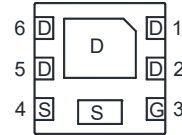
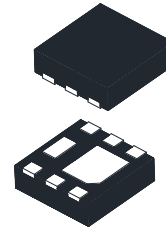
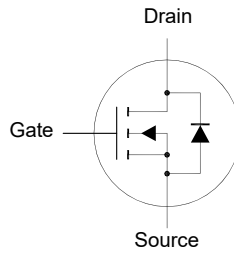


# MMFTN3016SMP-CH

## N-Channel Enhancement Mode Power MOSFET

### Features

- AEC-Q101 Qualified
- Ideal for Low Profile Applications
- Low On-Resistance
- Low Gate Threshold Voltage
- Halogen and Antimony Free(HAF), RoHS compliant



1. Drain 2. Drain 3. Gate  
4. Source 5. Drain 6. Drain  
DFN2020-6HMA Plastic Package

### Applications

- Battery Management Application
- Power Management Functions
- DC-DC Converters

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current at $V_{GS} = 10\text{ V}$ , Steady State	$I_D$	10 8	A
Drain Current at $V_{GS} = 10\text{ V}$ , $t < 10\text{ s}$	$I_D$	12 9	A
Pulsed Drain Current <sup>1)</sup>	$I_{DM}$	50	A
Avalanche Current	$I_{AS}$	20	A
Single Pulse Avalanche Energy <sup>4)</sup>	$E_{AS}$	20	mJ
Total Power Dissipation <sup>2)</sup>	$P_{tot}$	1.4 0.85	W
Operating Junction and Storage Temperature Range	$T_j, T_{stg}$	- 55 to + 150	$^\circ\text{C}$

### Thermal Characteristics

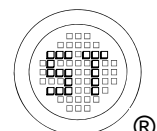
Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient <sup>2)</sup> Steady State $t < 10\text{ s}$	$R_{\theta JA}$	90 75	$^\circ\text{C/W}$
Thermal Resistance from Junction to Ambient <sup>3)</sup> Steady State $t < 10\text{ s}$	$R_{\theta JA}$	125 100	$^\circ\text{C/W}$

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

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

<sup>3)</sup> Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

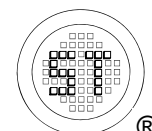
<sup>4)</sup> Limited by  $T_{J(\text{MAX})}$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.1\text{ mH}$ ,  $R_g = 25\ \Omega$ ,  $I_{AS} = 20\text{A}$ ,  $V_{GS} = 10\text{ V}$ .



# MMFTN3016SMP-CH

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

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 $V_{GS} = \pm 20 \text{ V}$	$I_{GSS}$	-	-	$\pm 100$	nA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	$V_{GS(th)}$	1	-	2	V
Drain-Source On-State Resistance at $V_{GS} = 10 \text{ V}$ , $I_D = 11 \text{ A}$ at $V_{GS} = 4.5 \text{ V}$ , $I_D = 9 \text{ A}$	$R_{DS(on)}$	- -	- -	12 16	m $\Omega$
<b>DYNAMIC PARAMETERS</b>					
Gate resistance at $V_{DS} = 0 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	$R_g$	-	1.8	-	$\Omega$
Input Capacitance at $V_{DS} = 15 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{iss}$	-	1128	-	pF
Output Capacitance at $V_{DS} = 15 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{oss}$	-	151	-	pF
Reverse Transfer Capacitance at $V_{DS} = 15 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{rss}$	-	106	-	pF
Total Gate Charge at $V_{DS} = 15 \text{ V}$ , $I_D = 10 \text{ A}$ , $V_{GS} = 10 \text{ V}$ at $V_{DS} = 15 \text{ V}$ , $I_D = 10 \text{ A}$ , $V_{GS} = 4.5 \text{ V}$	$Q_g$	- -	25 11	- -	nC
Gate to Source Charge at $V_{DS} = 15 \text{ V}$ , $I_D = 10 \text{ A}$ , $V_{GS} = 10 \text{ V}$	$Q_{gs}$	-	5.1	-	nC
Gate to Drain Charge at $V_{DS} = 15 \text{ V}$ , $I_D = 10 \text{ A}$ , $V_{GS} = 10 \text{ V}$	$Q_{gd}$	-	6.5	-	nC
Turn-On Delay Time at $V_{DD} = 15 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 10 \text{ A}$ , $R_G = 4.7 \Omega$	$t_{d(on)}$	-	15.8	-	ns
Turn-On Rise Time at $V_{DD} = 15 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 10 \text{ A}$ , $R_G = 4.7 \Omega$	$t_r$	-	72.5	-	ns
Turn-Off Delay Time at $V_{DD} = 15 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 10 \text{ A}$ , $R_G = 4.7 \Omega$	$t_{d(off)}$	-	15.5	-	ns
Turn-Off Fall Time at $V_{DD} = 15 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 10 \text{ A}$ , $R_G = 4.7 \Omega$	$t_f$	-	22	-	ns
<b>Body-Diode PARAMETERS</b>					
Drain-Source Diode Forward Voltage at $I_S = 1 \text{ A}$ , $V_{GS} = 0 \text{ V}$	$V_{SD}$	-	0.8	1.2	V
Body-Diode Continuous Current	$I_S$	-	-	10	A
Body Diode Reverse Recovery Time at $I_S = 10 \text{ A}$ , $di/dt = 100 \text{ A} / \mu\text{s}$	$t_{rr}$	-	11	-	ns
Body Diode Reverse Recovery Charge at $I_S = 10 \text{ A}$ , $di/dt = 100 \text{ A} / \mu\text{s}$	$Q_{rr}$	-	3.2	-	nc



# MMFTN3016SMP-CH

## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

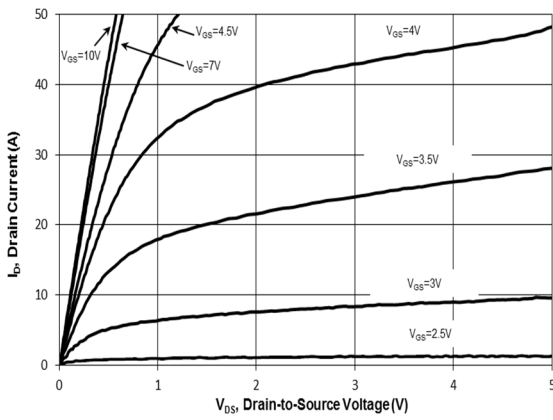


Fig. 2 Typical Transfer Characteristics

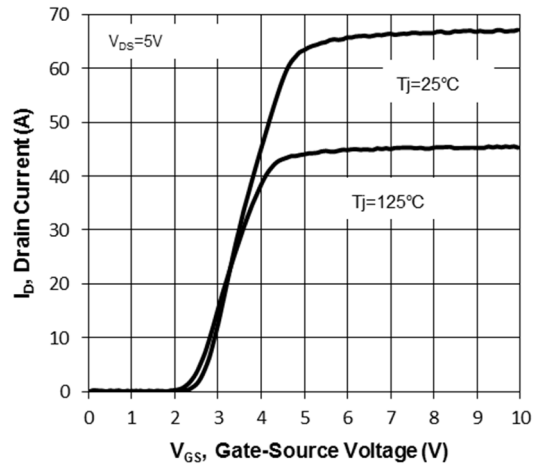


Fig. 3  $R_{DS(on)}$  vs. Gate-Source Voltage

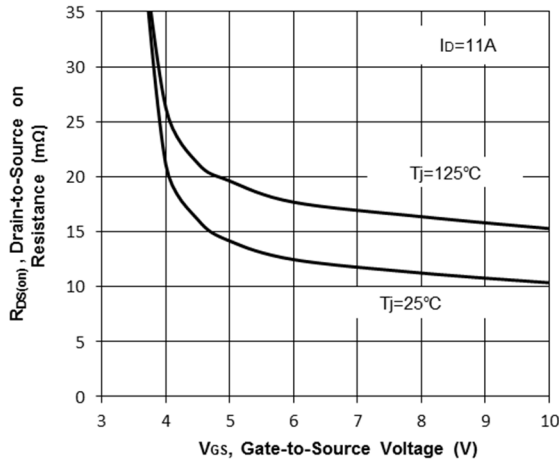


Fig. 4 on-Resistance vs.  $T_J$

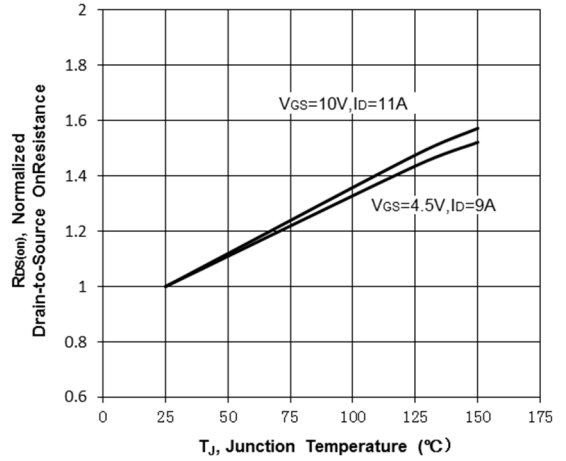


Fig. 5 on-Resistance vs. Drain Current

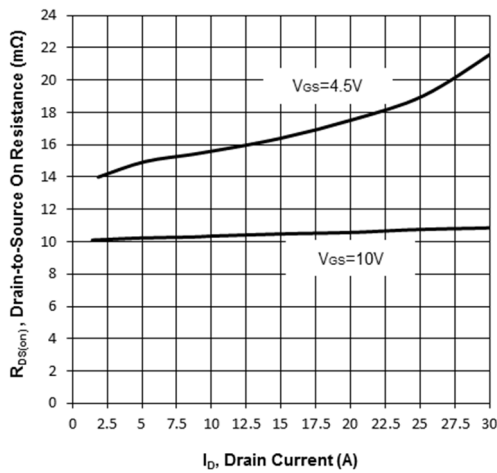
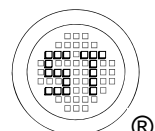
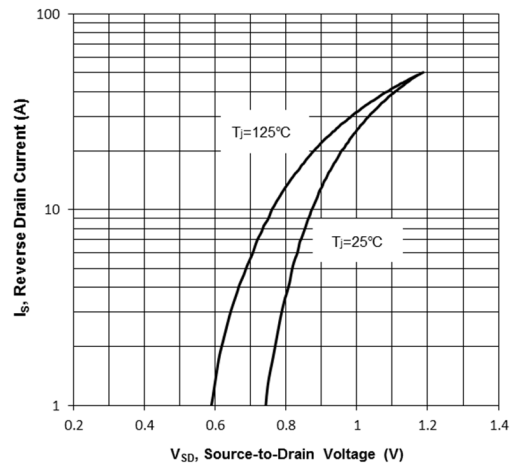


Fig. 6 Forward Characteristics



# MMFTN3016SMP-CH

## Electrical Characteristics Curves

Fig. 7 Junction Capacitance

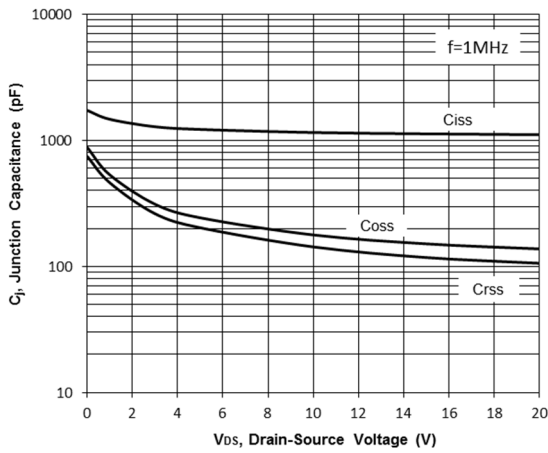


Fig. 8 Gate Charge

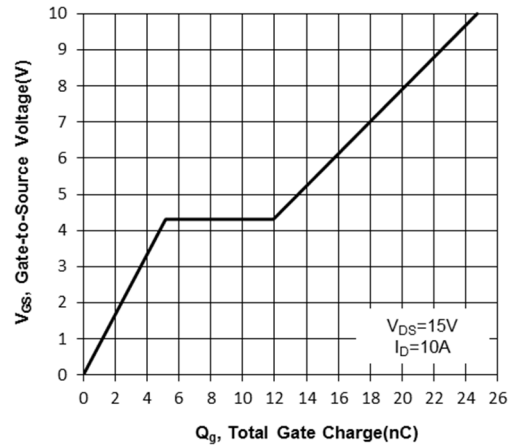


Fig. 9 Gate Threshold Variation vs.  $T_J$

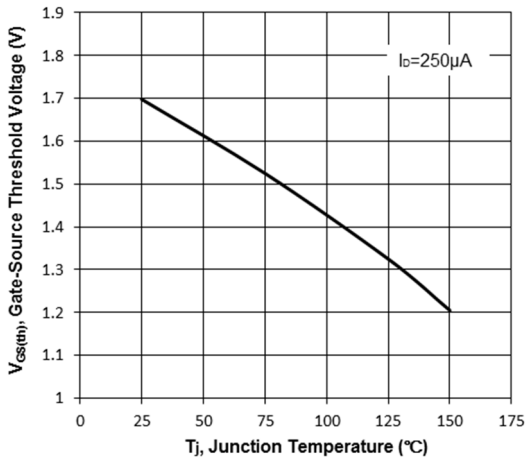


Fig. 10 Drain Leakage Current vs.  $T_J$

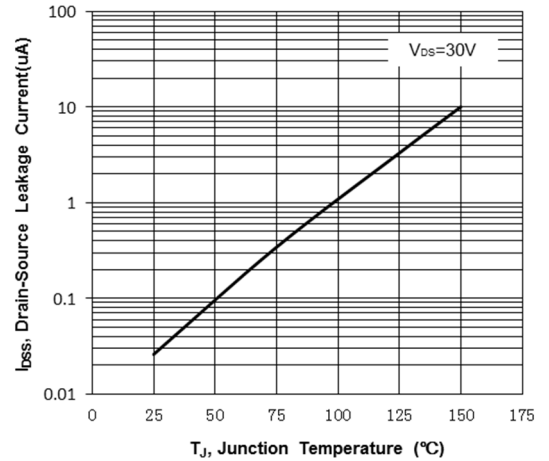


Fig.11  $B_{VDS}$  vs. Temperature

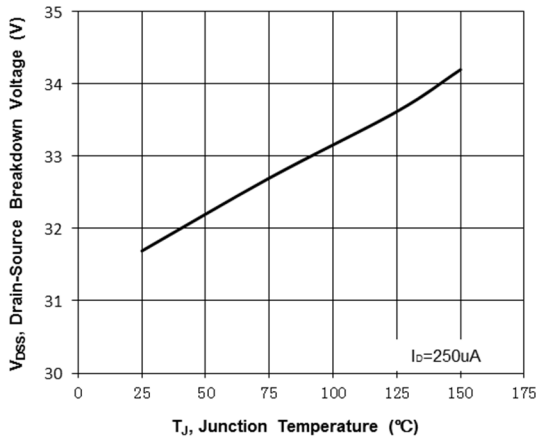
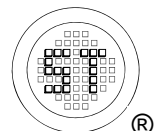
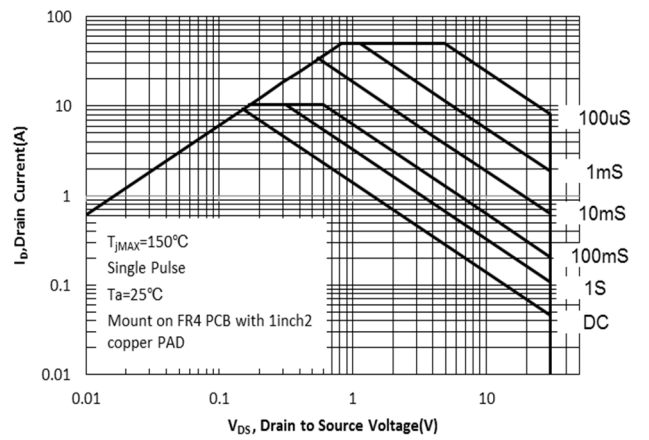


Fig.12 SOA, safe Operation Area



## Electrical Characteristics Curves

Fig.13 Transient Thermal Resistance

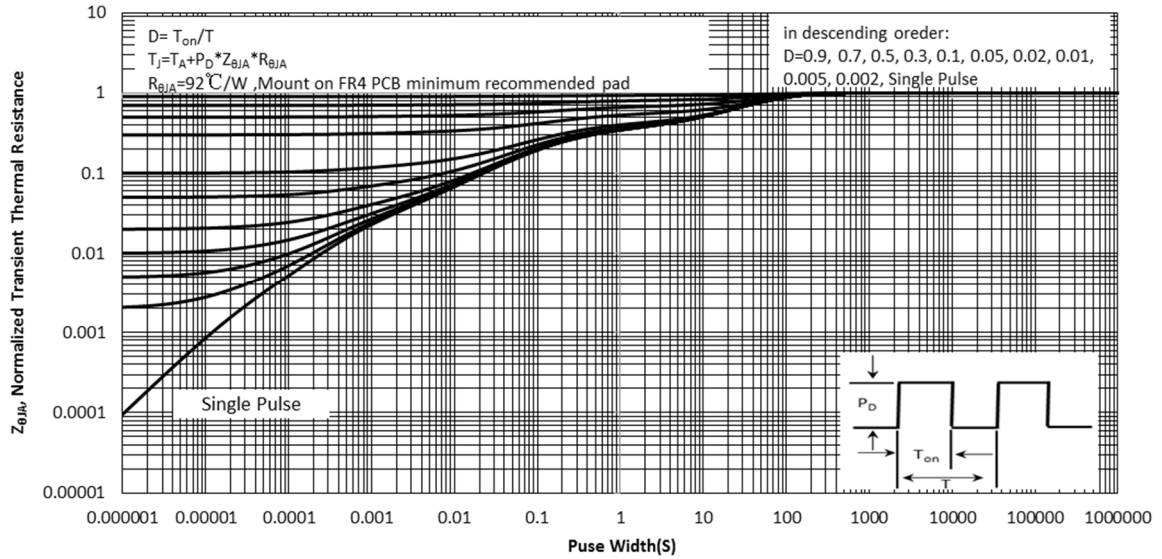
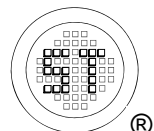
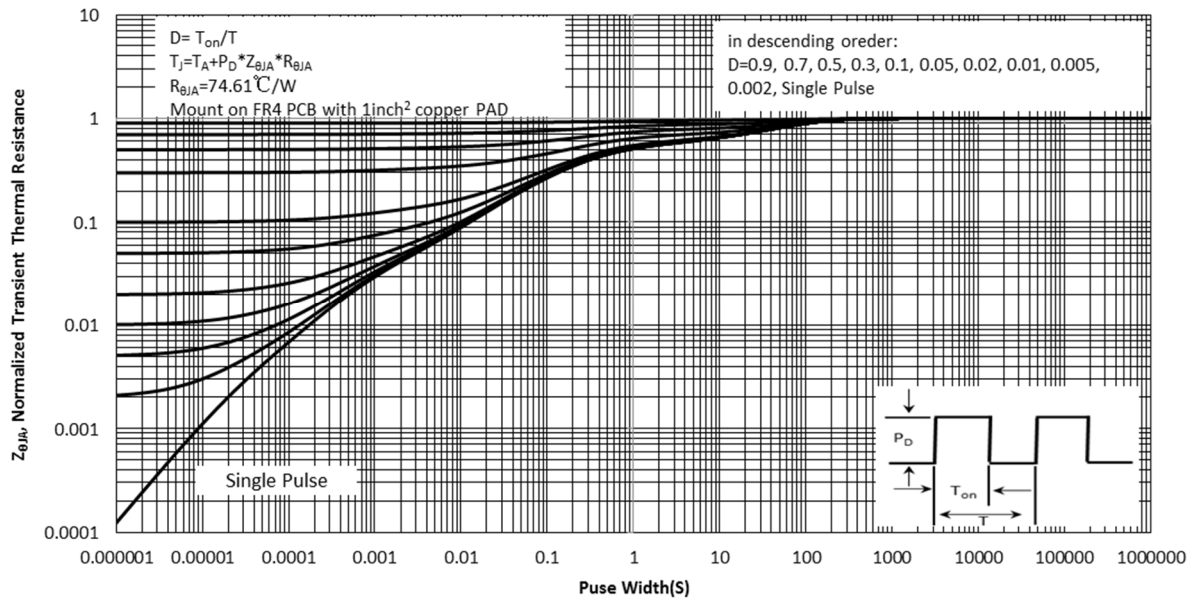


Fig.14 Transient Thermal Resistance



## Test Circuits

Fig.1-1 Switching times test circuit

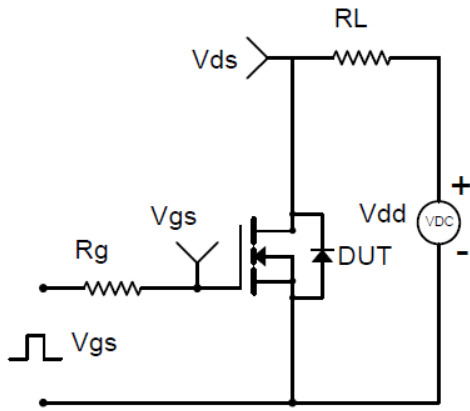


Fig.1-2 Switching Waveform

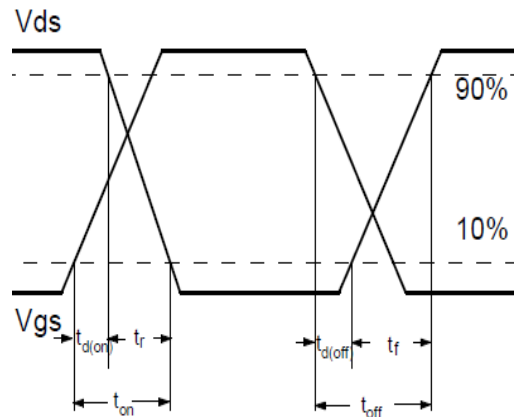


Fig.2-1 Gate charge test circuit

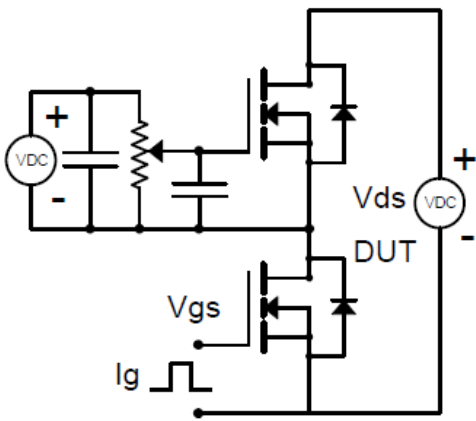


Fig.2-2 Gate charge waveform

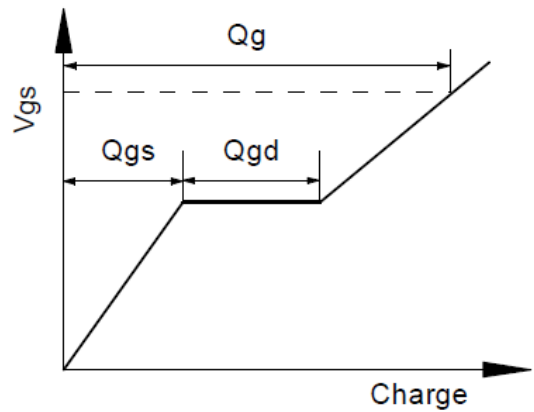


Fig.3-1 Avalanche test circuit

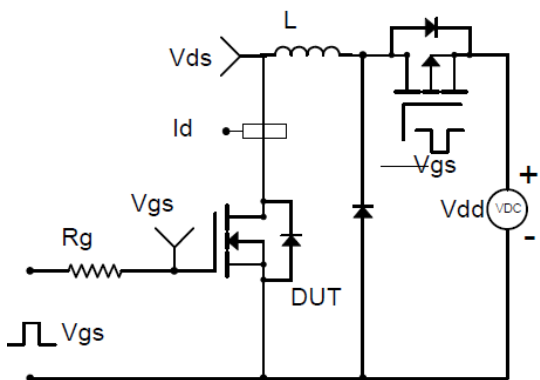
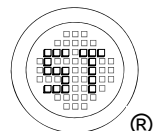
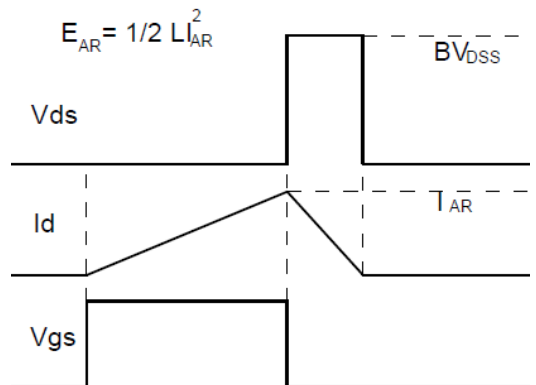


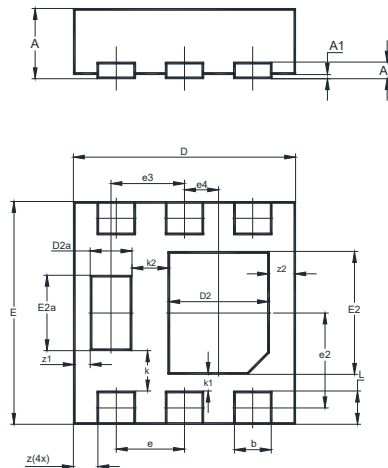
Fig.3-2 Avalanche waveform



# MMFTN3016SMP-CH

Package Outline Dimensions (Units: mm)

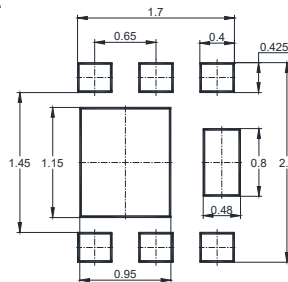
DFN2020-6HMA



UNIT	A	A1	A3	b	D	D2	D2a	E	E2	E2a	L
mm	0.55 0.65	0 0.05	0.15 Typ.	0.25 0.35	1.95 2.05	0.85 1.05	0.33 0.43	1.95 2.05	1.05 1.25	0.65 0.75	0.225 0.325

UNIT	e	e2	e3	e4	k	k1	k2	z	z1	z2
mm	0.65 BSC	0.863 BSC	0.7 BSC	0.325 BSC	0.37 BSC	0.15 BSC	0.36 BSC	0.2 BSC	0.11 BSC	0.2 BSC

## Recommended Soldering Footprint



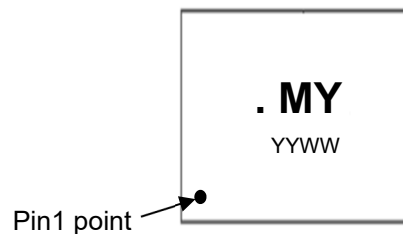
## Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
DFN2020-6HMA	8	4 ± 0.1	0.157 ± 0.004	178	7	4,000

## Marking information

- " MY " = Part No.
- " • " = HAF (Halogen and Antimony Free)
- " YYWW " = Date Code Marking
- " Y " = Year (ex: 19 = 2019)
- " W " = Week (ex: 09 = the 9th week of the year)

Font type: Arial



Disclaimer: Our company reserve the right to make modifications, enhancements, improvements, corrections or other changes to improve product design, functions and reliability, anytime without notice. Semtech Electronics Limited makes no warranties, representations or warranties regarding the suitability of its products for any particular purpose, and does not accept any liability arising from the application or use of any product or circuit such as: Apply to medical, military, aircraft, space or life support equipment and expressly waive any and all liability, including but not limited to special, consequential or collateral damage.

