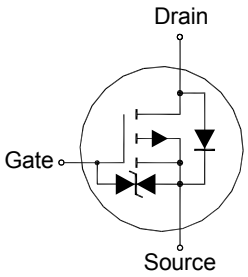
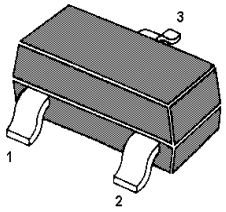
MMFTP3415K-HAF

P-Channel Enhancement Mode MOSFET

Features

- Extremely low threshold voltage
- Halogen and Antimony Free(HAF), RoHS compliant





1. Gate 2. Source 3. Drain
TO-236 Plastic Package

Applications

- Portable appliances
- Battery management
- High speed switch
- Low power DC to DC Converter

Absolute Maximum Ratings(T_a = 25℃)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		$-V_{DS}$	20	V
Gate-Source Voltage		V_{GS}	± 8	V
Continuous Drain Current	T_a = 25℃ T_a = 70℃	$-I_D$	5 4	A
Pulsed Drain Current [3]		$-I_{DM}$	30	A
Power Dissipation [2]	T_a = 25℃ T_a = 70℃	P_D	1.5 1	W
Thermal Resistance Junction to Ambient	t ≤ 10s Steady-State	$R_{\theta JA}$	80 [1] 100 [1) 4)]	℃/W
Operating Junction Temperature Range		T_j	- 55 to + 150	℃
Storage Temperature Range		T_{stg}	- 55 to + 150	℃

[1] The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_a = 25°C. The value in any given application depends on the user's specific board design.

[2] The power dissipation P_D is based on $T_{j(MAX)}$ = 150°C, using ≤ 10 s junction-to-ambient thermal resistance.

[3] Repetitive rating, pulse width limited by junction temperature $T_{j(MAX)}$= 150°C. Ratings are based on low frequency and duty cycles to keep initial T_j = 25°C.

[4] The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

Dated: 09/07/2020 CL Rev: 02

Characteristics at T_J = 25℃ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at $-I_D$ = 250 µA	$-V_{(BR)DSS}$	20	-	-	V
Gate Voltage Drain Current at $-V_{DS}$ = 20 V	$-I_{DSS}$	-	-	1	µA
Gate-Source Leakage at V_{GS} = ± 8 V	I_{GSS}	-	-	± 10	µA
Gate-Source Threshold Voltage at V_{DS} = V_{GS}, $-I_D$ = 250 µA	$-V_{GS(th)}$	0.3	-	0.9	V
Drain-Source On-State Resistance at $-V_{GS}$ = 4.5V, $-I_D$ = 4 A at $-V_{GS}$ = 2.5V, $-I_D$ = 4 A at $-V_{GS}$ = 1.8V, $-I_D$ = 2 A at $-V_{GS}$ = 1.5V, $-I_D$ = 1 A	$R_{DS(on)}$	- - - -	- - - 61	41 53 65 -	mΩ
DYNAMIC PARAMETERS					
Input Capacitance at $-V_{DS}$ = 10 V, V_{GS} = 0 V, f = 1 MHz	C_{iss}	-	816	-	pF
Output Capacitance at $-V_{DS}$ = 10 V, V_{GS} = 0 V, f = 1 MHz	C_{oss}	-	213	-	pF
Reverse Transfer Capacitance at $-V_{DS}$ = 10 V, V_{GS} = 0 V, f = 1 MHz	C_{rss}	-	83	-	pF
Total Gate Charge at $-V_{DS}$ = 10 V, $-I_D$ = 3 A , $-V_{GS}$ = 4.5 V	Q_g	-	12.5	-	nC
Gate Source Charge at $-V_{DS}$ = 10 V, $-I_D$ = 3 A , $-V_{GS}$ = 4.5 V	Q_{gs}	-	1.6	-	nC
Gate Drain Charge at $-V_{DS}$ = 10 V, $-I_D$ = 3 A , $-V_{GS}$ = 4.5 V	Q_{gd}	-	2.8	-	nC
Turn-On Delay Time at $-V_{DS}$ = 10 V, $-V_{GS}$ = 4.5 V, $-I_D$ = 3 A , R_G = 4.5 Ω , R_L = 3.33 Ω	$t_{d(on)}$	-	86	-	nS
Turn-On Rise Time at $-V_{DS}$ = 10 V, $-V_{GS}$ = 4.5 V, $-I_D$ = 3 A , R_G = 4.5 Ω , R_L = 3.33 Ω	t_r	-	51	-	nS
Turn-Off Delay Time at $-V_{DS}$ = 10 V, $-V_{GS}$ = 4.5 V, $-I_D$ = 3 A , R_G = 4.5 Ω , R_L = 3.33 Ω	$t_{d(off)}$	-	185	-	nS
Turn-Off Fall Time at $-V_{DS}$ = 10 V, $-V_{GS}$ = 4.5 V, $-I_D$ = 3 A , R_G = 4.5 Ω , R_L = 3.33 Ω	t_f	-	1050	-	nS
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $-I_S$ = 3 A	$-V_{SD}$	-	-	1.2	V
Body Diode Reverse Recovery Time at $-I_F$ = 3 A , di/dt = 100 A / µs	t_{rr}	-	0.9	-	µS
Body Diode Reverse Recovery Charge at $-I_F$ = 3 A , di/dt = 100 A / µs	Q_{rr}	-	6.3	-	µC

Electrical Characteristics Curves

Fig. 1 Output Characteristic

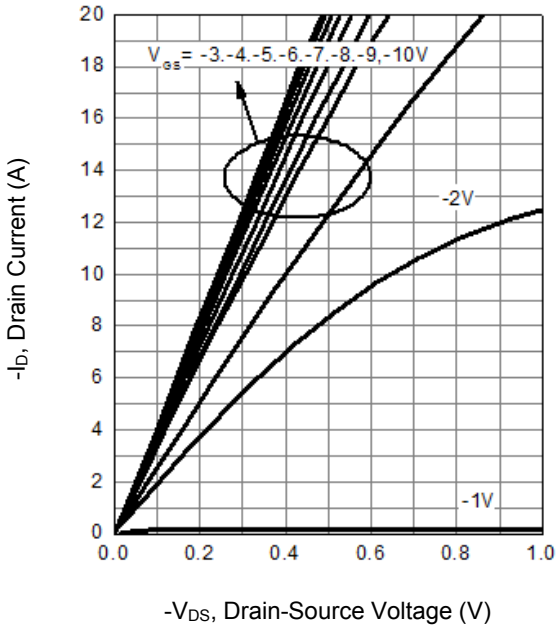


Fig. 2 Transfer Characteristics

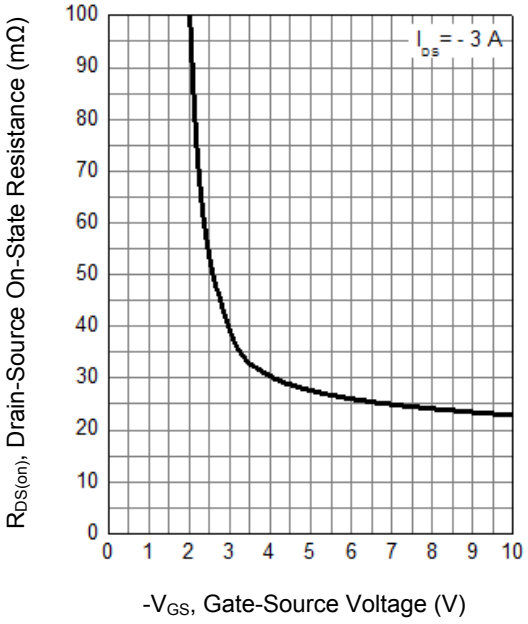


Fig. 3 On-Resistance vs. Drain Current

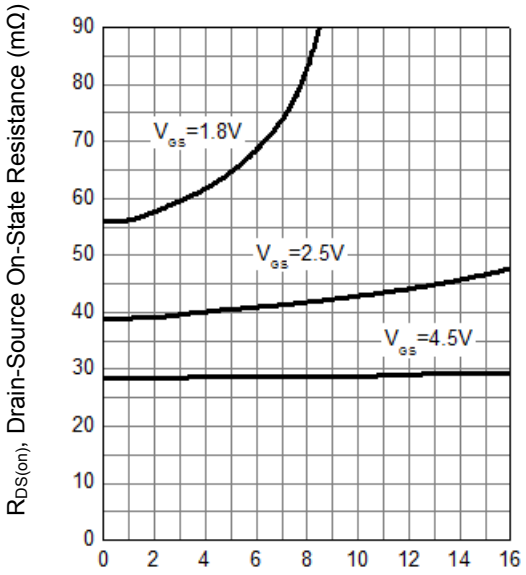
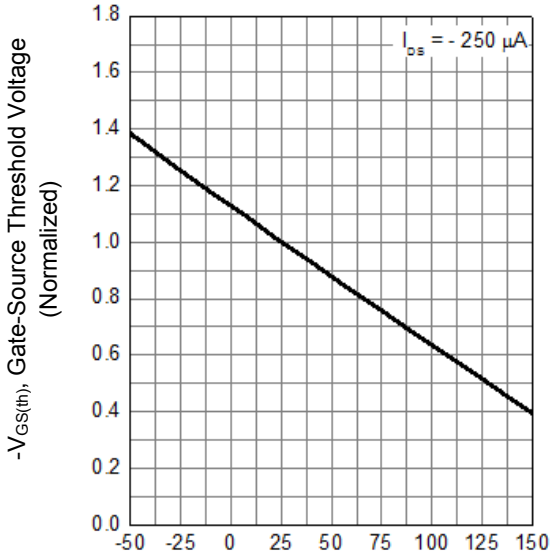


Fig. 4 Gate-Source Threshold Voltage vs. Junction Temperature



Electrical Characteristics Curves

Fig. 5 On-Resistance vs. Junction Temperature

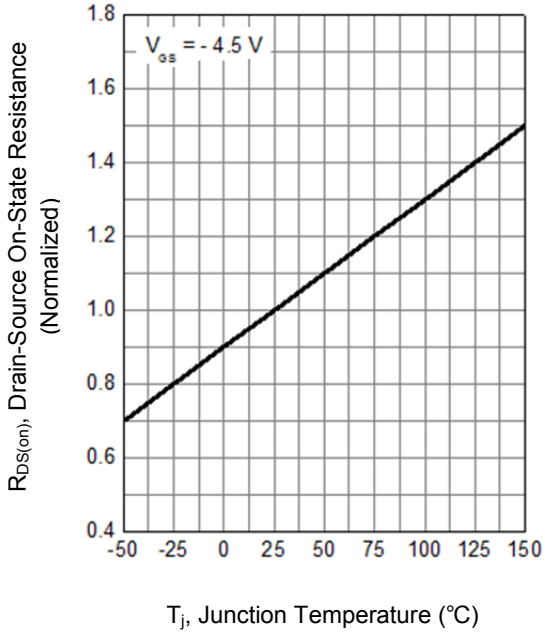


Fig. 6 Diode Forward

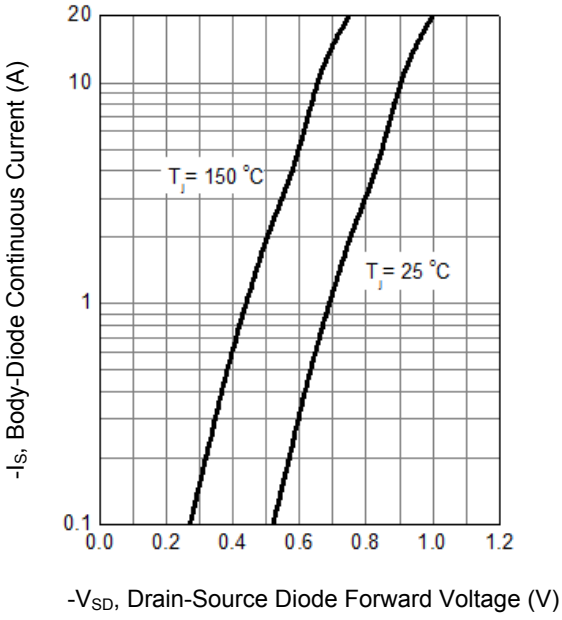


Fig. 7 Capacitance

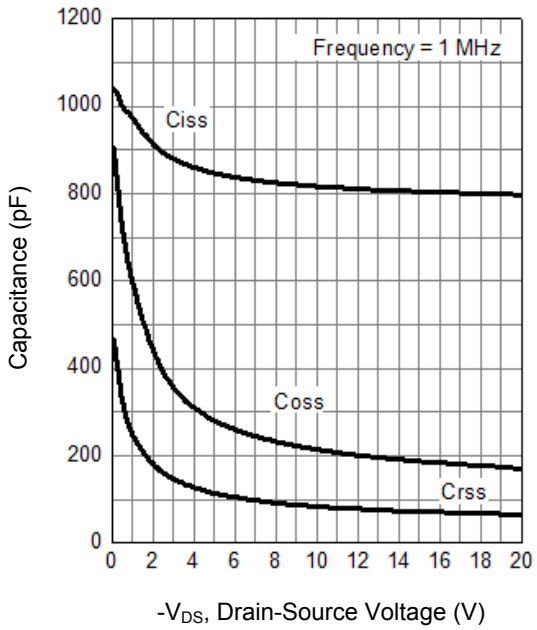
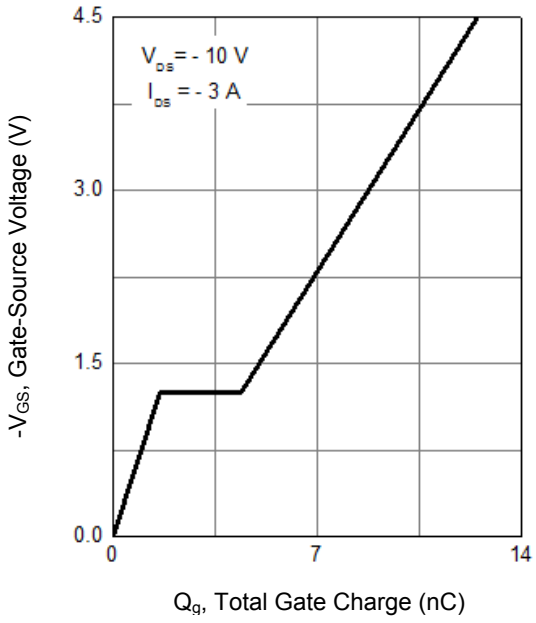


Fig. 8 Gate Charge



Test Circuits

Fig.1-1 Switching times test circuit

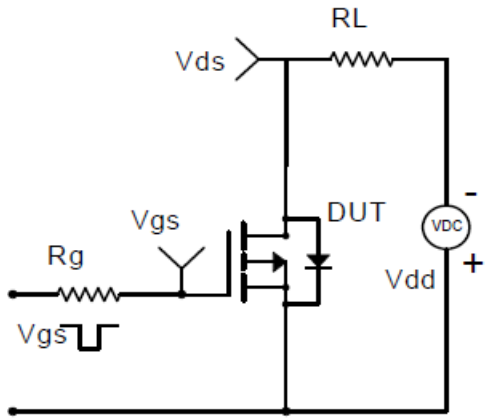


Fig.1-2 Switching Waveform

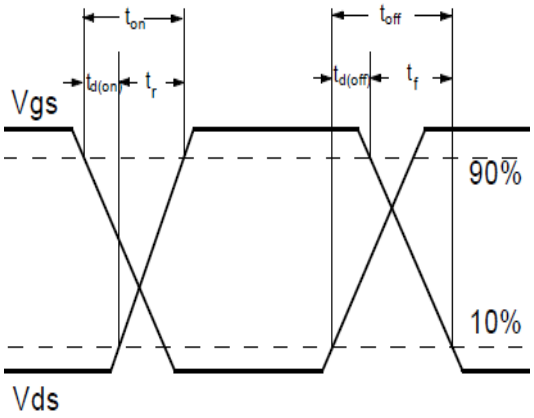


Fig.2-1 Gate charge test circuit

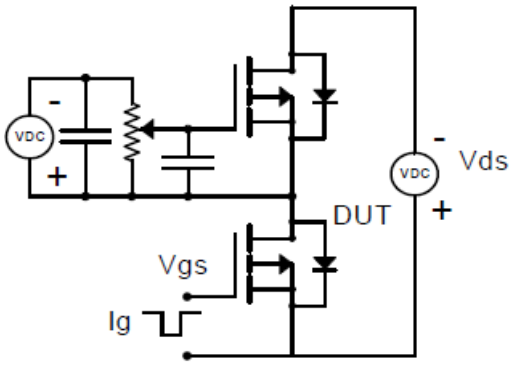
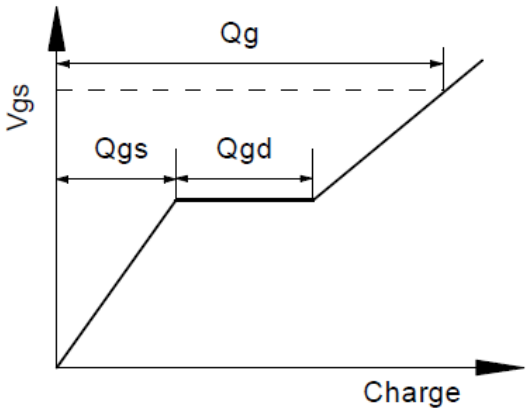
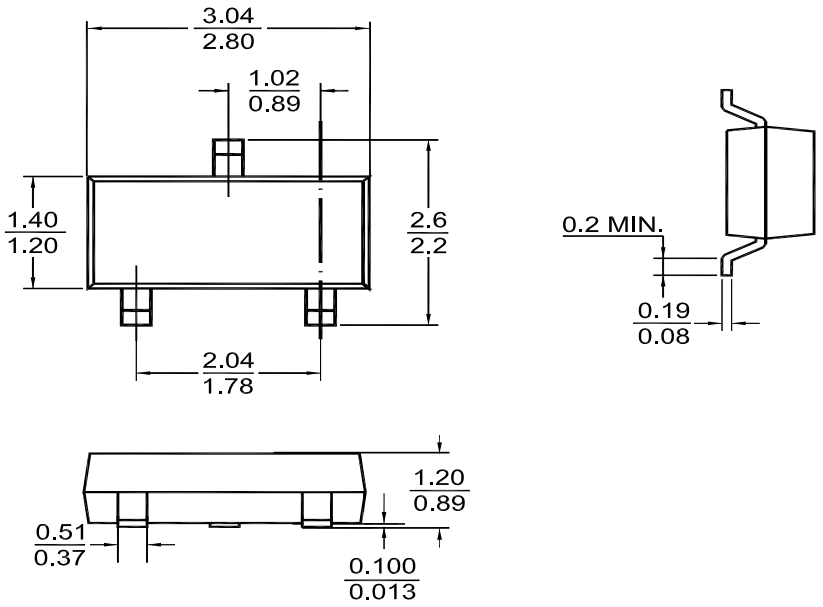


Fig.2-2 Gate charge waveform

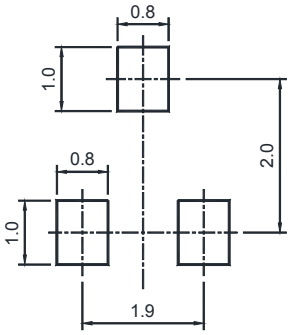


PACKAGE OUTLINE

Plastic surface mounted package (Dimensions in mm) TO-236



Recommended Soldering Footprint



Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
TO-236	8	4 ± 0.1	0.157 ± 0.004	178	7	3,000

Marking information

" MG " = Part No.

" • " = HAF (Halogen and Antimony Free)

"YM" = Date Code Marking

"Y" = Year

"M" = Month

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