

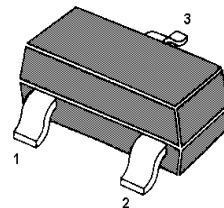
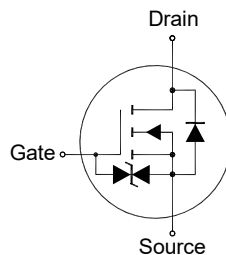
MMFTN3422AK-E-HAF

N-Channel Enhancement Mode Power MOSFET

Features

- Low Threshold Voltage
- Halogen and Antimony Free(HAF),
RoHS compliant
- Typical ESD Protection HBM Class 2

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



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

Applications

- Portable appliances
- Battery management

Absolute Maximum Ratings($T_a = 25^{\circ}\text{C}$)

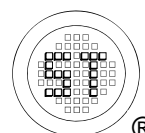
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current	I_D	4.2	A
Pulsed Drain Current ¹⁾	I_{DM}	20	A
Power Dissipation	P_D	1.25	W
Operating Junction Temperature Range	T_J	- 55 to + 150	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	- 55 to + 150	$^{\circ}\text{C}$

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance-Junction to Ambient ²⁾ $t < 10$ s	$R_{\theta JA}$	100	$^{\circ}\text{C/W}$
Thermal Resistance-Junction to Ambient ²⁾ Steady State		120	$^{\circ}\text{C/W}$

¹⁾ Pulse Test: Pulse Width ≤ 100 μs , Duty Cycle $\leq 2\%$.

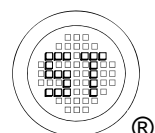
²⁾ $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as The solder mounting surface of the drain pins mounted on a 1 inch FR-4 with 2oz. square pad of copper.



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Characteristics at $T_a = 25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at $I_D = 250\ \mu\text{A}$	$V_{(BR)DSS}$	30	-	-	V
Zero Gate Voltage Drain Current at $V_{DS} = 30\ \text{V}$ at $V_{DS} = 30\ \text{V}$, $T_j = 55^\circ\text{C}$	I_{DSS}	- -	- -	1 5	μA
Gate-Source Leakage at $V_{GS} = \pm 10\ \text{V}$	I_{GSS}	-	-	± 10	μA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	$V_{GS(th)}$	0.4	-	1.2	V
Drain-Source On-State Resistance at $V_{GS} = 10\ \text{V}$, $I_D = 4.2\ \text{A}$ at $V_{GS} = 4.5\ \text{V}$, $I_D = 3.5\ \text{A}$ at $V_{GS} = 2.5\ \text{V}$, $I_D = 2.8\ \text{A}$	$R_{DS(on)}$	- - -	- - -	42 48 55	$\text{m}\Omega$
DYNAMIC PARAMETERS					
Gate resistance at $V_{DS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	R_g	-	1.5	-	$\text{k}\Omega$
Input Capacitance at $V_{DS} = 15\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	C_{iss}	-	387	-	pF
Output Capacitance at $V_{DS} = 15\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	C_{oss}	-	37	-	pF
Reverse Transfer Capacitance at $V_{DS} = 15\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	C_{rss}	-	10	-	pF
Gate charge total at $V_{DS} = 15\ \text{V}$, $I_D = 4.2\ \text{A}$, $V_{GS} = 10\ \text{V}$ at $V_{DS} = 15\ \text{V}$, $I_D = 4.2\ \text{A}$, $V_{GS} = 4.5\ \text{V}$	Q_g	- -	14.5 7	- -	nC
Gate to Source Charge at $V_{DS} = 15\ \text{V}$, $I_D = 4.2\ \text{A}$, $V_{GS} = 10\ \text{V}$	Q_{gs}	-	1.2	-	nC
Gate to Drain Charge at $V_{DS} = 15\ \text{V}$, $I_D = 4.2\ \text{A}$, $V_{GS} = 10\ \text{V}$	Q_{gd}	-	2.7	-	nC
Turn-On Delay Time at $V_{DD} = 15\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 1\ \text{A}$, $R_G = 1\ \Omega$	$t_{d(on)}$	-	1138	-	ns
Turn-On Rise Time at $V_{DD} = 15\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 1\ \text{A}$, $R_G = 1\ \Omega$	t_r	-	68	-	ns
Turn-Off Delay Time at $V_{DD} = 15\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 1\ \text{A}$, $R_G = 1\ \Omega$	$t_{d(off)}$	-	892	-	ns
Turn-Off Fall Time at $V_{DD} = 15\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 1\ \text{A}$, $R_G = 1\ \Omega$	t_f	-	99	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $I_S = 1\ \text{A}$	V_{SD}	-	-	1.2	V
Body-Diode Continuous Current	I_S	-	-	4.2	A
Body Diode Reverse Recovery Time at $I_S = 4.2\ \text{A}$, $di/dt = 100\ \text{A} / \mu\text{s}$	t_{rr}	-	607	-	ns
Body Diode Reverse Recovery Charge at $I_S = 4.2\ \text{A}$, $di/dt = 100\ \text{A} / \mu\text{s}$	Q_{rr}	-	3.3	-	μC



Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

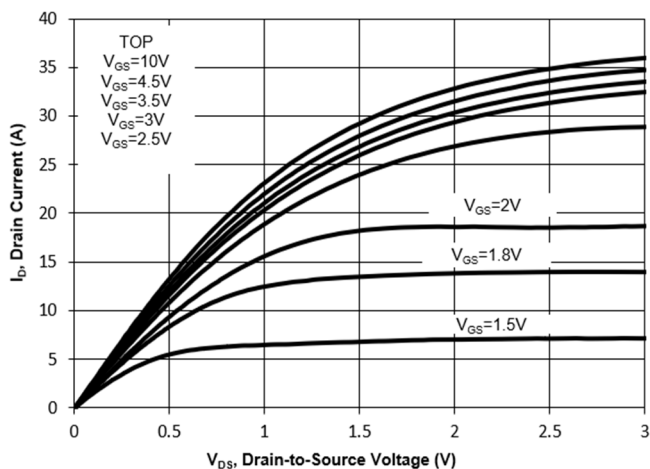


Fig. 2 Typical Transfer Characteristic

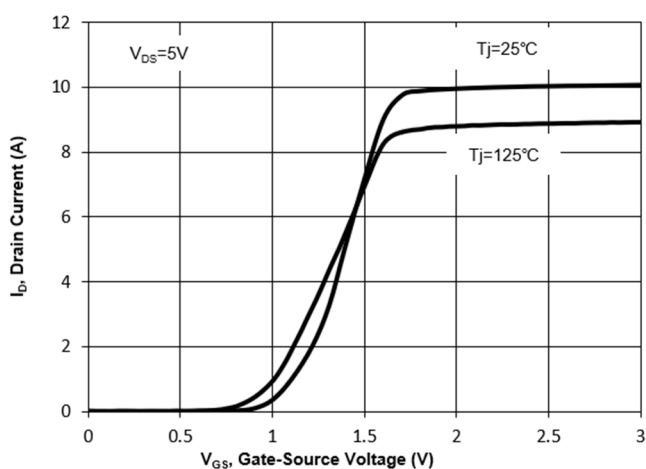


Fig. 3 on-Resistance vs. Drain Current

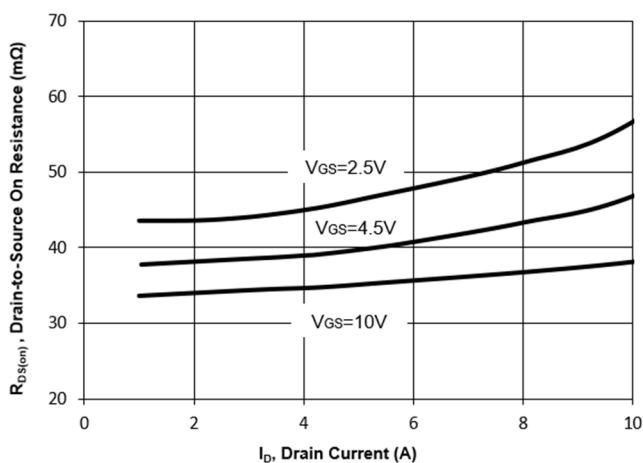


Fig. 4 on-Resistance vs. Gate Voltage

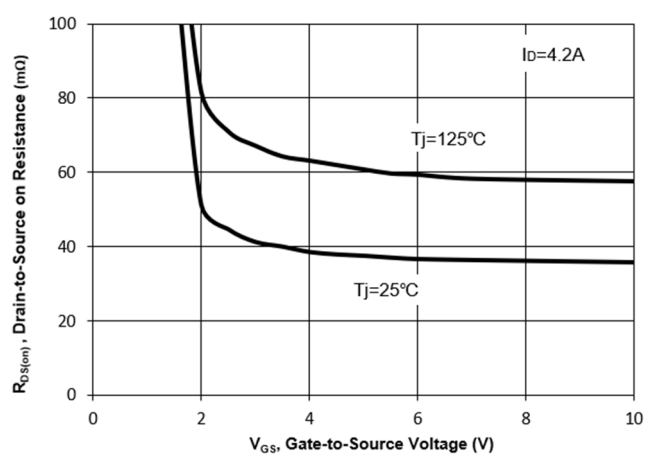


Fig. 5 on-Resistance vs. Tj

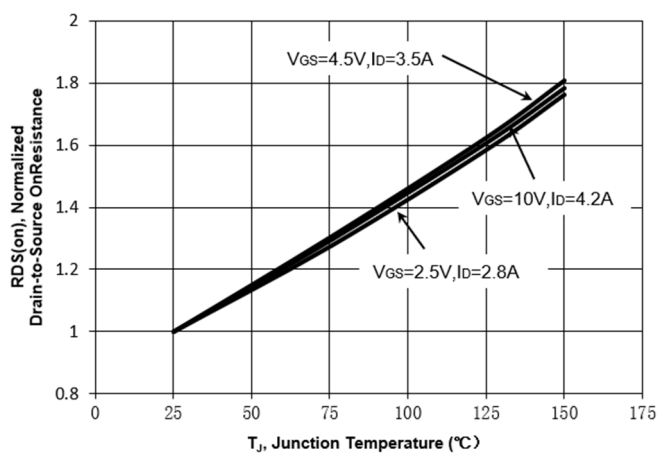
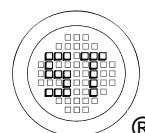
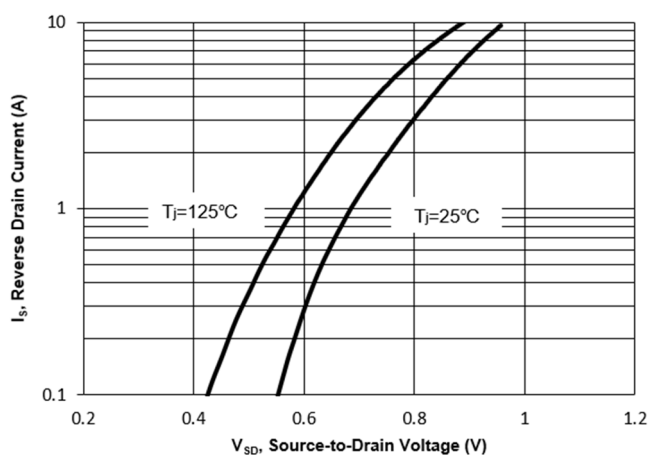


Fig. 6 Typical Forward Characteristic



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

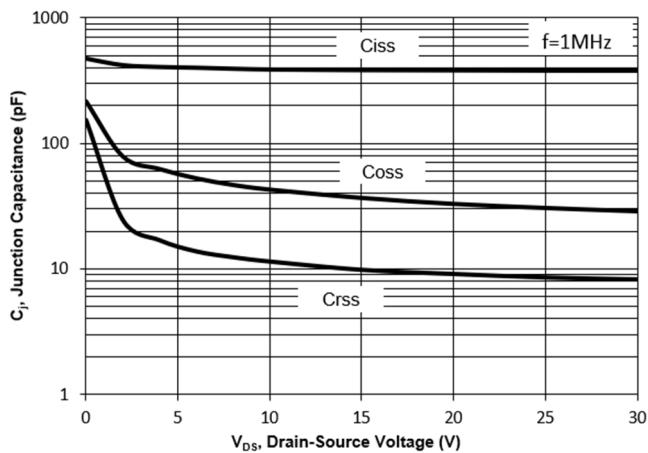


Fig. 8 Drain-Source Leakage Current vs. T_j

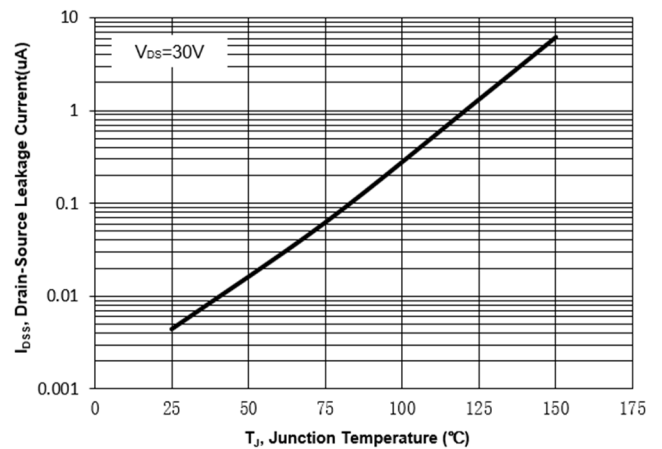


Fig. 9 V_{(BR)DSS} vs. Junction Temperature

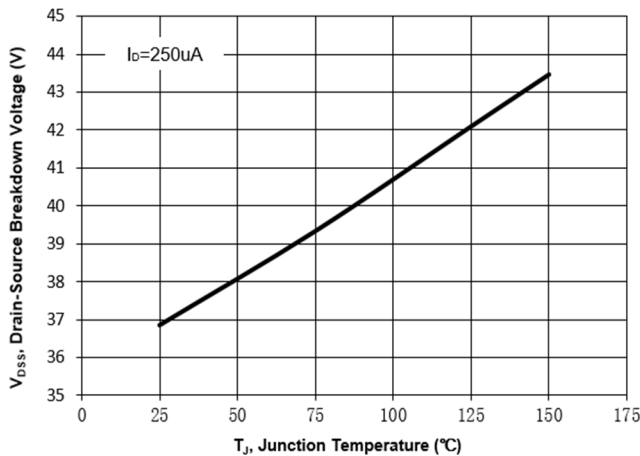


Fig. 10 Gate Threshold Variation vs. T_j

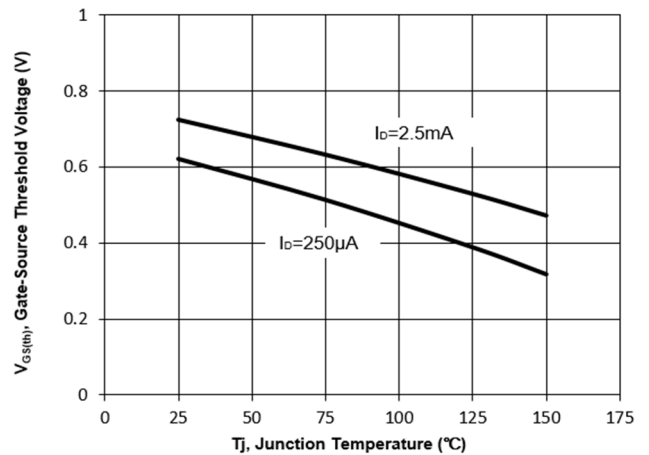


Fig. 11 Gate Charge

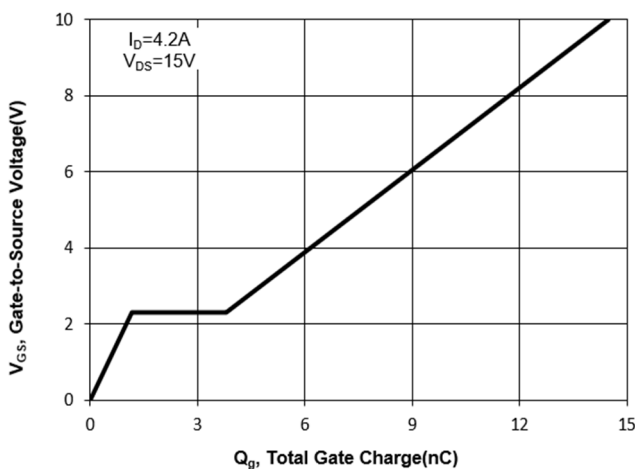
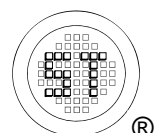
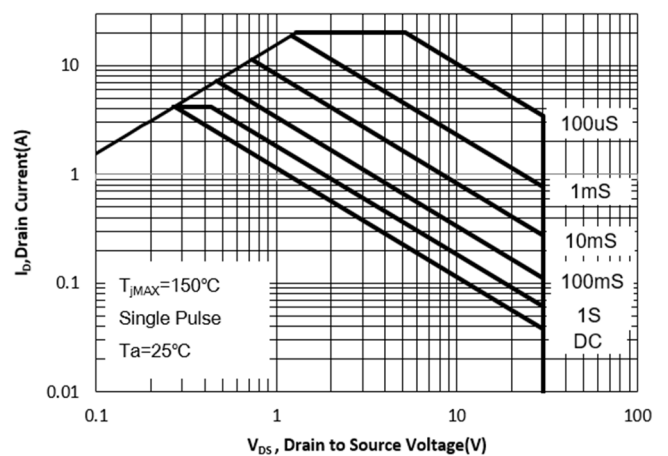


Fig. 12 Safe Operation Area



Test Circuits

Fig.1-1 Switching times test circuit

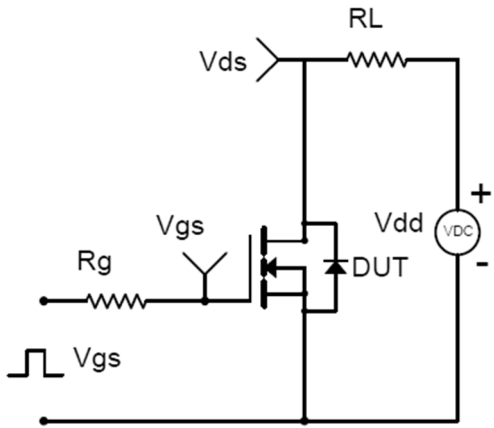


Fig.1-2 Switching Waveform

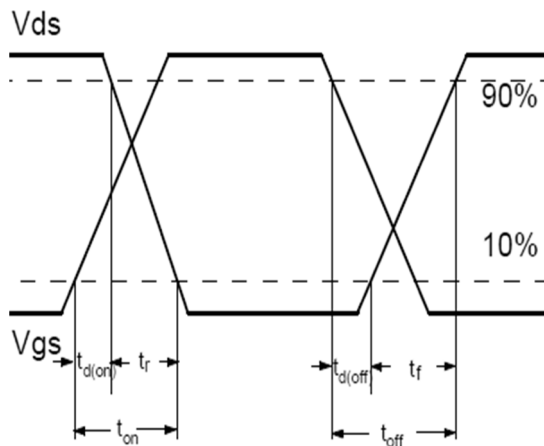


Fig.2-1 Gate charge test circuit

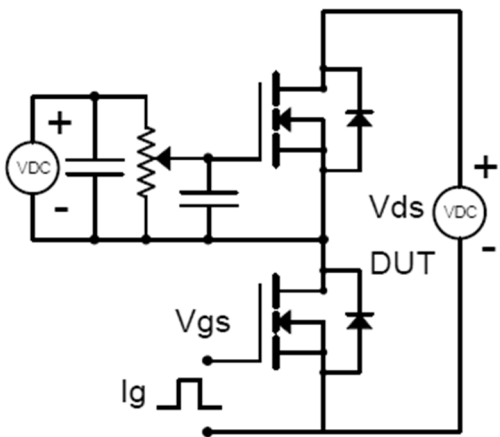
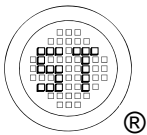
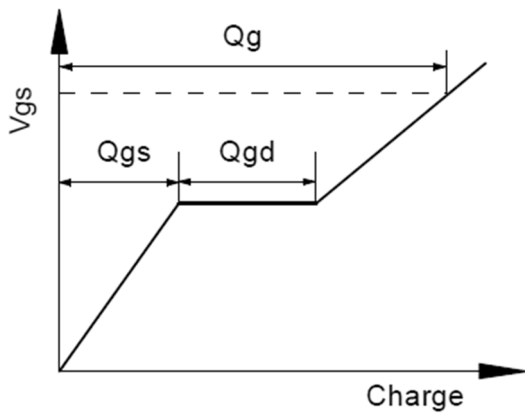


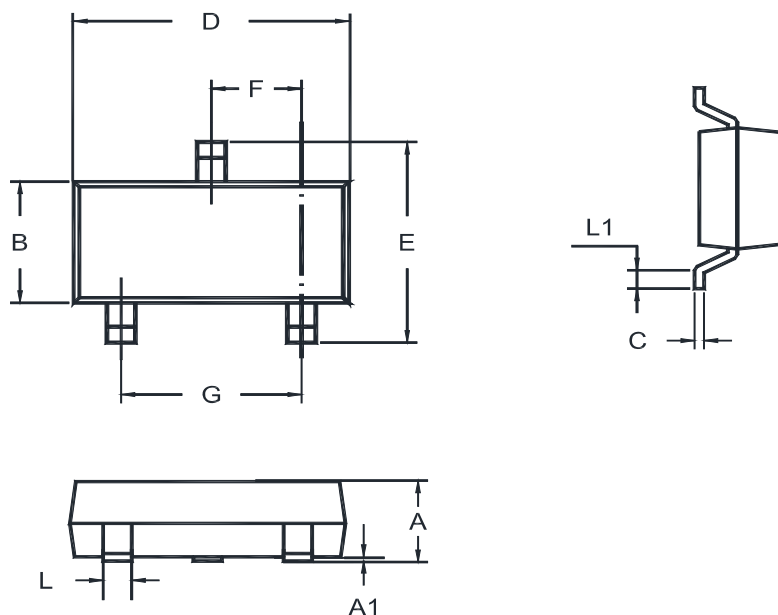
Fig.2-2 Gate charge waveform



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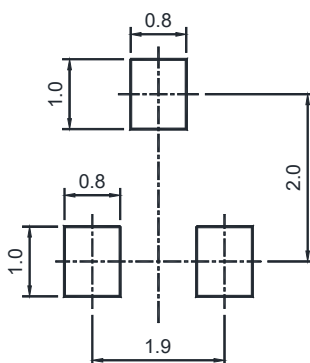
Package Outline (Dimensions in mm)

TO-236



Unit	A	A1	B	C	D	E	F	G	L	L1
mm	1.20 0.89	0.100 0.013	1.40 1.20	0.19 0.08	3.04 2.80	2.6 2.2	1.02 0.89	2.04 1.78	0.51 0.37	0.2 MIN

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

" EG " = Part No.

" • " = HAF (Halogen and Antimony Free)

" YM " = Date Code Marking

" Y " = Year

" M " = Month

Font type: Arial

