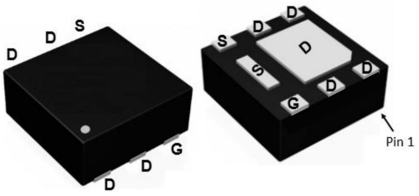
30V N-Channel Enhancement Mode Power MOSFET

Description

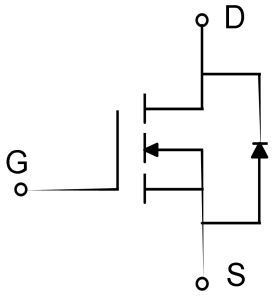
EMR13N03M uses advanced power trench technology that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.



DFN2020-6L

Features

- V_{DS} =30V, I_D = 12.5A
  $R_{DS(on)}$ < 11mΩ @ V_{GS} = 10V
  $R_{DS(on)}$ < 13.5mΩ @ V_{GS} = 4.5V
- Green Device Available
- High Power and Current Handing Capability
- MSL1



Applications

- Battery Protection
- Power Management
- Load Switch

Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain Current[1]	T_A = 25℃	I_D	12.5	A
	T_A = 100℃		7.5	
Pulsed Drain Current[2]		I_{DM}	38	A
Single Pulse Avalanche Energy[3]		EAS	31.2	mJ
Avalanche Current		I_{AS}	25	A
Total Power Dissipation[4]	T_A = 25℃	P_D	1.71	W
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction-to-Ambient[1]	$R_{\theta JA}$	73	°C/W

Electrical Characteristics T_c = 25°C, unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	30	-	-	V
Gate-body Leakage current	I_{GSS}	V_{DS} = 0V, V_{GS} = ±12V	-	-	±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30V, V_{GS} = 0V	-	-	1	μA
Gate-Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	0.4	0.75	1	V
Drain-Source on-Resistance[2]	$R_{DS(on)}$	V_{GS} = 10V, I_D = 8A	-	8.5	11	mΩ
		V_{GS} = 4.5V, I_D = 6A	-	9.0	13.5	
		V_{GS} = 2.5V, I_D = 4A	-	10.3	16	
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS} = 15V, V_{GS} =0V, f = 1.0 MHz	-	1430	-	pF
Output Capacitance	C_{oss}		-	150	-	
Reverse Transfer Capacitance	C_{rss}		-	124	-	
Switching Characteristics						
Gate Resistance	R_G	V_{DS} = 0V, V_{GS} =0V, f = 1MHz	-	2.5	-	Ω
Total Gate Charge	Q_g	V_{GS} = 4.5V, V_{DS} = 15V, I_D = 10A	-	10	-	nC
Gate-Source Charge	Q_{gs}		-	3.5	-	
Gate-Drain Charge	Q_{gd}		-	2.2	-	
Turn-on Delay Time	$t_{d(on)}$	V_{GS} = 4.5V, V_{DS} = 15V, I_D = 10A, R_G = 3Ω	-	8	-	nS
Rise Time	t_r		-	28	-	
Turn-off Delay Time	$t_{d(off)}$		-	15	-	
Fall Time	t_f		-	7	-	
Drain-Source Body Diode Characteristics						
Diode Forward Voltage[2]	V_{SD}	I_S = 1A, V_{GS} = 0V	-	-	1	V
Continuous Source Current[1,5]	I_S	V_G = V_D = 0V , Force Current	-	-	12.5	A

Notes:

1.The data tested by surface mounted on a 1 inch2 FR-4 board with 2OZ copper

2.The data tested by pulsed , pulse width ≤ 300us, duty cycle ≤ 2%

3.The EAS data shows Max. rating . The test condition is V_{DD}= 25V, V_{GS}= 10V, L= 0.1mH, I_{AS}= 25A

4.The power dissipation is limited by 150℃ junction temperature

5.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation

Typical Characteristics

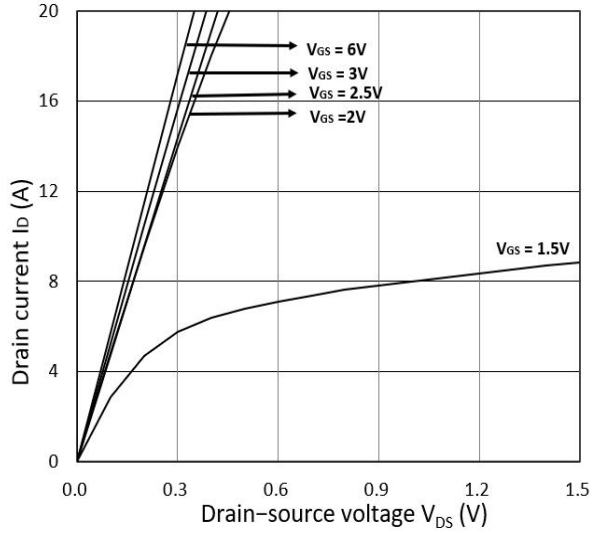


Figure 1. Output Characteristics

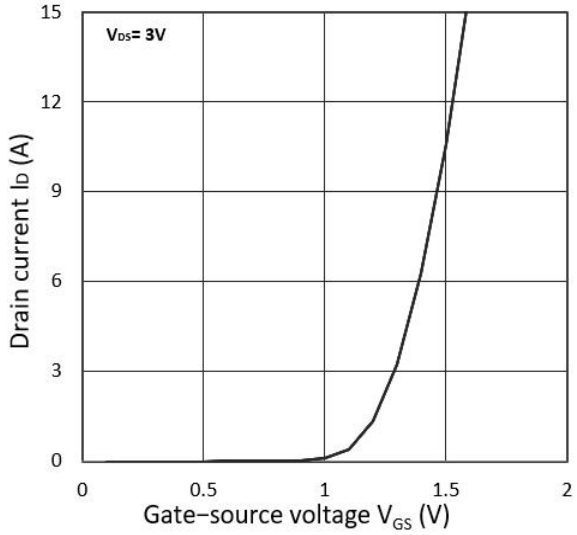


Figure 2. Transfer Characteristic

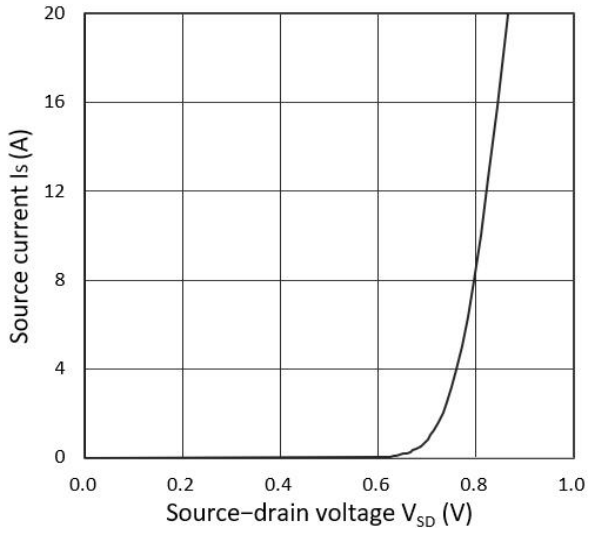


Figure 3. Forward Characteristics of Reverse

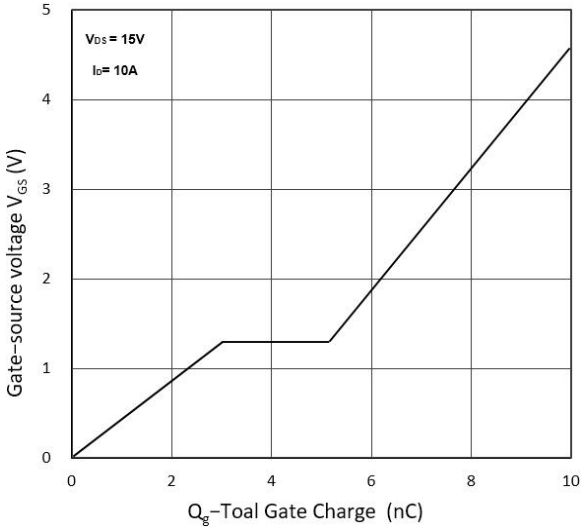


Figure 4. Gate Charge Characteristics

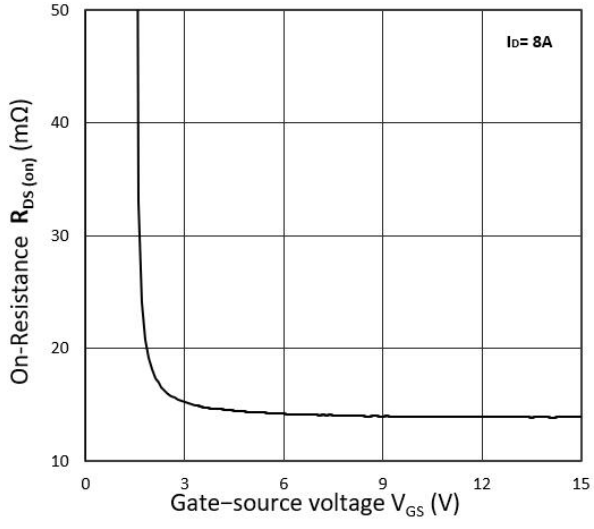


Figure 5. $R_{DS(on)}$ vs. V_{GS}

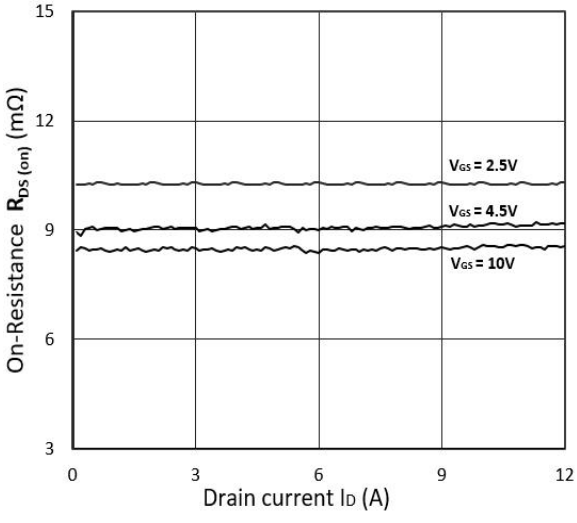


Figure 6. $R_{DS(on)}$ vs. I_D

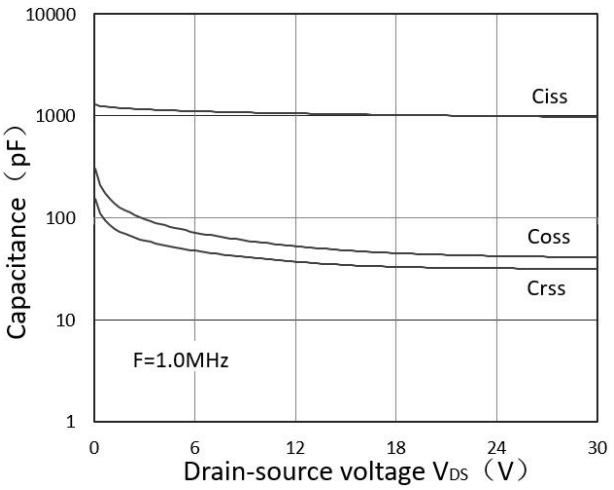


Figure 7. Capacitance Characteristics

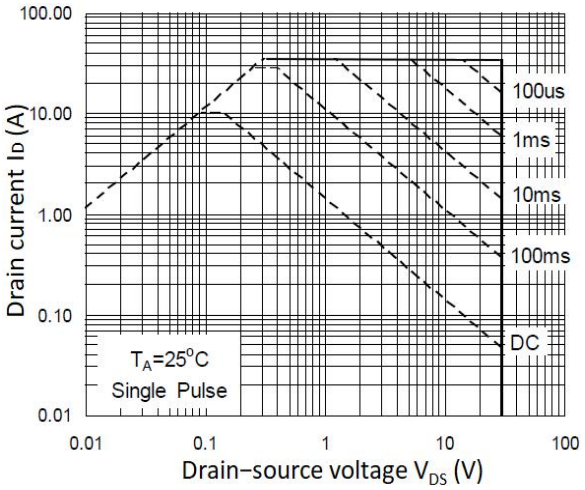


Figure 8. Safe Operating Area

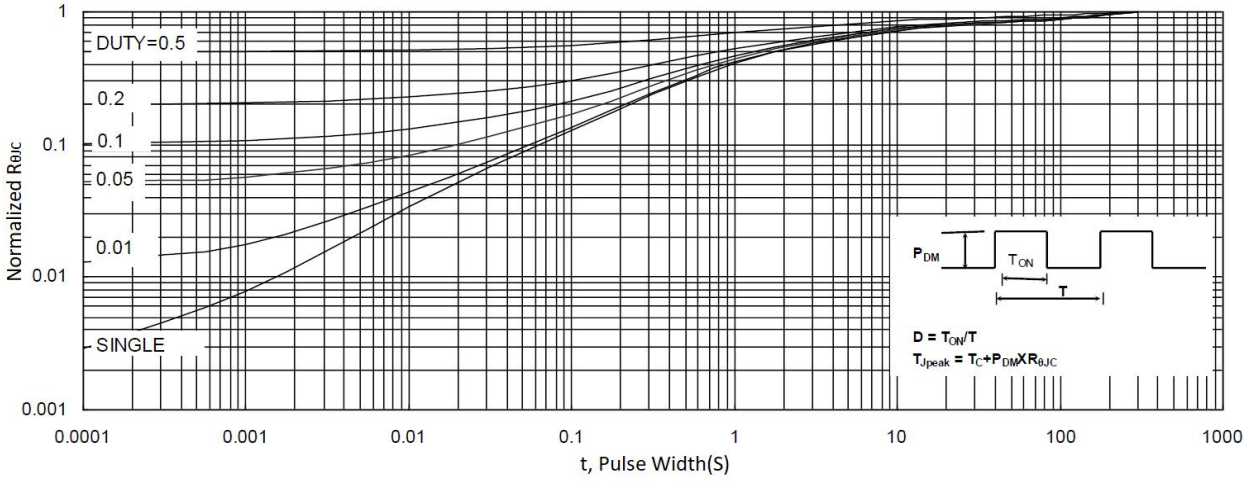


Figure 9. Normalized Maximum Transient Thermal Impedance

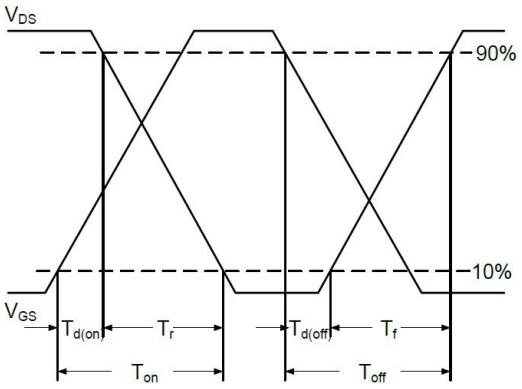


Figure 10. Switching Time Waveform

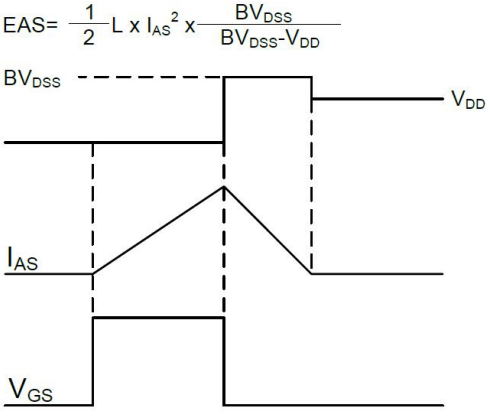
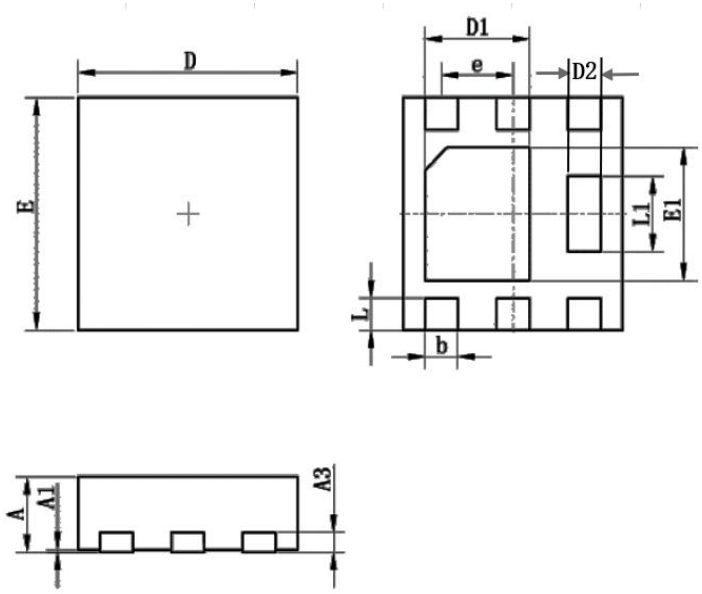


Figure 11. Unclamped Inductive Switching Waveform

Outline Drawing – DFN2020-6L

Package Outline

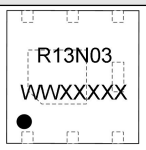


SYMBOL	MM	
	MIN	MAX
A	0.5	0.6
A1	0	0.05
A2	0.152REF	
b	0.25	0.35
D	1.95	2.05
D1	0.8	1
E	1.95	2.05
E1	0.8	1
L1	0.46	0.66
D2	0.25	0.35
e	0.65BSC	
L	0.25	0.35

Ordering Information

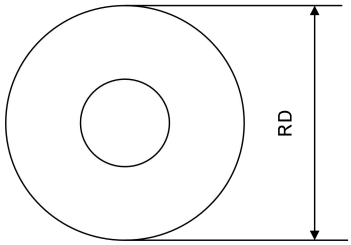
Part	Package	Marking	Packing method
EMR13N03M	DFN2020-6L	R13N03	Tape and Reel

Marking Information

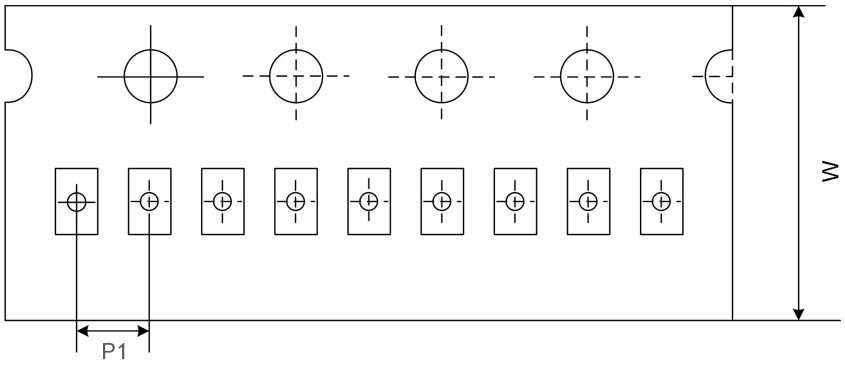
Part Number	Marking
EMR13N03M	 R13N03= Device code WWXXXXX= Tracking Number

Tape Information

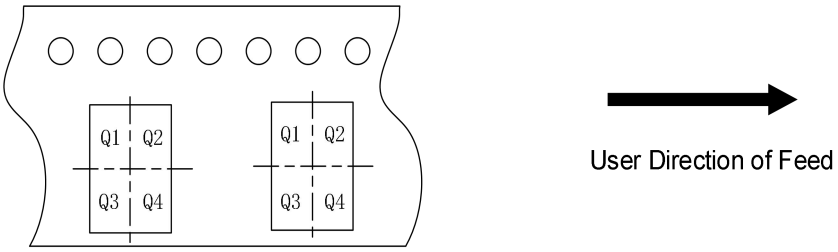
Reel Dimensions



Tape Dimensions

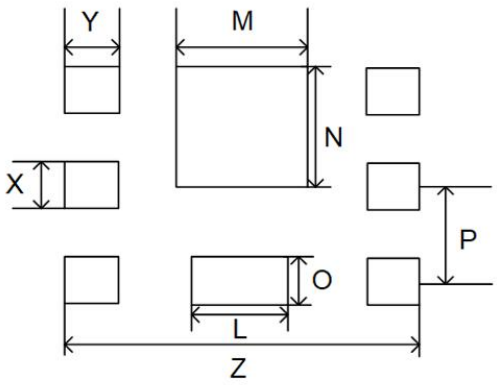


Quadrant Assignments For PIN1 Orientation In Tape



RD	Reel Dimensions	7 inch
W	Overall width of the carrier tape	8 mm
P1	Pitch between successive cavity centers	4 mm
Pin1	Pin1 Quadrant	Q2

DFN2020-6L RECOMMENDED LAND PATTERN



DIMENSIONS	
SYMBOL	MM
X	0.40
Y	0.425
M	1.15
N	0.95
L	0.80
O	0.48
P	0.65
Z	2.30

Note:

1. Controlling dimension: in millimeters.
2. General tolerance:±0.050mm.
3. The pad layout is for reference purposes only.

Revision History

No.	Version	Date	Revision Item	Request	Function and characteristic checking	Package dimension checking	Typos checking
1	1.0	2020-09-22	Released Version	Qi Shu Kun	Qi Shu Kun	Liu Jia Ying	Liu Jia Ying
2	1.1	2020-11-4	Add Tape information and recommended land pattern	Qi Shu Kun	Qi Shu Kun	Liu Jia Ying	Liu Jia Ying
3	1.2	2021-3-19	Update Package size,marking and Qg graph	Qi Shu Kun	Qi Shu Kun	Liu Jia Ying	Liu Jia Ying
4	1.3	2021-6-23	Update recommended land pattern	Qi Shu Kun	Qi Shu Kun	Liu Jia Ying	Liu Jia Ying
5	1.4	2021-8-19	Update PIN1 Direction	Qi Shu Kun	Qi Shu Kun	Liu Jia Ying	Liu Jia Ying