

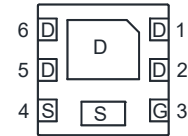
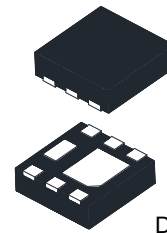
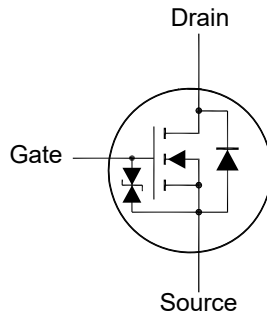
# MMV06N040LSZK

## N-Channel Enhancement Mode MOSFET

### Features

- Surface-mounted package
- Built-in G-S Protection Diode
- 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. Drain 2. Drain 3. Gate  
4. Source 5. Drain 6. Drain  
DFN2020-6HMA Plastic Package

### Applications

- Portable appliances
- Battery management

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

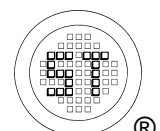
Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current	$I_D$	6	A
Peak Drain Current, Pulsed <sup>1)</sup>	$I_{DM}$	30	A
Total Power Dissipation <sup>2)</sup> $t \leq 10$ s	$P_{tot}$	2.8	W
Operating Junction and Storage Temperature Range	$T_j, T_{stg}$	- 55 to + 150	$^\circ\text{C}$

### Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction to Ambient <sup>2)</sup> $t \leq 10$ s Steady State	$R_{\theta JA}$	45 80	$^\circ\text{C/W}$

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

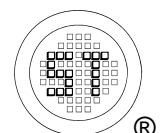
<sup>2)</sup> Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air.



# MMV06N040LSZK

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 $I_D = 250 \mu\text{A}$	$V_{(BR)DSS}$	60	-	-	V
Drain-Source Leakage Current at $V_{DS} = 48 \text{ V}$	$I_{DSS}$	-	-	1	$\mu\text{A}$
Gate-Source Leakage Current at $V_{GS} = \pm 20 \text{ V}$	$I_{GSS}$	-	-	$\pm 10$	$\mu\text{A}$
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	$V_{GS(th)}$	1.2	-	2.5	V
Drain-Source On-State Resistance at $V_{GS} = 10 \text{ V}, I_D = 6 \text{ A}$ at $V_{GS} = 4.5 \text{ V}, I_D = 4 \text{ A}$	$R_{DS(on)}$	- -	- -	40 50	$\text{m}\Omega$
<b>DYNAMIC PARAMETERS</b>					
Forward Transconductance at $V_{DS} = 4.5 \text{ V}, I_D = 4 \text{ A}$	$g_{FS}$	-	8.4	-	S
Gate resistance at $V_{DS} = 0 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	$R_g$	-	0.8	-	$\Omega$
Input Capacitance at $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	$C_{iss}$	-	1087	-	pF
Output Capacitance at $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	$C_{oss}$	-	47	-	pF
Reverse Transfer Capacitance at $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	$C_{rss}$	-	43	-	pF
Total Gate Charge at $V_{DS} = 30 \text{ V}, I_D = 6 \text{ A}, V_{GS} = 10 \text{ V}$ at $V_{DS} = 30 \text{ V}, I_D = 6 \text{ A}, V_{GS} = 4.5 \text{ V}$	$Q_g$	- -	19 8.6	- -	nC
Gate to Source Charge at $V_{DS} = 30 \text{ V}, I_D = 6 \text{ A}, V_{GS} = 10 \text{ V}$	$Q_{gs}$	-	4.7	-	nC
Gate to Drain Charge at $V_{DS} = 30 \text{ V}, I_D = 6 \text{ A}, V_{GS} = 10 \text{ V}$	$Q_{gd}$	-	2.6	-	nC
Turn-On Delay Time at $V_{DS} = 30 \text{ V}, I_D = 6 \text{ A}, V_{GS} = 10 \text{ V}, R_G = 3.3 \Omega$	$t_{d(on)}$	-	10	-	ns
Turn-On Rise Time at $V_{DS} = 30 \text{ V}, I_D = 6 \text{ A}, V_{GS} = 10 \text{ V}, R_G = 3.3 \Omega$	$t_r$	-	21	-	ns
Turn-Off Delay Time at $V_{DS} = 30 \text{ V}, I_D = 6 \text{ A}, V_{GS} = 10 \text{ V}, R_G = 3.3 \Omega$	$t_{d(off)}$	-	9	-	ns
Turn-Off Fall Time at $V_{DS} = 30 \text{ V}, I_D = 6 \text{ A}, V_{GS} = 10 \text{ V}, R_G = 3.3 \Omega$	$t_f$	-	2	-	ns
<b>Body-Diode PARAMETERS</b>					
Drain-Source Diode Forward Voltage at $I_S = 1 \text{ A}$	$V_{SD}$	-	-	1.2	V
Body-Diode Continuous Current	$I_S$	-	-	6	A
Body Diode Reverse Recovery Time at $I_S = 6 \text{ A}, di/dt = 100 \text{ A} / \mu\text{s}$	$t_{rr}$	-	8.3	-	ns
Body Diode Reverse Recovery Charge at $I_S = 6 \text{ A}, di/dt = 100 \text{ A} / \mu\text{s}$	$Q_{rr}$	-	4.9	-	nC



## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

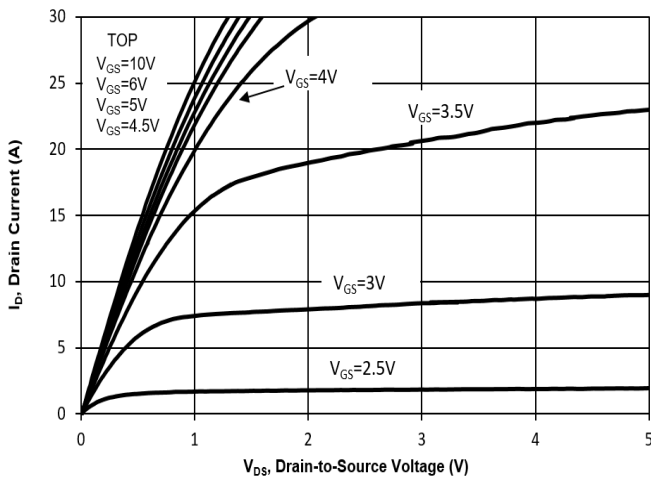


Fig. 2 Typical Transfer Characteristics

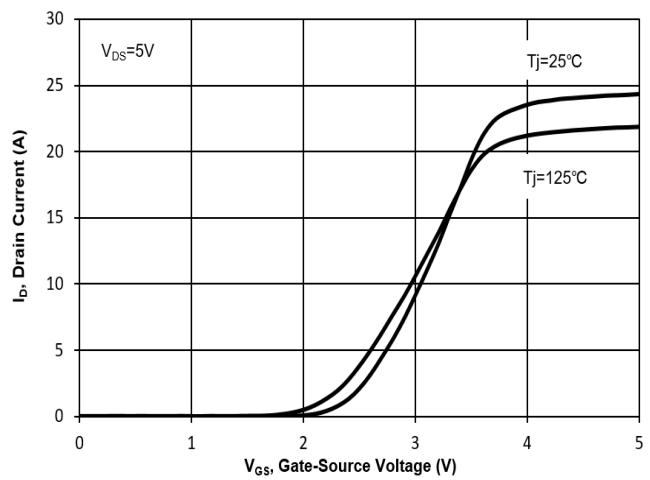


Fig. 3 On-Resistance vs. Drain Current

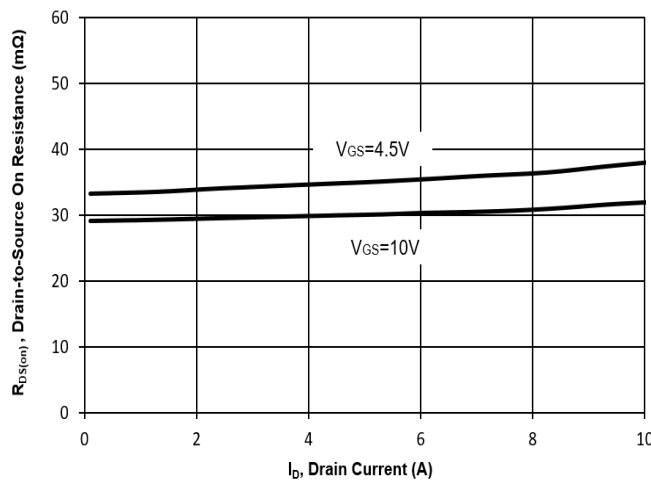


Fig. 4 On-Resistance vs. Gate-Source Voltage

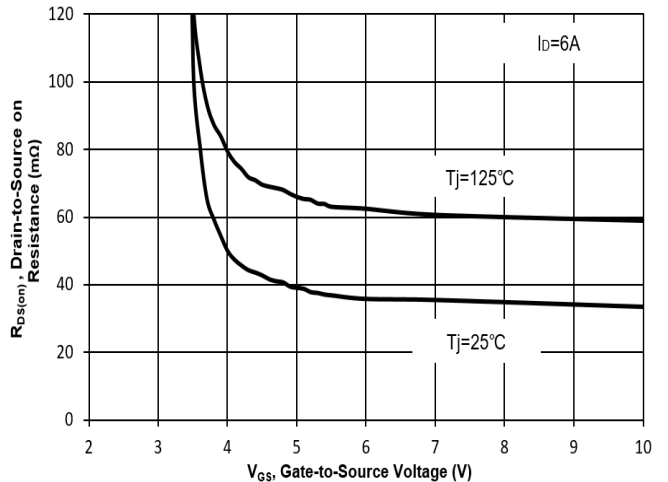


Fig. 5 On-Resistance vs. Tj

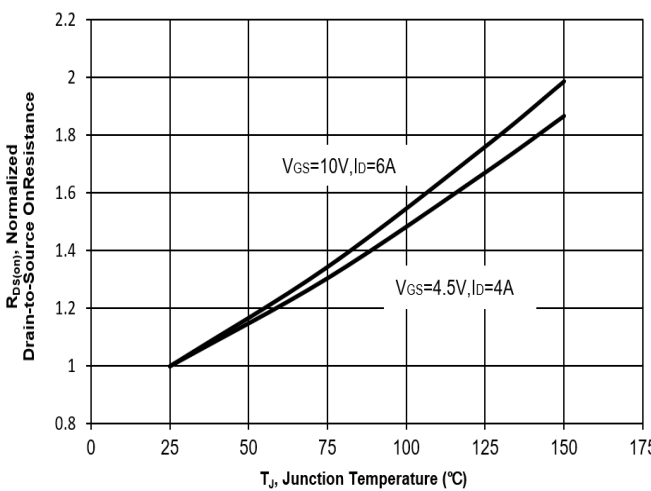
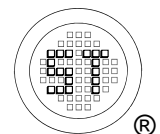
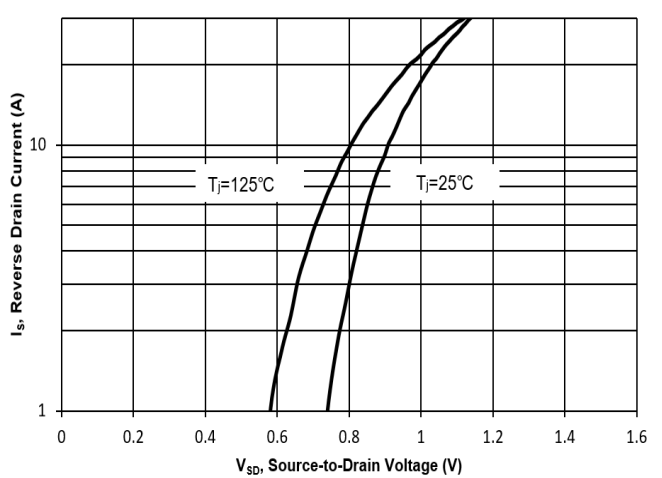


Fig. 6 Typical Body-Diode Forward Characteristics



## Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

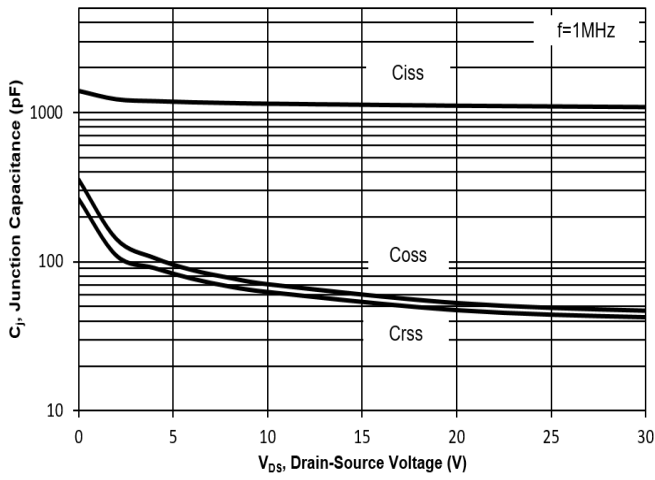


Fig. 8 Drain-Source Leakage Current vs.  $T_j$

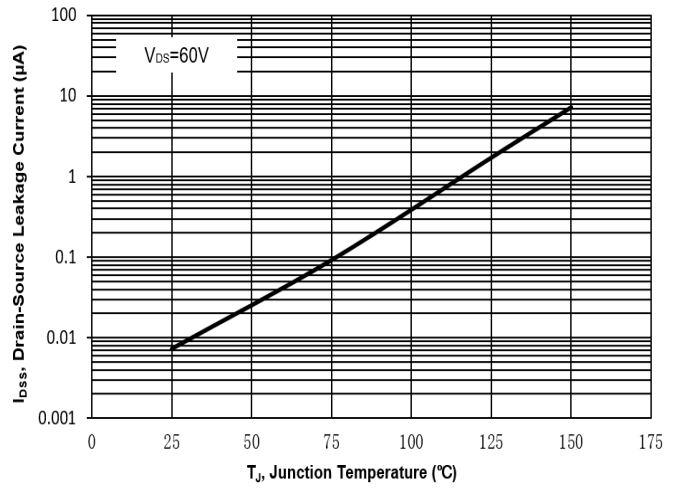


Fig. 9  $V_{(BR)DSS}$  vs. Junction Temperature

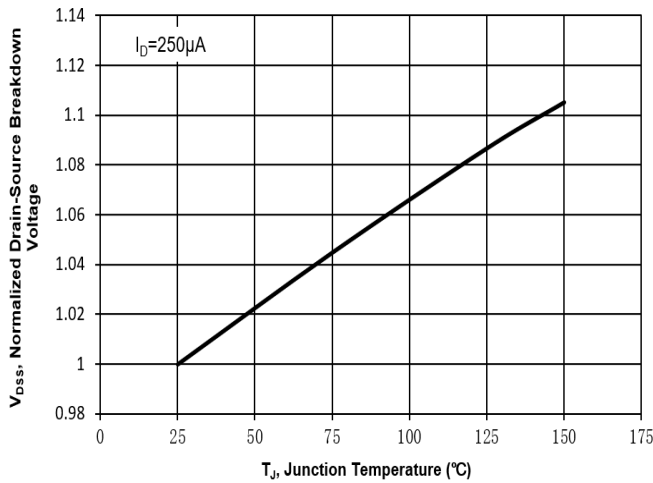


Fig. 10 Gate Threshold Variation vs.  $T_j$

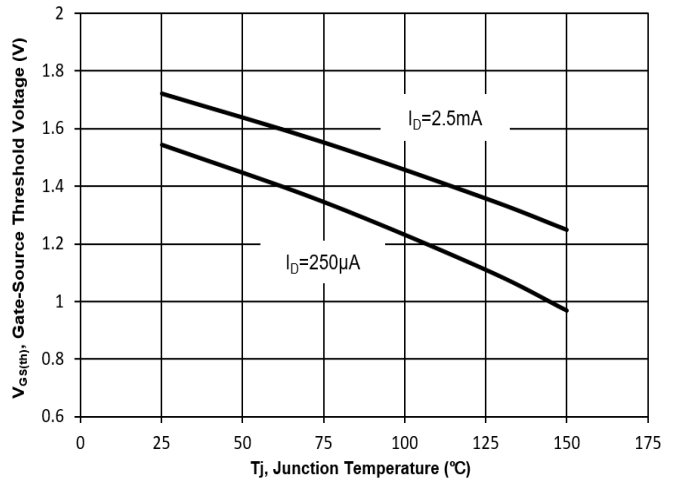
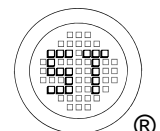
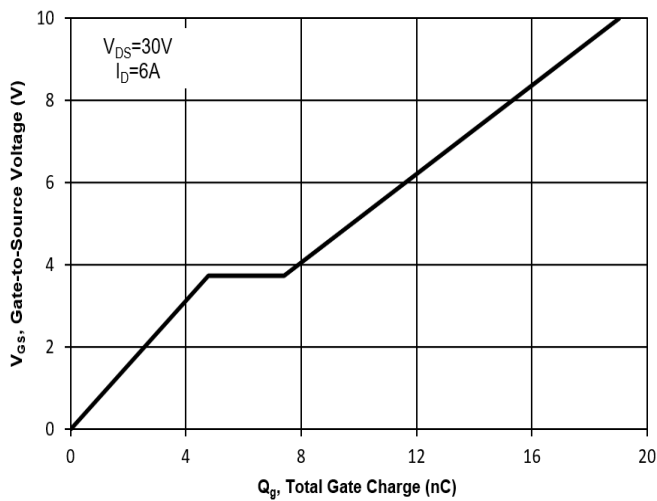


Fig. 11 Gate Charge



## Test Circuits

Fig.1-1 Switching times test circuit

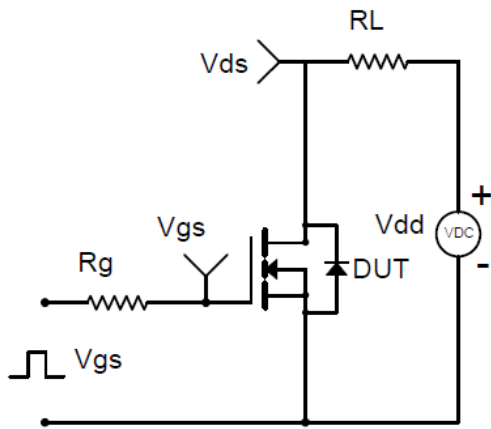


Fig.1-2 Switching Waveform

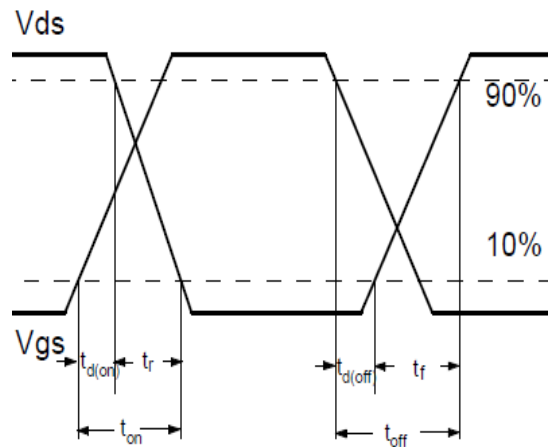


Fig.2-1 Gate charge test circuit

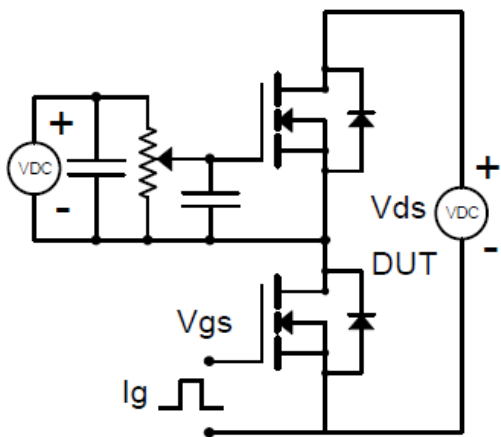
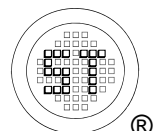
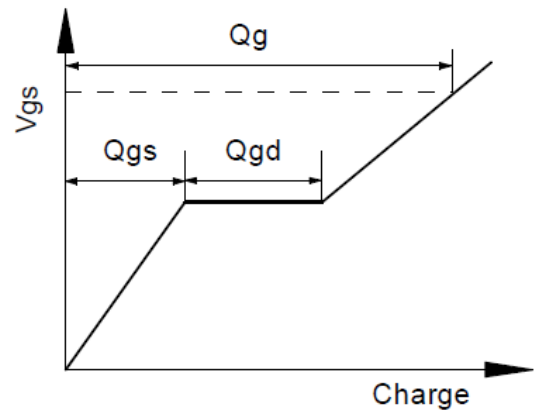


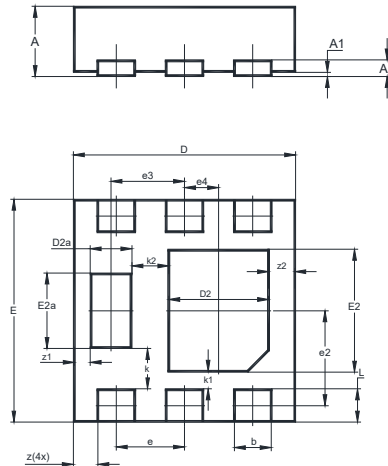
Fig.2-2 Gate charge waveform



# MMV06N040LSZK

## Package Outline Dimensions (Units: mm)

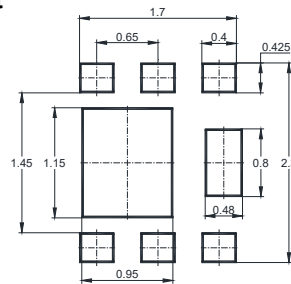
DFN2020-6HMA



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

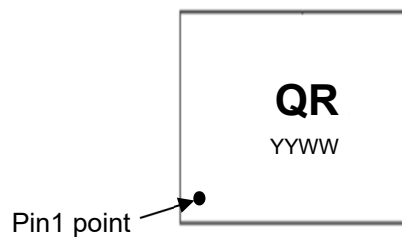


## Packing information

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

- " QR " = Part No.
  - " YYWW " = Date Code Marking
  - " Y " = Year (ex: 19 = 2019)
  - " W " = Week (ex: 09 = the 9th week of the year)
- Font type: Arial



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