

Dual N-Channel PowerTrench MOSFET

General Description

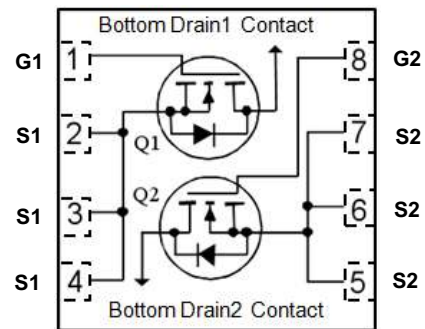
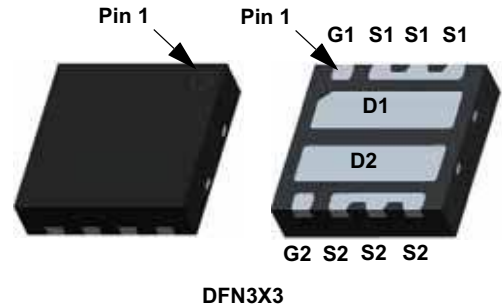
This device includes two 40V N-Channel MOSFETs in a dual **DFN3X3** (3 mm X 3 mm MLP) package. The package is enhanced for exceptional thermal performance.

Features

- Max $r_{DS(on)}$ = 20 m Ω at $V_{GS} = 10$ V, $I_D = 7$ A
- Max $r_{DS(on)}$ = 27 m Ω at $V_{GS} = 4.5$ V, $I_D = 6$ A
- Low Inductance Packaging Shortens Rise/Fall Times
- Lower Switching Losses
- 100% Rg Tested
- Termination is Lead-free and RoHS Compliant

Applications

- Battery Protection
- Load Switching
- Point of Load



Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
7N40	RMD7N40DN	DFN3X3	13 "	12 mm	3000 units

Maximum Ratings $T_A = 25$ °C unless otherwise noted

Symbol	Parameter	Rated Value	Units
V_{DS}	Drain to Source Voltage	40	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current -Continuous	$T_C = 25$ °C	20
	-Continuous	$T_A = 25$ °C (Note 1a)	7
	-Pulsed	(Note 4)	50
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	13 mJ
P_D	Power Dissipation	$T_C = 25$ °C	12
	Power Dissipation	$T_A = 25$ °C (Note 1a)	1.9
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

Symbol	Parameter	Rated Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	9.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	65	

Electrical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}, V_{GS} = 0\text{ V}$	40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		23		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 32\text{ V}, V_{GS} = 0\text{ V}$			1	μA
I_{GSS}	Gate to Source Leakage Current, Forward	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.0	1.8	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		-5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 7\text{ A}$		16	20	m Ω
		$V_{GS} = 4.5\text{ V}, I_D = 6\text{ A}$		21	27	
		$V_{GS} = 10\text{ V}, I_D = 7\text{ A}$ $T_J = 125\text{ }^\circ\text{C}$		23	29	
g_{FS}	Forward Transconductance	$V_{DD} = 5\text{ V}, I_D = 7\text{ A}$		27		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$ $f = 1\text{ MHz}$		513	720	pF
C_{oss}	Output Capacitance			137	195	pF
C_{rss}	Reverse Transfer Capacitance			9.3	15	pF
R_g	Gate Resistance		0.1	2.6	3.6	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20\text{ V}, I_D = 7\text{ A}$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$		5.5	11	ns
t_r	Rise Time			1.2	10	ns
$t_{d(off)}$	Turn-Off Delay Time			13	24	ns
t_f	Fall Time			1.3	10	ns
$Q_{g(TOT)}$	Total Gate Charge		$V_{GS} = 0\text{ V to } 10\text{ V}$		7.6	11
	Total Gate Charge	$V_{GS} = 0\text{ V to } 4.5\text{ V}$	$V_{DD} = 20\text{ V}$ $I_D = 7\text{ A}$	3.6	5.1	nC
Q_{gs}	Gate to Source Charge			1.5		nC
Q_{gd}	Gate to Drain "Miller" Charge			1.0		nC

Drain-Source Diode Characteristics

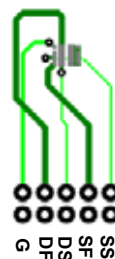
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 7\text{ A}$ (Note 2)		0.85	1.3	V
		$V_{GS} = 0\text{ V}, I_S = 1.4\text{ A}$ (Note 2)		0.75	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 7\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		16	29	ns
Q_{rr}	Reverse Recovery Charge			3.9	10	nC

NOTES:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. $65\text{ }^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper



b. $155\text{ }^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0 %.

3. E_{AS} of 13 mJ is based on starting $T_J = 25\text{ }^\circ\text{C}$, $L = 3\text{ mH}$, $I_{AS} = 3\text{ A}$, $V_{DD} = 40\text{ V}$, $V_{GS} = 10\text{ V}$. 100% tested at $L = 0.1\text{ mH}$, $I_{AS} = 11\text{ A}$.

4. Pulse Id refers to Figure.11 Forward Bias Safe Operation Area.

RATING AND CHARACTERISTICS CURVES (RMD7N40DN)

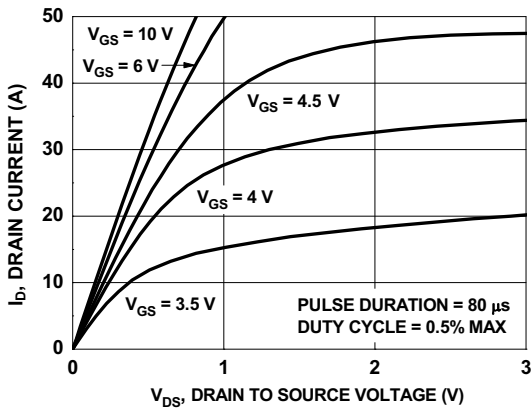


Figure 1. On-Region Characteristics

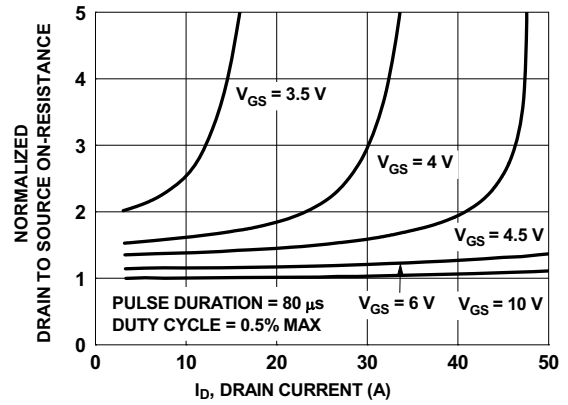


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

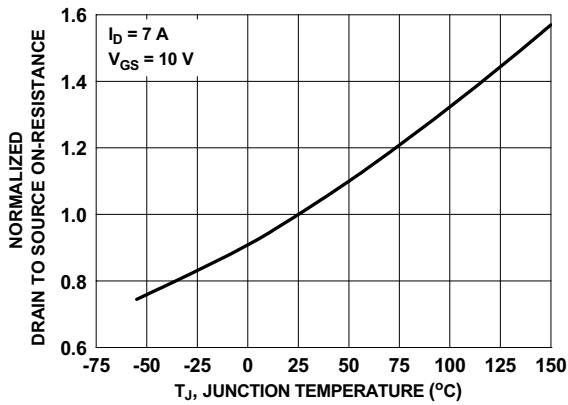


Figure 3. Normalized On-Resistance vs Junction Temperature

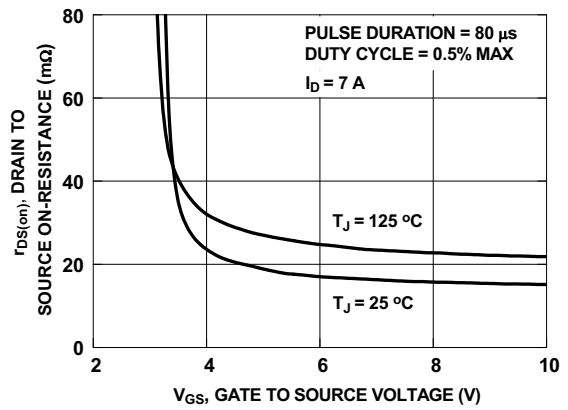


Figure 4. On-Resistance vs Gate to Source Voltage

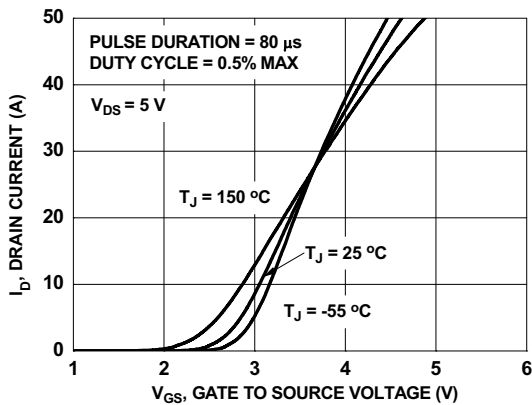


Figure 5. Transfer Characteristics

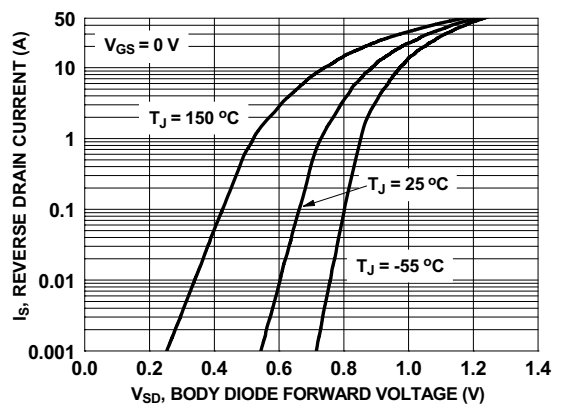


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

RATING AND CHARACTERISTICS CURVES (RMD7N40DN)

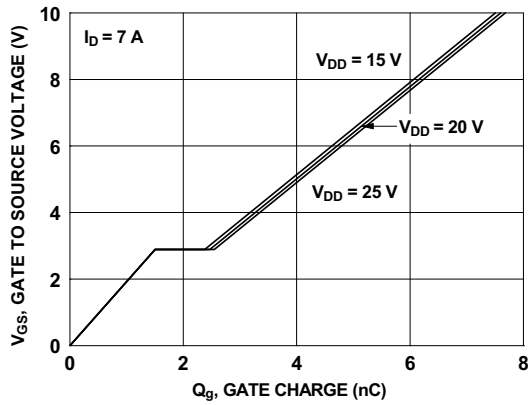


Figure 7. Gate Charge Characteristics

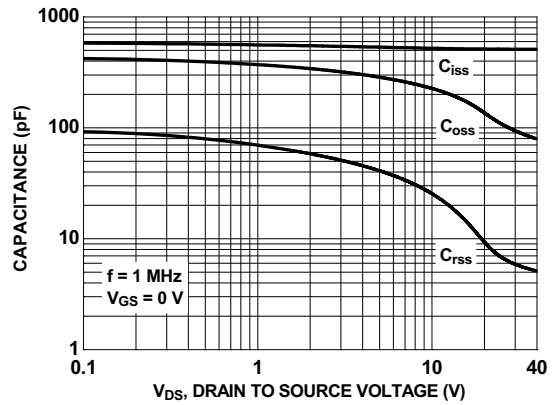


Figure 8. Capacitance vs Drain to Source Voltage

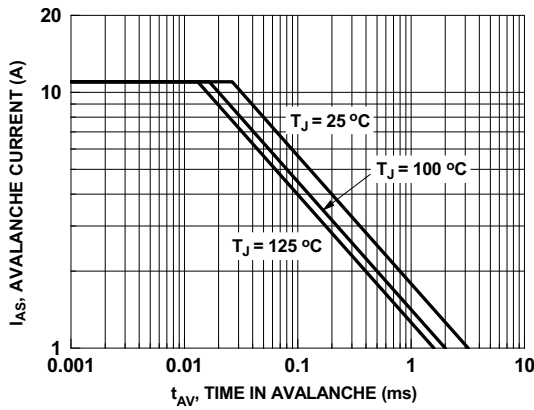


Figure 9. Unclamped Inductive Switching Capability

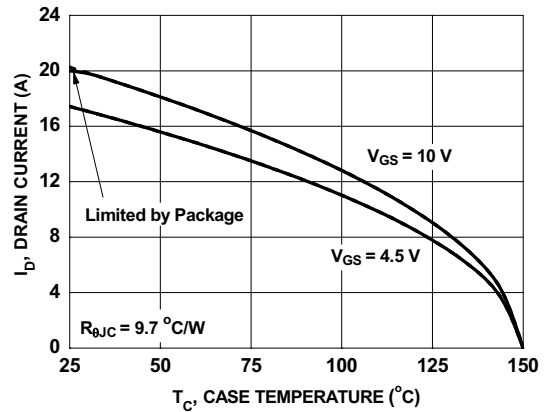


Figure 10. Maximum Continuous Drain Current vs Case Temperature

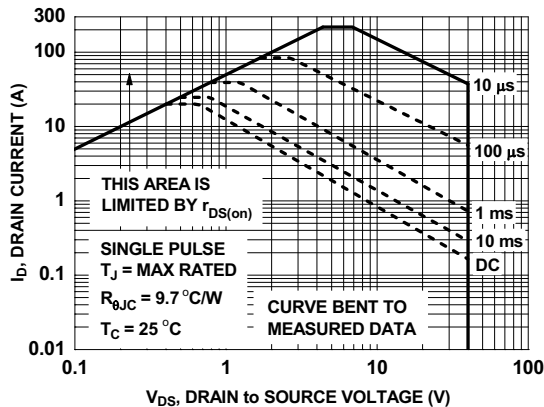


Figure 11. Forward Bias Safe Operating Area

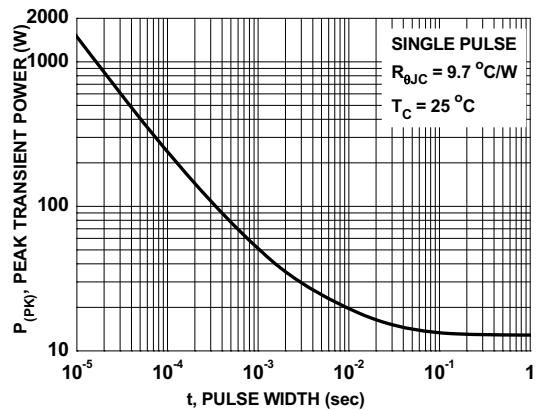


Figure 12. Single Pulse Maximum Power Dissipation

RATING AND CHARACTERISTICS CURVES (RMD7N40DN)

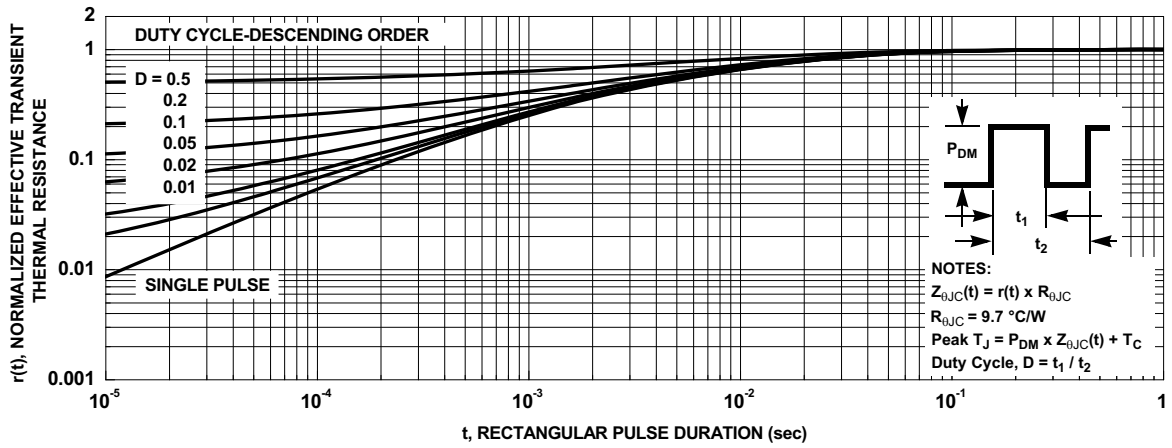
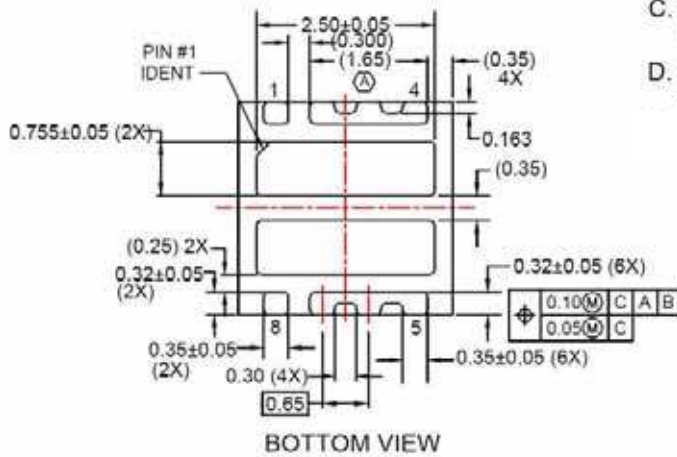
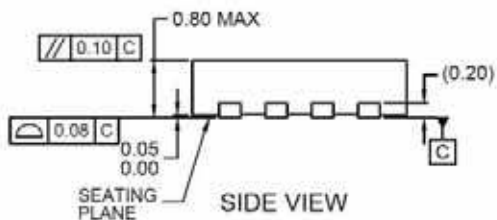
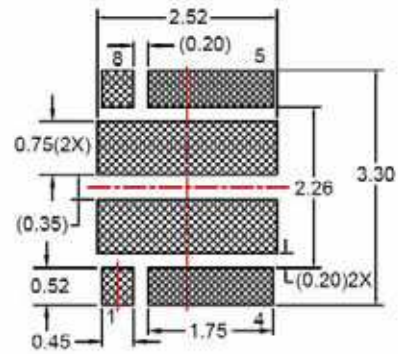
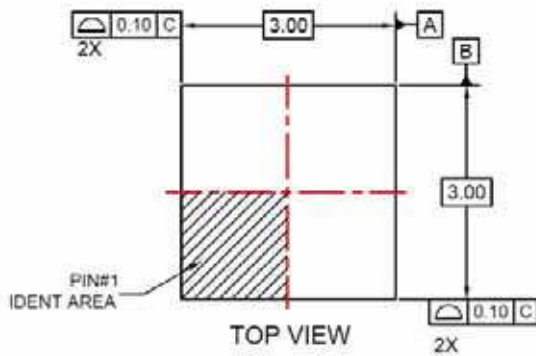


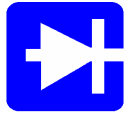
Figure 13. Transient Thermal Response Curve

Dimensional Outline and Pad Layout



NOTES:

- A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MO-229.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- D. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY



RECTRON

Marking on the body



← Rectron Logo

7 N 4 0 ← Part No.

Y Y W W

Year – Code
(Y:18-----2018
19-----2019.....)

Week – code
(WW:01~52)

Package	Tube (pcs/tube)	Tube (pcs/inner box)	Tube (pcs/cartoon)	Tape&Reel (pcs/reel)	Tape&Reel (pcs/inner box)	Tape&Reel (pcs/cartoon)
DFN	100	10,000	100,000	2,500	5,000	40,000
SOP-8	100	10,000	100,000	4,000	4,000	20,000
TSSOP-8	100	32,000	128,000	3,000	6,000	48,000
SOT-23-3L	—	—	—	3,000	30,000	120,000
SOT-23-6L	—	—	—	3,000	30,000	120,000
SOT-23(6R)	—	—	—	3,000	30,000	120,000
SOT-363	—	—	—	3,000	30,000	120,000
SOT-523	—	—	—	3,000	30,000	120,000
SOT223	—	—	—	2,500	2,500	20,000
TO-220	50	1,000	5,000	—	—	—
TO-220F	50	1,000	10,000	—	—	—
TO-247	30	300	1,200	—	—	—
TO-251	80	4,000	40,000	—	—	—
TO-251S(4R)	80	4,000	40,000	—	—	—
TO-252-2L(4R)	80	4,000	40,000	2,500	2,500	25,000
TO-263-2L	50	1,000	10,000	800	800	8,000
TO-3P	30	300	3,000	—	—	—
TO-92	—	—	—	1,000(袋装)	10,000	100,000

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