: Transfer Characteristics
 $R_{DS(ON)}$, (mΩ) Drain-Source On-Resistance I_D, Drain Current (A) Figure 3: On-Resistance vs. Drain Current and Gate Voltage	 I_{DR}, Reverse Drain Current(A) V_{SD}, Source-Drain Voltage (V) Figure 4: Body Diode Forward Voltage Variation vs. Source Current and Temperature
 Capacitance (pF) V_{DS}, Drain Source Voltage (V) Figure 5: Capacitance Characteristics	 V_{GS}, Gate-Source Voltage (V) Q_G, Total Gate Charge (nC) Figure 6: Gate Charge Characteristics



6.2Typical characteristic

Drain-Source Breakdown Voltage BV_{DSS}, (Normalized) T_J, Junction Temperature (°C)	Drain-Source On-Resistance $R_{DS(on)}$, (Normalized) T_J, Junction Temperature (°C)
Figure 7: SBreakdown Voltage Variationvs. Temperature	Figure 8: On-Resistance Variationvs. Temperature
Drain Current (A) I_D, Drain Current (A) V_{DS}, DrainSource Voltage (V)	Drain Current (A) I_D, Drain Current (A) T_C, Case Temperature (°C)
Figure 9: Maximum Safe Operating Area	Figure 10: Maximum Drain Currentvs. Case Temperature
Thermal Response (°C/W) $Z_{\theta JC}(t)$, Thermal Response (°C/W) t_1 , Rectangular Pulse Duration (sec)	
Figure 11: Transient Thermal Response Curve	



6.3 Typical characteristic

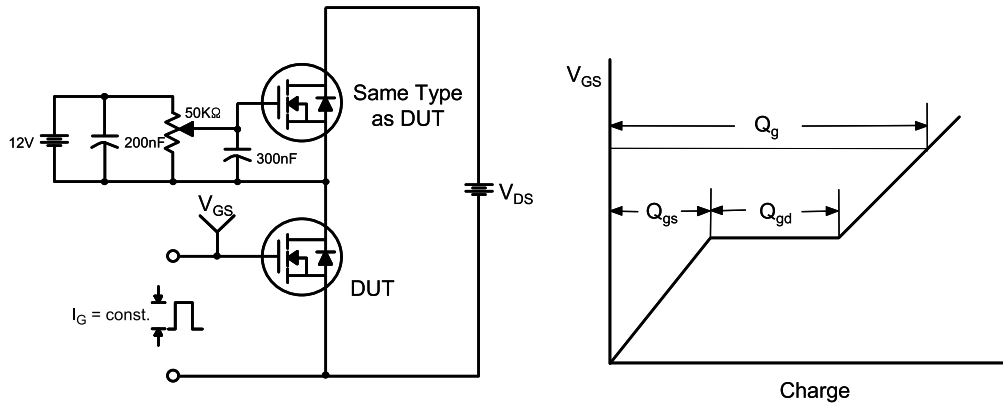


Figure 12. Gate Charge Test Circuit & Waveform

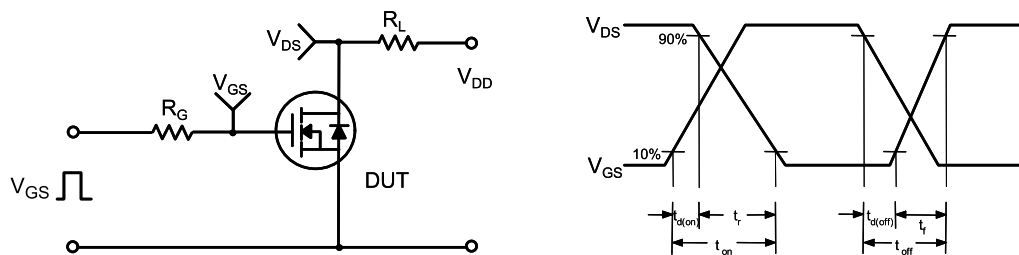


Figure 13. Resistive Switching Test Circuit & Waveforms

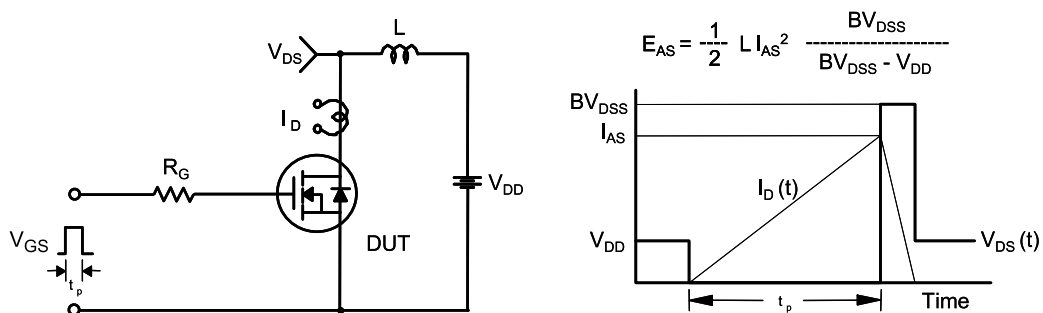
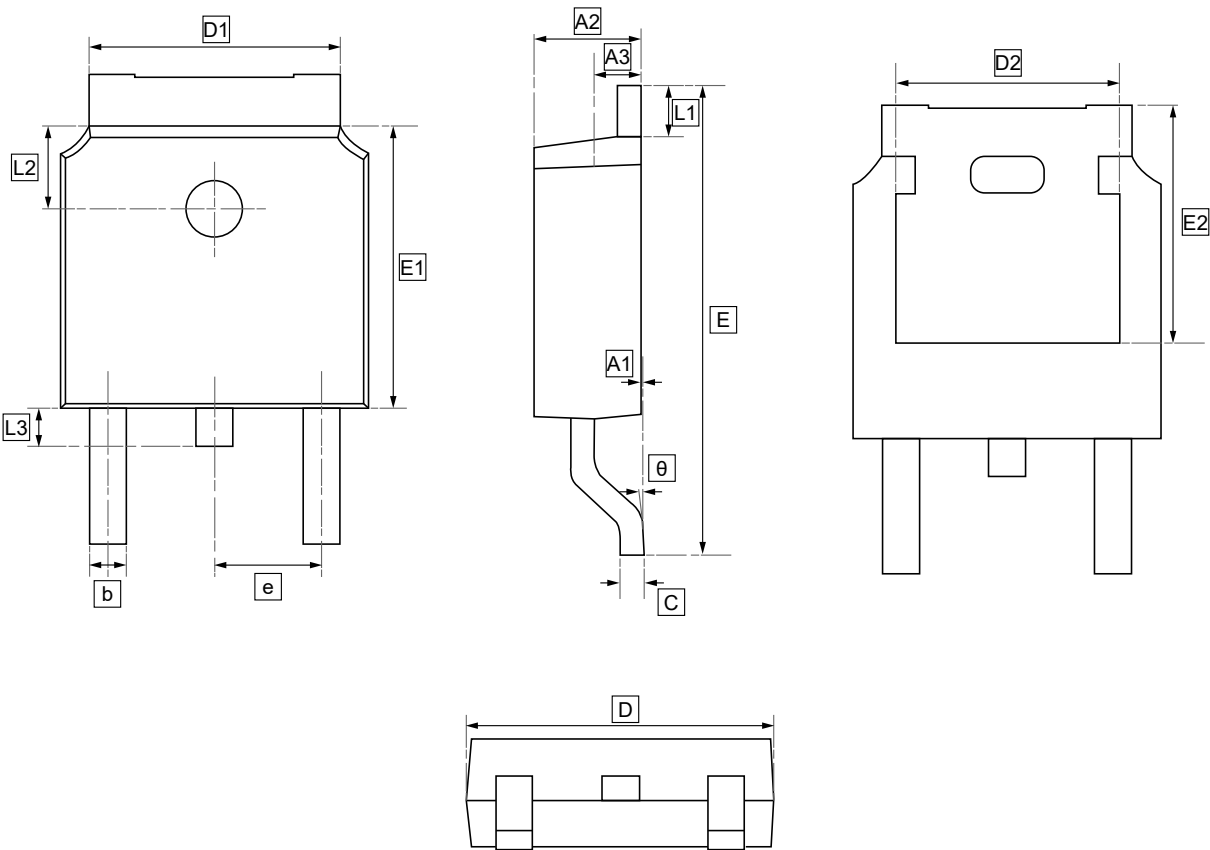


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



7.TO-252 Package Outline Dimensions

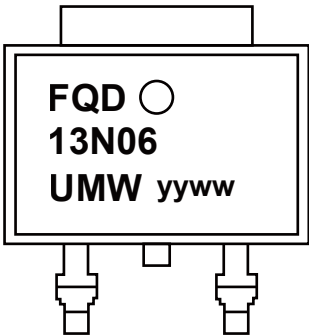


DIMENSIONS (mm are the original dimensions)

Symbol	A1	A2	A3	b	c	D	D1	D2	E	E1	E2	e	L1	L2	L3	θ
Min	0.00	2.18	0.90	0.65	0.46	6.35	4.95	4.32	9.40	5.97	5.21	2.286 BSC	0.89	1.70	0.60	0.00
Max	0.13	2.39	1.10	0.85	0.61	6.73	5.46	4.90	10.41	6.22	5.38		1.27	1.90	1.00	8.00



8.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW FQD13N06LTM	TO-252	2500	Tape and reel



9.Disclaimer

UMW reserves the right to make changes to all products, specifications. Customers should obtain the latest version of product documentation and verify the completeness and currency of the information before placing an order.

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