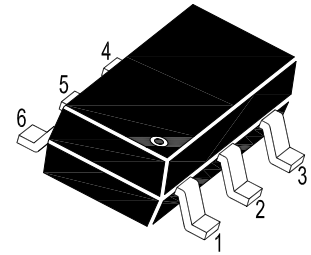
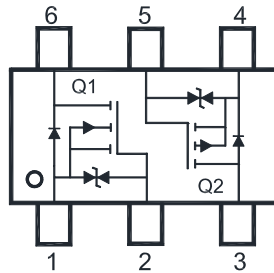


# MMFTX3008KDW-AH

## Complementary N/P-Channel Enhancement Mode MOSFET

### Features

- AEC-Q101 Qualified
- Low threshold voltage
- Built-in G-S Protection Diode
- Halogen and Antimony Free(HAF), RoHS compliant
- Typical ESD Protection HBM Class 1C



Q1: 1.Source 2.Gate 6.Drain  
Q2: 4.Source 5.Gate 3.Drain  
SOT-363 Plastic Package

Classification	Voltage Range(V)
0A	< 125
0B	125 to < 250
1A	250 to < 500
1B	500 to < 1000
1C	1000 to < 2000
2	2000 to < 4000
3A	4000 to < 8000
3B	≥ 8000

### Application

- Portable appliances
- Battery management

### Absolute Maximum Ratings (at $T_a = 25^\circ\text{C}$ unless otherwise specified) (Q1/Q2)

Parameter	Symbol	Value		Unit
		Q1	Q2	
Drain-Source Voltage	$V_{DS}$	30	-30	V
Gate-Source Voltage	$V_{GS}$	± 8	± 8	V
Continuous Drain Current	$I_D$	350	-200	mA
Peak Drain Current, Pulsed <sup>1)</sup>	$I_{DM}$	1.4	-0.8	A
Total Power Dissipation	$P_{tot}$	280 <sup>2)</sup> 320 <sup>3)</sup>		mW
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 150		°C

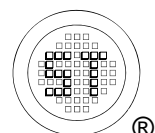
### Thermal Characteristics (Q1/Q2)

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	446 <sup>2)</sup> 390 <sup>3)</sup>	°C/W

<sup>1)</sup> Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%, Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ\text{C}$ .

<sup>2)</sup> Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad.

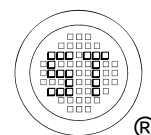
<sup>3)</sup> Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate.



# MMFTX3008KDW-AH

Characteristics at  $T_a = 25^\circ\text{C}$  unless otherwise specified (N-Channel Q1)

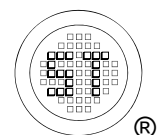
Parameter	Symbol	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>					
Drain-Source Breakdown Voltage at $I_D = 250\ \mu\text{A}$	$BV_{DSS}$	30	-	-	V
Drain-Source Leakage Current at $V_{DS} = 30\ \text{V}$	$I_{DSS}$	-	-	1	$\mu\text{A}$
Gate Leakage Current at $V_{GS} = \pm 8\ \text{V}$	$I_{GSS}$	-	-	$\pm 1$	$\mu\text{A}$
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	$V_{GS(th)}$	0.5	-	1.1	V
Static Drain Source On-Resistance at $V_{GS} = 4.5\ \text{V}$ , $I_D = 350\ \text{mA}$ at $V_{GS} = 2.5\ \text{V}$ , $I_D = 200\ \text{mA}$ at $V_{GS} = 1.8\ \text{V}$ , $I_D = 10\ \text{mA}$	$R_{DS(ON)}$	- - -	- - -	1.4 2.1 2.8	$\Omega$
<b>DYNAMIC PARAMETERS</b>					
Forward Transconductance at $V_{DS} = 4.5\ \text{V}$ , $I_D = 350\ \text{mA}$	$g_{fs}$	-	1.1	-	S
Input Capacitance at $V_{DS} = 15\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$	$C_{iss}$	-	54	-	pF
Output Capacitance at $V_{DS} = 15\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$	$C_{oss}$	-	9.4	-	pF
Reverse Transfer Capacitance at $V_{DS} = 15\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$	$C_{rss}$	-	4.4	-	pF
Gate charge total at $V_{DS} = 15\ \text{V}$ , $I_D = 0.5\ \text{A}$ , $V_{GS} = 4.5\ \text{V}$ at $V_{DS} = 15\ \text{V}$ , $I_D = 0.5\ \text{A}$ , $V_{GS} = 2.5\ \text{V}$	$Q_g$	- -	0.8 0.42	- -	nC
Gate to Source Charge at $V_{DS} = 15\ \text{V}$ , $I_D = 0.5\ \text{A}$ , $V_{GS} = 4.5\ \text{V}$	$Q_{gs}$	-	0.2	-	nC
Gate to Drain Charge at $V_{DS} = 15\ \text{V}$ , $I_D = 0.5\ \text{A}$ , $V_{GS} = 4.5\ \text{V}$	$Q_{gd}$	-	0.08	-	nC
Turn-On Delay Time at $V_{DS} = 15\ \text{V}$ , $V_{GS} = 4.5\ \text{V}$ , $I_D = 0.5\ \text{A}$ , $R_G = 4.7\ \Omega$	$t_{d(on)}$	-	1.8	-	ns
Turn-On Rise Time at $V_{DS} = 15\ \text{V}$ , $V_{GS} = 4.5\ \text{V}$ , $I_D = 0.5\ \text{A}$ , $R_G = 4.7\ \Omega$	$t_r$	-	18	-	ns
Turn-Off Delay Time at $V_{DS} = 15\ \text{V}$ , $V_{GS} = 4.5\ \text{V}$ , $I_D = 0.5\ \text{A}$ , $R_G = 4.7\ \Omega$	$t_{d(off)}$	-	29	-	ns
Turn-Off Fall Time at $V_{DS} = 15\ \text{V}$ , $V_{GS} = 4.5\ \text{V}$ , $I_D = 0.5\ \text{A}$ , $R_G = 4.7\ \Omega$	$t_f$	-	22	-	ns
<b>Body-Diode PARAMETERS</b>					
Drain-Source Diode Forward Voltage at $I_S = 350\ \text{mA}$	$V_{SD}$	-	-	1.2	V
Body-Diode Continuous Current	$I_S$	-	-	350	mA



# MMFTX3008KDW-AH

Characteristics at  $T_a = 25^\circ\text{C}$  unless otherwise specified (P-Channel Q2)

Parameter	Symbol	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>					
Drain-Source Breakdown Voltage at $-I_D = 250 \mu\text{A}$	$-BV_{DSS}$	30	-	-	V
Drain-Source Leakage Current at $-V_{DS} = 30 \text{ V}$	$-I_{DSS}$	-	-	1	$\mu\text{A}$
Gate Leakage Current at $V_{GS} = \pm 8 \text{ V}$	$I_{GSS}$	-	-	$\pm 1$	$\mu\text{A}$
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$ , $-I_D = 250 \mu\text{A}$	$-V_{GS(th)}$	0.5	-	1.1	V
Drain-Source On-State Resistance at $-V_{GS} = 4.5 \text{ V}$ , $-I_D = 200 \text{ mA}$ at $-V_{GS} = 2.5 \text{ V}$ , $-I_D = 10 \text{ mA}$	$R_{DS(on)}$	- -	- -	4.1 6.5	$\Omega$
<b>DYNAMIC PARAMETERS</b>					
Forward Transconductance at $-V_{DS} = 4.5 \text{ V}$ , $-I_D = 200 \text{ mA}$	$g_{fs}$	-	510	-	mS
Input Capacitance at $-V_{DS} = 10 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{iss}$	-	50	-	pF
Output Capacitance at $-V_{DS} = 10 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{oss}$	-	6	-	pF
Reverse Transfer Capacitance at $-V_{DS} = 10 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{rss}$	-	5	-	pF
Total Gate Charge at $-V_{DS} = 10 \text{ V}$ , $-V_{GS} = 4.5 \text{ V}$ , $-I_D = 0.1 \text{ A}$ at $-V_{DS} = 10 \text{ V}$ , $-V_{GS} = 2.5 \text{ V}$ , $-I_D = 0.1 \text{ A}$	$Q_g$	- -	1.22 0.8	- -	nC
Gate to Source Charge at $-V_{DS} = 10 \text{ V}$ , $-V_{GS} = 4.5 \text{ V}$ , $-I_D = 0.1 \text{ A}$	$Q_{gs}$	-	0.33	-	nC
Gate to Drain Charge at $-V_{DS} = 10 \text{ V}$ , $-V_{GS} = 4.5 \text{ V}$ , $-I_D = 0.1 \text{ A}$	$Q_{gd}$	-	0.22	-	nC
Turn-On Delay Time at $-V_{DD} = 10 \text{ V}$ , $-V_{GS} = 4.5 \text{ V}$ , $-I_D = 0.1 \text{ A}$ , $R_G = 4.7 \Omega$	$t_{d(on)}$	-	3.4	-	ns
Turn-On Rise Time at $-V_{DD} = 10 \text{ V}$ , $-V_{GS} = 4.5 \text{ V}$ , $-I_D = 0.1 \text{ A}$ , $R_G = 4.7 \Omega$	$t_r$	-	13	-	ns
Turn-Off Delay Time at $-V_{DD} = 10 \text{ V}$ , $-V_{GS} = 4.5 \text{ V}$ , $-I_D = 0.1 \text{ A}$ , $R_G = 4.7 \Omega$	$t_{d(off)}$	-	37	-	ns
Turn-Off Fall Time at $-V_{DD} = 10 \text{ V}$ , $-V_{GS} = 4.5 \text{ V}$ , $-I_D = 0.1 \text{ A}$ , $R_G = 4.7 \Omega$	$t_f$	-	23	-	ns
<b>Body-Diode PARAMETERS</b>					
Drain-Source Diode Forward Voltage at $-I_S = 200 \text{ mA}$	$-V_{SD}$	-	-	1.2	V
Body-Diode Continuous Current	$-I_S$	-	-	200	mA



# MMFTX3008KDW-AH

## Electrical characteristics curves (N-Channel Q1)

Fig. 1 Typical Output Characteristics

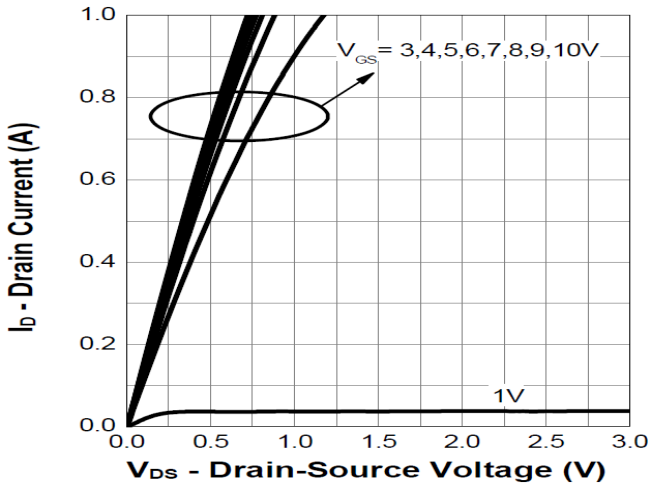


Fig. 2 Gate Threshold Variation vs.  $T_j$

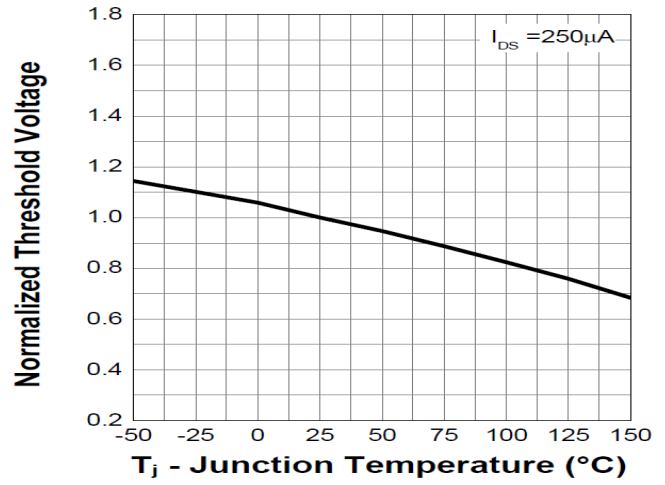


Fig. 3 on-Resistance vs. Drain Current

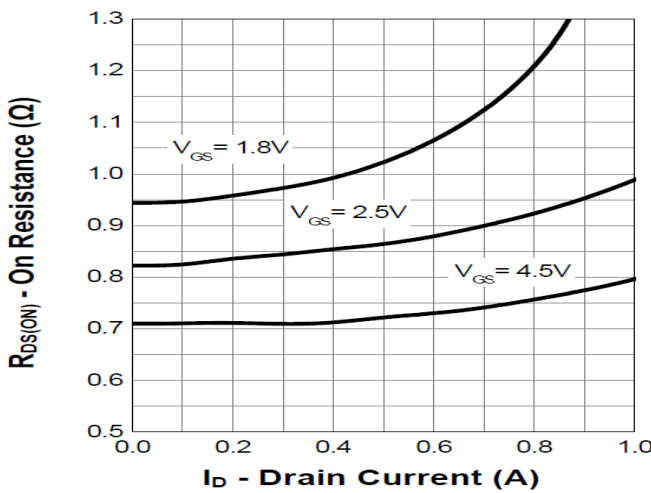


Fig. 4 on-Resistance vs. Gate-Source Voltage

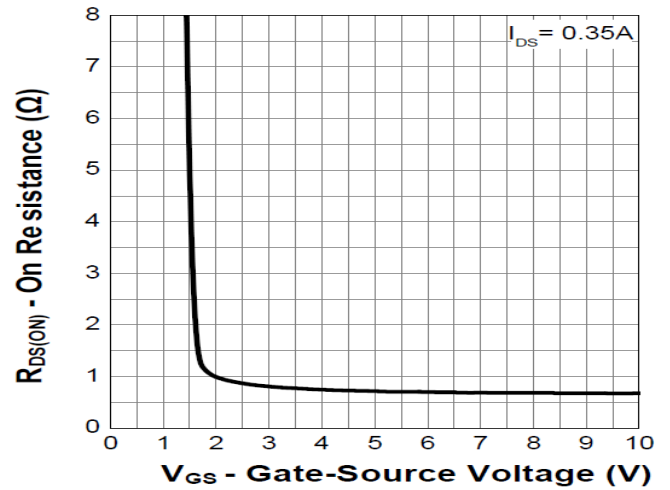


Fig. 5 on-Resistance vs.  $T_j$

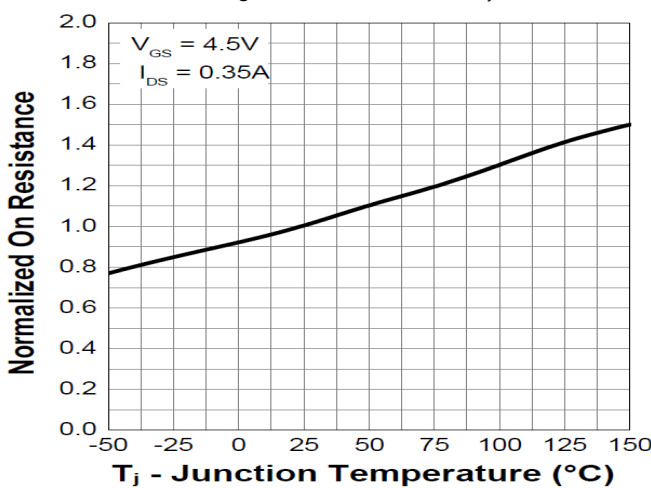
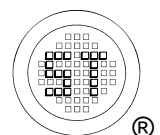
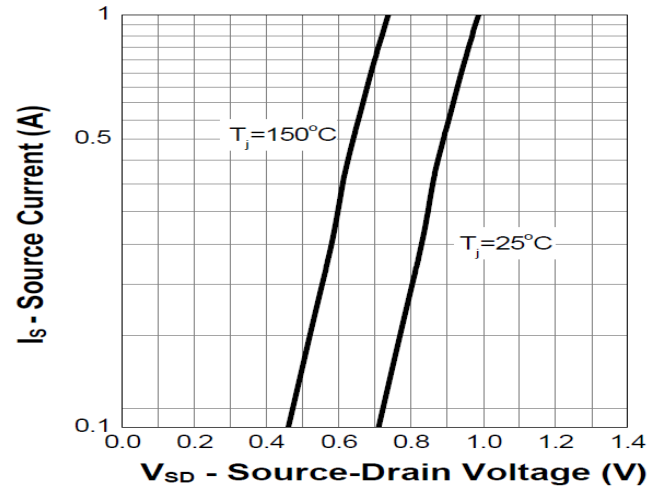


Fig. 6 Typical Forward Characteristics



# MMFTX3008KDW-AH

## Electrical characteristics curves (N-Channel Q1)

Fig. 7 Typical Junction Capacitance

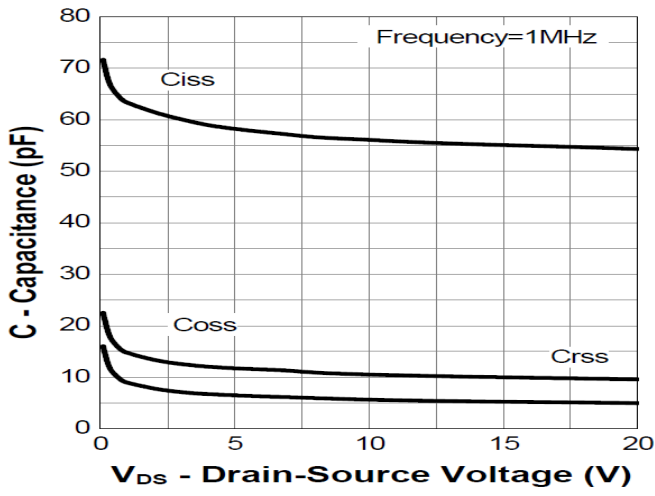
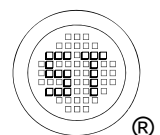
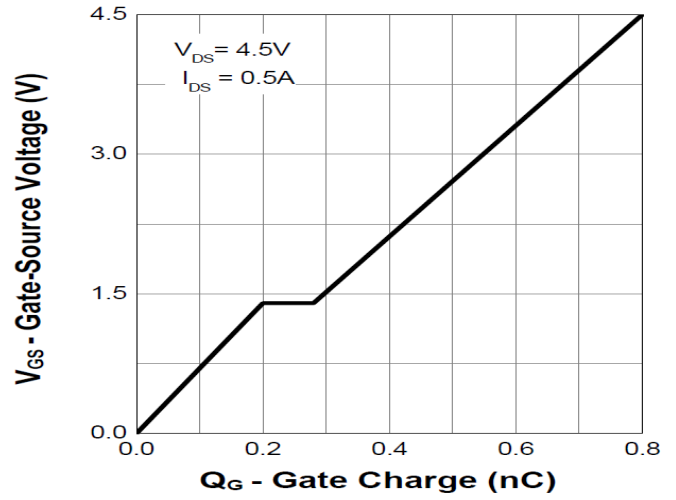


Fig. 8 Gate Charge



## Electrical characteristics curves (P-Channel Q2)

Fig. 1 Typical Output Characteristics

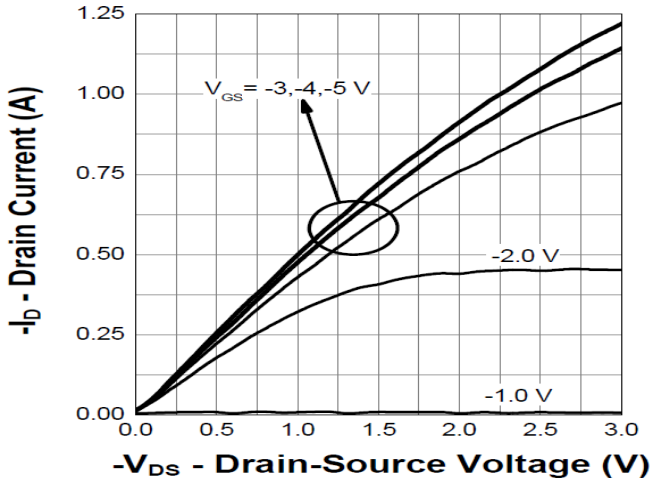


Fig. 2 Gate Threshold Variation vs.  $T_j$

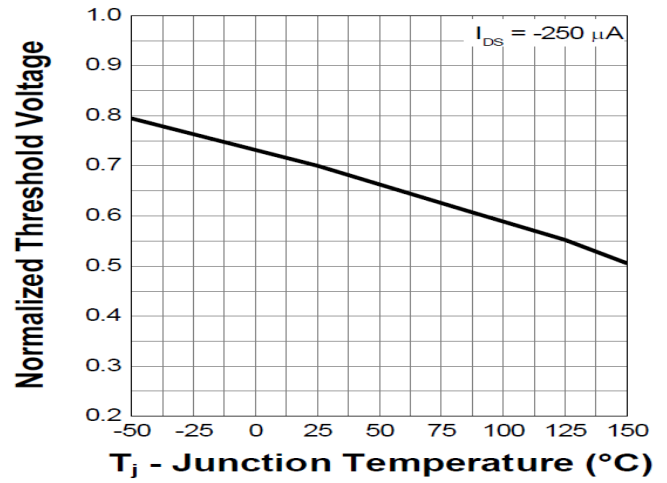


Fig. 3 on-Resistance vs. Drain Current

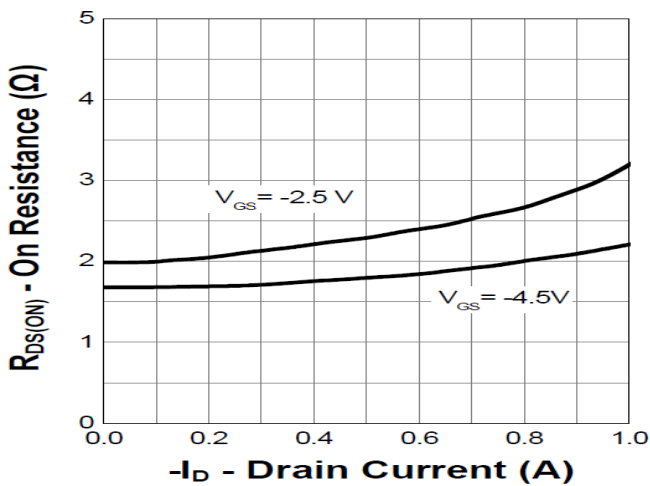


Fig. 4 on-Resistance vs. Gate-Source Voltage

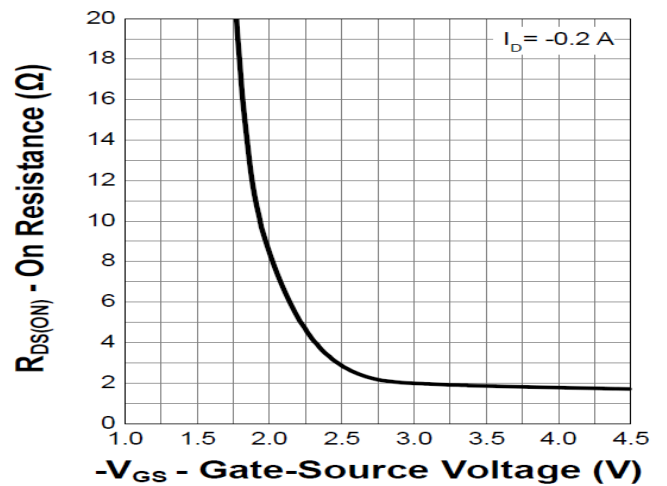


Fig. 5 on-Resistance vs.  $T_j$

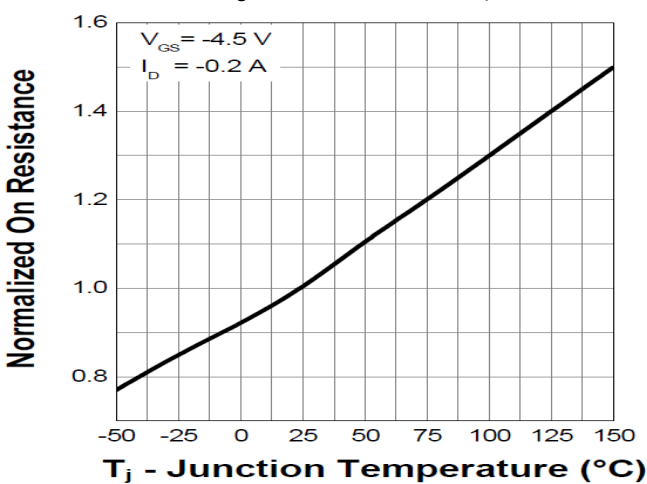
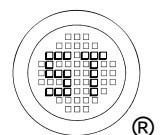
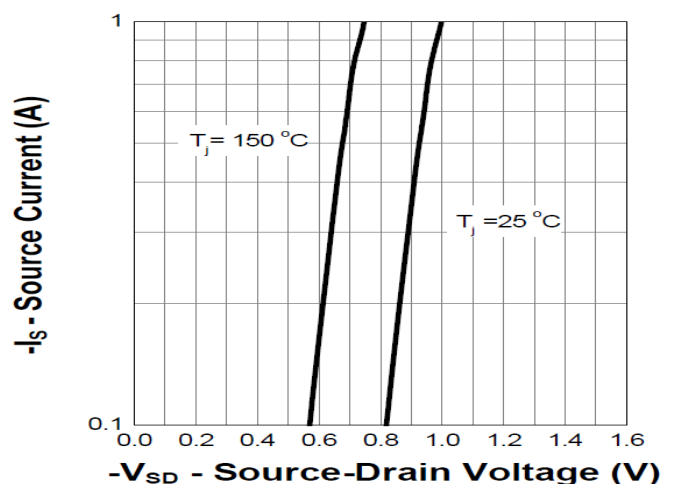


Fig. 6 Typical Forward Characteristics



# MMFTX3008KDW-AH

## Electrical characteristics curves (P-Channel Q2)

Fig. 7 Typical Junction Capacitance

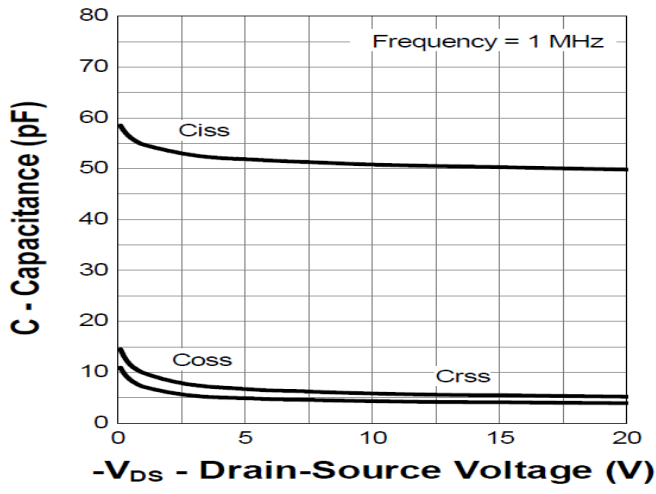
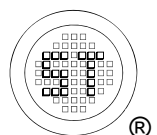
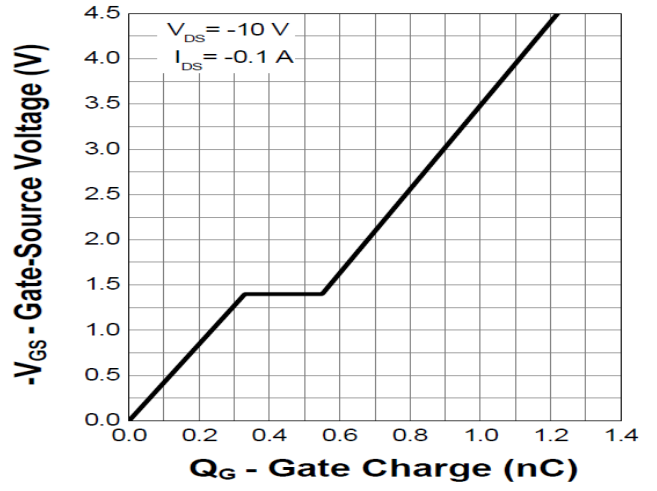


Fig. 8 Gate Charge



## Test Circuits (N-Channel Q1)

Fig.1-1 Switching times test circuit

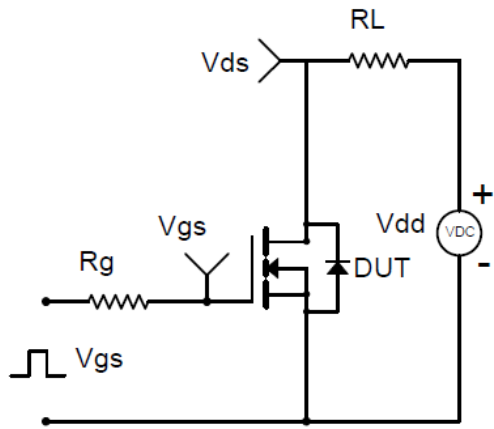


Fig.1-2 Switching Waveform

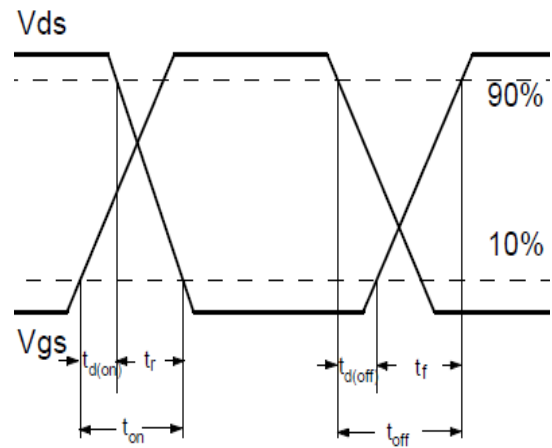


Fig.2-1 Gate charge test circuit

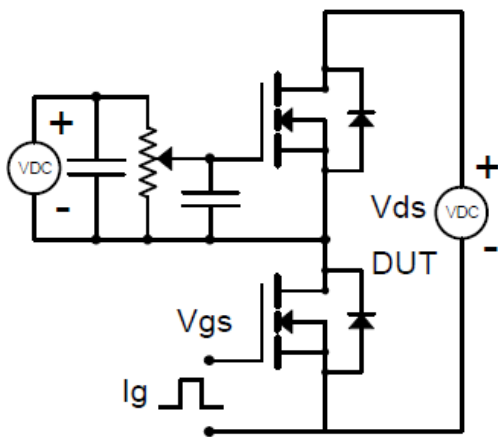
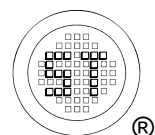
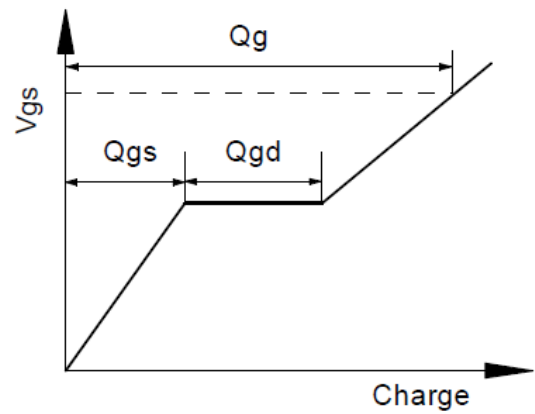


Fig.2-2 Gate charge waveform





## Test Circuits (P-Channel Q2)

Fig.1-1 Switching times test circuit

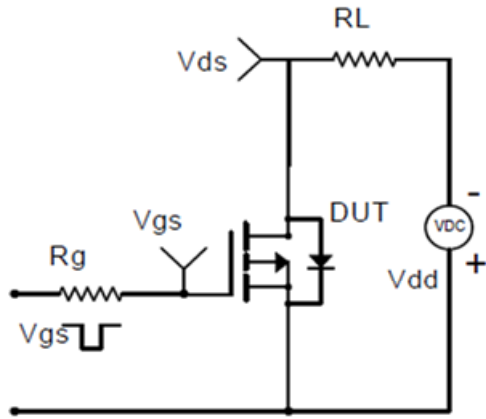


Fig.1-2 Switching Waveform

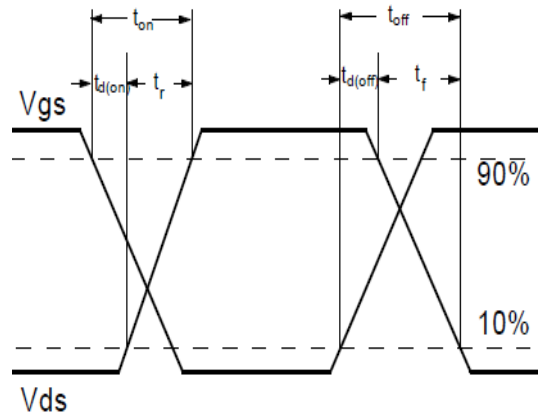


Fig.2-1 Gate charge test circuit

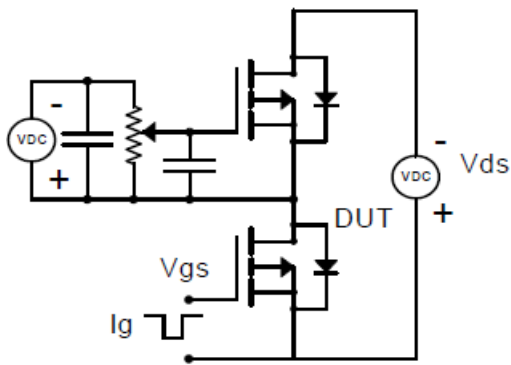
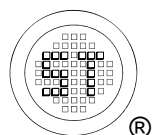
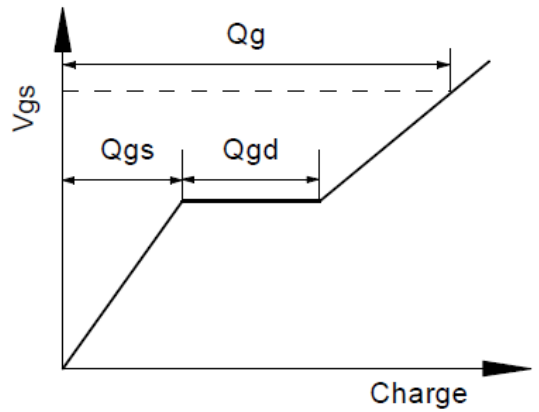


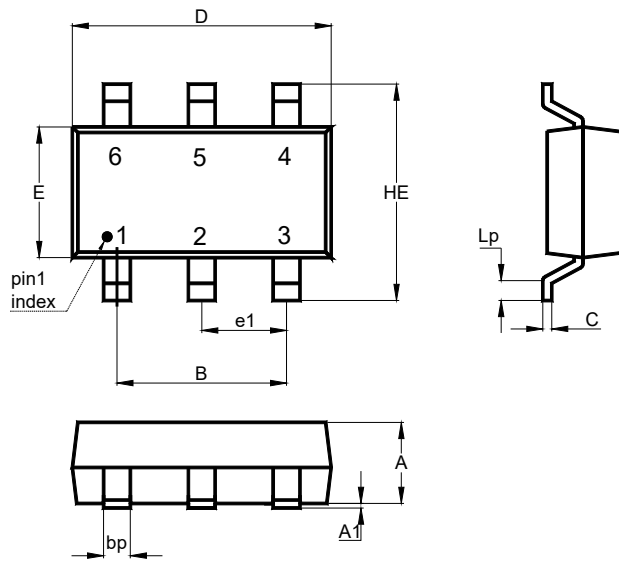
Fig.2-2 Gate charge waveform



# MMFTX3008KDW-AH

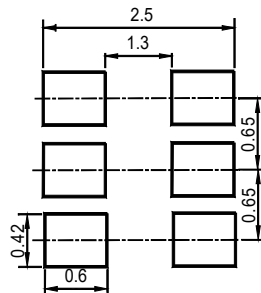
## Package Outline (Dimensions in mm)

SOT-363



Unit	A	A1	B	C	D	E	e1	HE	Lp	bp
mm	1.0	0.1	1.3	0.25	2.2	1.35	0.65	2.2	0.4	0.3
	0.9	0	typ.	0.1	1.8	1.15	typ.	2.0	0.15	0.1

## Recommended Soldering Footprint

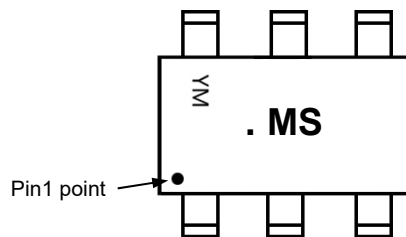


## Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
SOT-363	8	4 ± 0.1	0.157 ± 0.004	178	7	3,000

## Marking information

- " MS " = Part No.
  - " • " = HAF (Halogen and Antimony Free)
  - " YM " = Date Code Marking
  - " Y " = Year
  - " M " = Month
- Font type: Arial



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