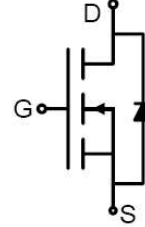


**N-Channel Enhancement Mosfet**

**Feature**

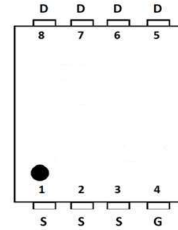
- 60V,20A  
 $R_{DS(ON)} < 29m\Omega @ V_{GS}=10V$  TYP:24 m $\Omega$   
 $R_{DS(ON)} < 33m\Omega @ V_{GS}=4.5V$  TYP:28.5 m $\Omega$
- Advanced Trench Technology
- Lead free product is acquired
- Excellent  $R_{DS(ON)}$  and Low Gate Charge



**Schematic Diagram**

**Application**

- PWM applications
- Load Switch
- Power management
- P/N suffix V means AEC-Q101 qualified, e.g:RM20N60D3V
- Halogen-free



**Pin Assignment**

**Package Marking and Ordering Information**

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
20N60	RM20N60D3V	DFN3X3	13 inch	-	5000

**ABSOLUTE MAXIMUM RATINGS ( $T_a=25^{\circ}C$  unless otherwise noted)**

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current ( $T_C=25^{\circ}C$ )	$I_D$	20	A
Continuous Drain Current ( $T_C=100^{\circ}C$ )	$I_D$	14	A
Pulsed Drain Current <sup>(1)</sup>	$I_{DM}$	60	A
Single Pulsed Avalanche Energy <sup>(2)</sup>	$E_{AS}$	34	mJ
Power Dissipation	$P_D$	20	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	7.2	$^{\circ}C/W$
Junction Temperature	$T_J$	150	$^{\circ}C$
Storage Temperature	$T_{STG}$	-55~ +150	$^{\circ}C$

## MOSFET ELECTRICAL CHARACTERISTICS( $T_a=25^{\circ}\text{C}$ unless otherwise noted)

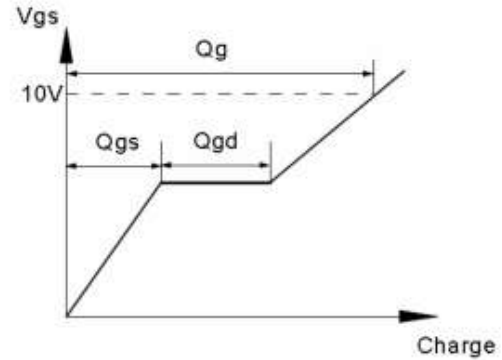
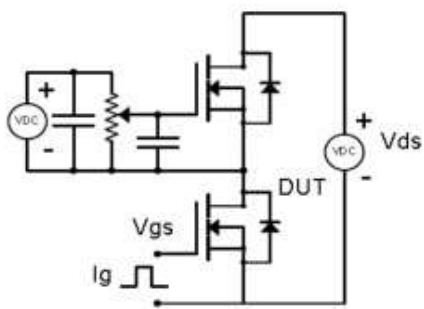
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	60	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 60V, V_{GS} = 0V$	-	-	1	$\mu A$
Gate-body leakage current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	$\pm 100$	nA
Gate threshold voltage <sup>(3)</sup>	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.1	1.6	2.2	V
Drain-source on-resistance <sup>(3)</sup>	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 15A$	-	24	29	m $\Omega$
		$V_{GS} = 4.5V, I_D = 10A$	-	28.5	33	
Forward tranconductance <sup>(3)</sup>	$g_{FS}$	$V_{DS} = 10V, I_D = 15A$	20	-	-	S
<b>Dynamic characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 25V, V_{GS} = 0V, f = 1MHz$	-	1090	-	pF
Output Capacitance	$C_{oss}$		-	56	-	
Reverse Transfer Capacitance	$C_{rss}$		-	47	-	
<b>Switching characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30V, I_D = 20A$ $V_{GS} = 10V, R_G = 1.8\Omega$	-	7.2	-	ns
Turn-on rise time	$t_r$		-	19	-	
Turn-off delay time	$t_{d(off)}$		-	14	-	
Turn-off fall time	$t_f$		-	22	-	
Total Gate Charge	$Q_g$	$V_{DS} = 30V, I_D = 10A,$ $V_{GS} = 10V$	-	19.2	-	nC
Gate-Source Charge	$Q_{gs}$		-	3.6	-	
Gate-Drain Charge	$Q_{gd}$		-	5.1	-	
<b>Source-Drain Diode characteristics</b>						
Diode Forward voltage <sup>(3)</sup>	$V_{DS}$	$V_{GS} = 0V, I_S = 15A$	-	-	1.2	V
Diode Forward current <sup>(4)</sup>	$I_S$		-	-	20	A
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}, I_F = 20A, di/dt = 100A/\mu s$		27		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$	$T_J = 25^{\circ}, I_F = 20A, di/dt = 100A/\mu s$		40		nc

### Notes:

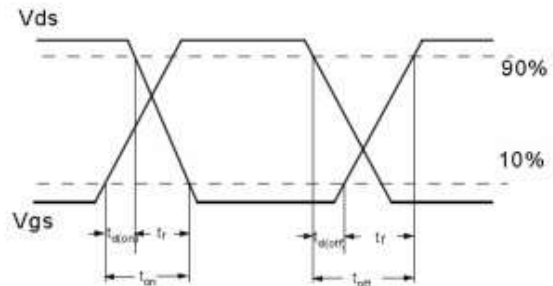
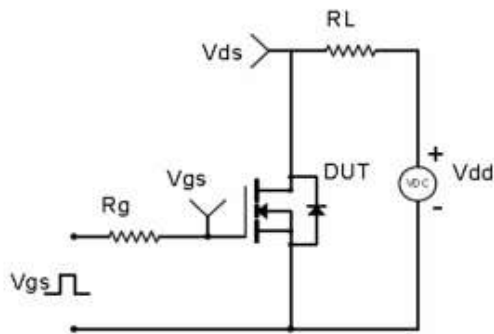
1. Repetitive Rating: pulse width limited by maximum junction temperature
2. EAS Condition:  $T_J = 25^{\circ}\text{C}, V_{DD} = 30V, R_G = 25\Omega, L = 0.5mH$
3. Pulse Test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
4. Surface Mounted on FR4 Board,  $t_s \leq 10\text{ sec}$

## Test Circuit & Waveform

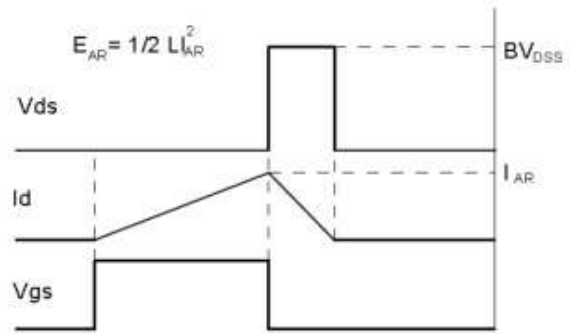
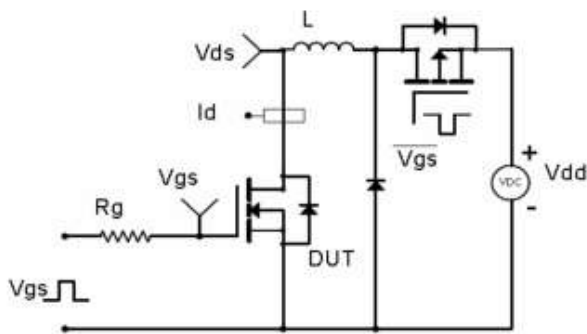
Gate Charge Test Circuit & Waveform



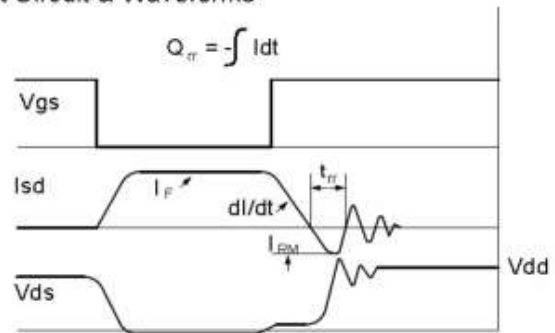
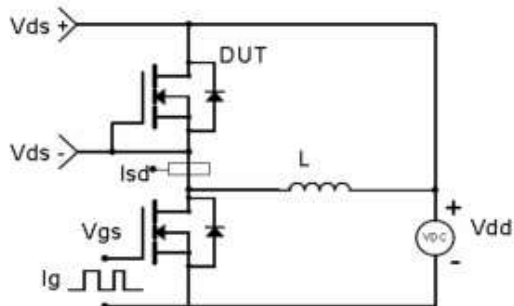
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



# RATING AND CHARACTERISTICS CURVES (RM20N60D3V)

Fig.1 Output Characteristics

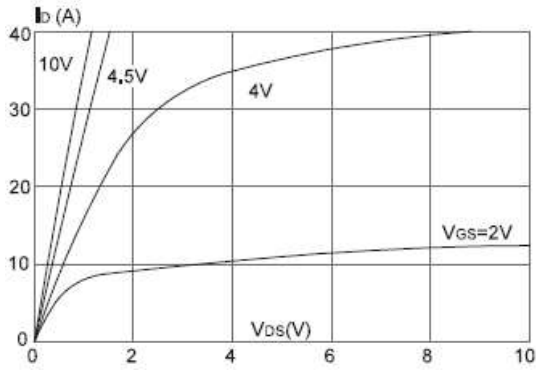


Fig.2 Typical Transfer Characteristics

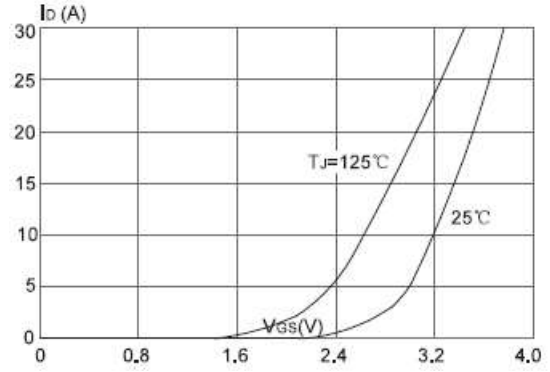


Fig.3 On-resistance VS Drain Current

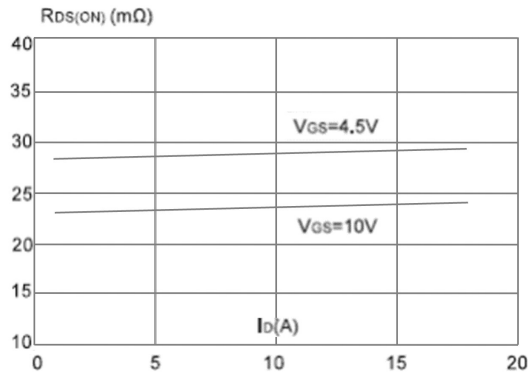


Fig. 4 Body Diode Characteristics

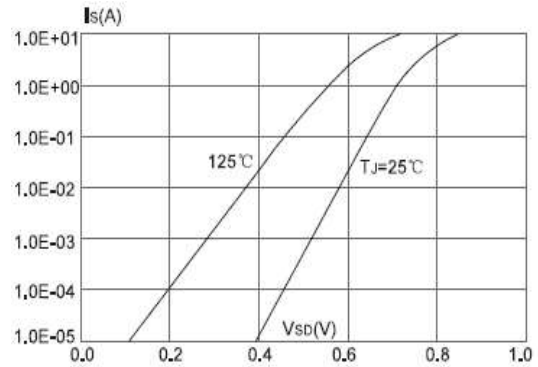


Fig.5 Gate Charge Characteristics

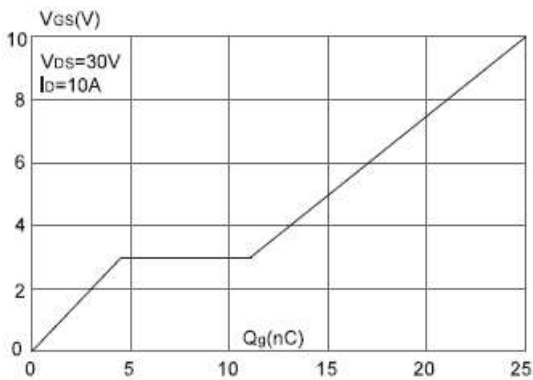
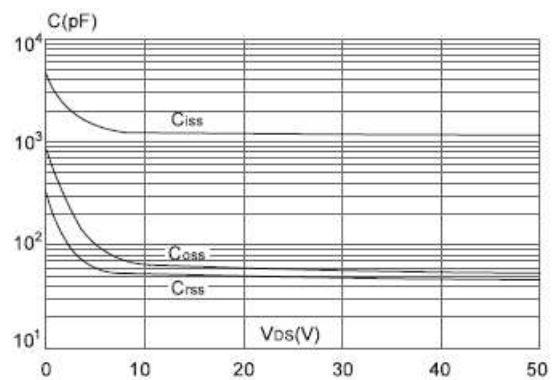
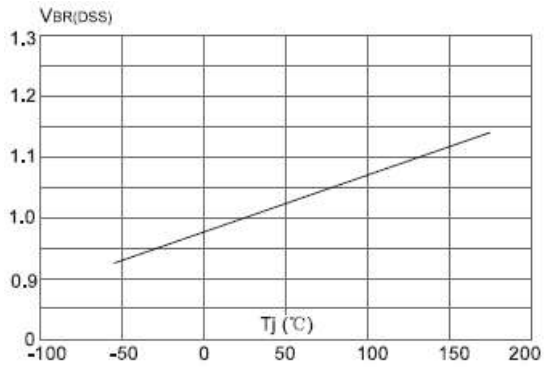


Fig. 6 Capacitance Characteristics



## RATING AND CHARACTERISTICS CURVES (RM20N60D3V)

VS Junction Temperature



Junction Temperature

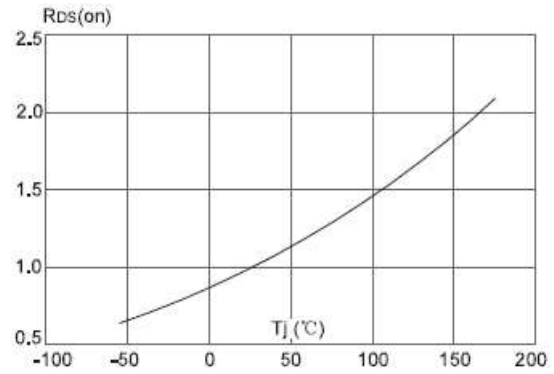
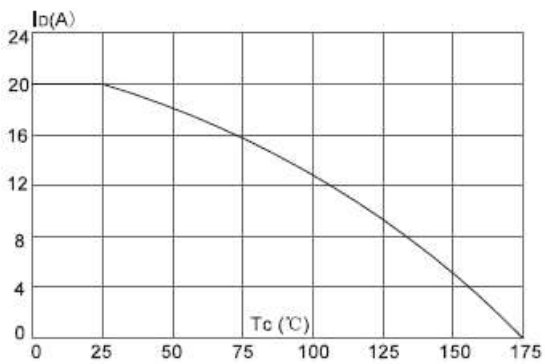


Fig.9 Maximum Continuous Drain Current VS. Case Temperature



## RATING AND CHARACTERISTICS CURVES (RM20N60D3V)

Fig.10 Safe Operating Area

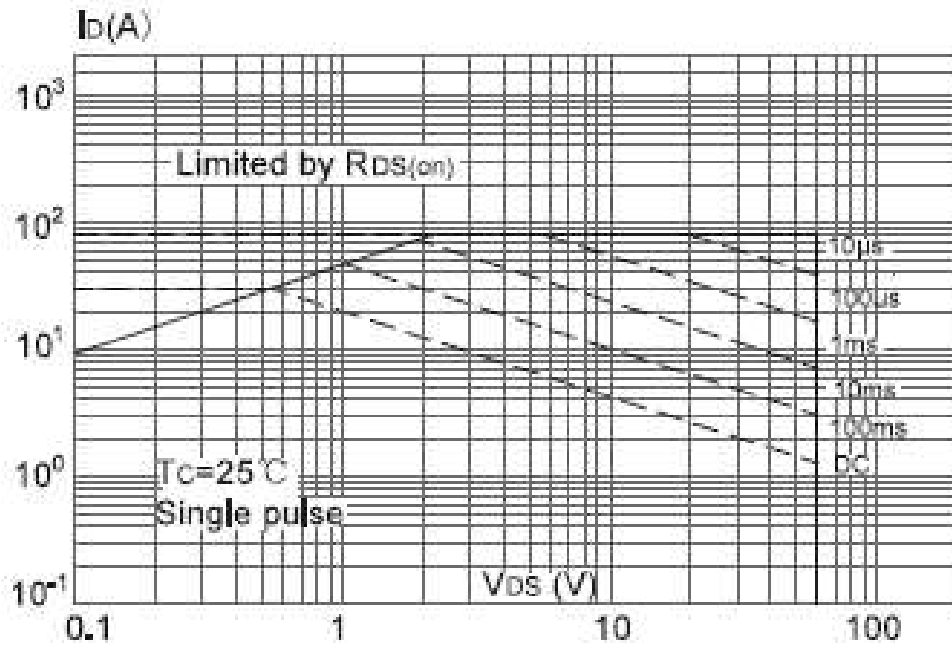
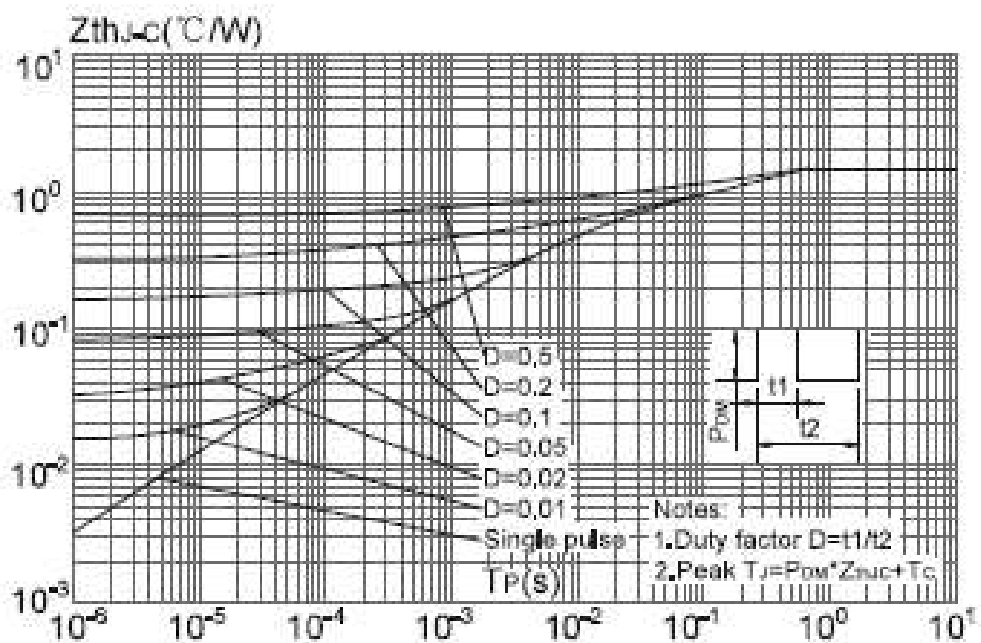
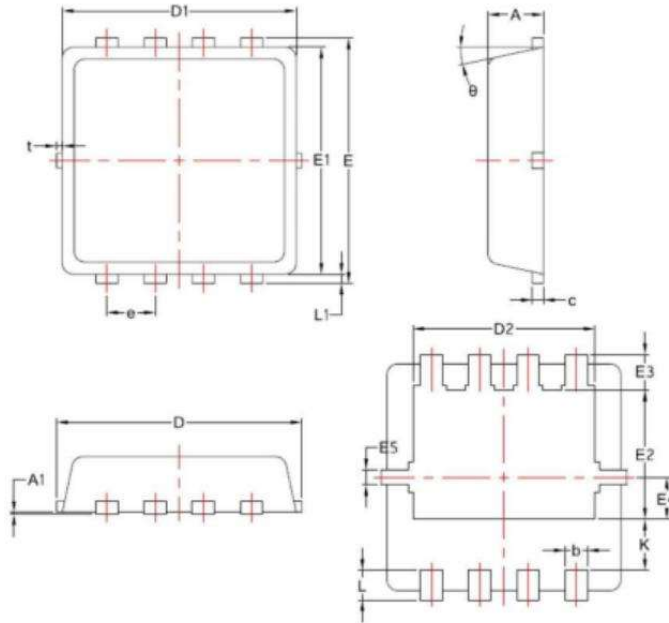


Fig. 11 Transient Thermal Response Curve



## DFN3X3 Package Information



SYMBOL	COMMON		
	MM		
	MIN	NOM	MAX
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.20	0.30	0.40
c	0.10	0.152	0.25
D	3.15	3.30	3.45
D1	3.00	3.15	3.25
D2	2.29	2.45	2.65
E	3.15	3.30	3.45
E1	2.90	3.05	3.20
E2	1.54	1.74	1.94
E3	0.28	0.48	0.65
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.59	0.69	0.89
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
t	0	0.075	0.13
$\theta$	10°	12°	14°

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