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Features

- V_{DS} =60V, I_D =25A
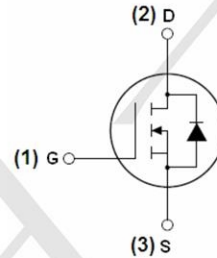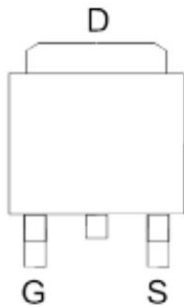 $R_{DS(ON)}$ <33mΩ @ V_{GS}=10V

Application

- Load/Power Switching
- Interfacing Switching
- Battery Management for Ultra Small Portable Electronics
- Logic Level Shift

Package and Pin Configuration

(TO-252-3L)

Top View

Marking:

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FR024N

Absolute Maximum Ratings (T_A=25℃ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	25	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	20	A
Pulsed Drain Current	I_{DM}	74	A
Maximum Power Dissipation	P_D	50	W
Derating factor		0.33	W/℃
Single pulse avalanche energy [Note 5]	E_{AS}	144	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case[Note 2]	$R_{θJC}$	3	℃/W

Electrical Characteristics (T_A=25℃ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics [Note 3]						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1.4	1.8	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A	-	26	33	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=20A	-	30	-	S
Dynamic Characteristics [Note4]						
Input Capacitance	C_{Iss}	V_{DS}=30V,V_{GS}=0V, F=1.0MHz	-	1900	-	PF
Output Capacitance	C_{oss}		-	130	-	PF
Reverse Transfer Capacitance	C_{rss}		-	95	-	PF
Switching Characteristics [Note 4]						
Turn-on Delay Time	$t_{d(on)}$	V_{DS}=30V, R_L=1.5Ω V_{GS}=10V,R_G=3Ω	-	5	-	nS
Turn-on Rise Time	t_r		-	2.6	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	16.1	-	nS
Turn-Off Fall Time	t_f		-	2.3	-	nS
Total Gate Charge	Q_g	V_{DS}=30V,I_D=20A, V_{GS}=10V	-	30	-	nC
Gate-Source Charge	Q_{gs}		-	4.5	-	nC
Gate-Drain Charge	Q_{gd}		-	7.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage [Note 3]	V_{SD}	V_{GS}=0V,I_S=30A	-	-	1.2	V
Diode Forward Current [Note 2]	I_S		-	-	25	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF =20A	-	35	-	nS
Reverse Recovery Charge	Q_{rr}	di/dt = 100A/μs [Note3]	-	53	-	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

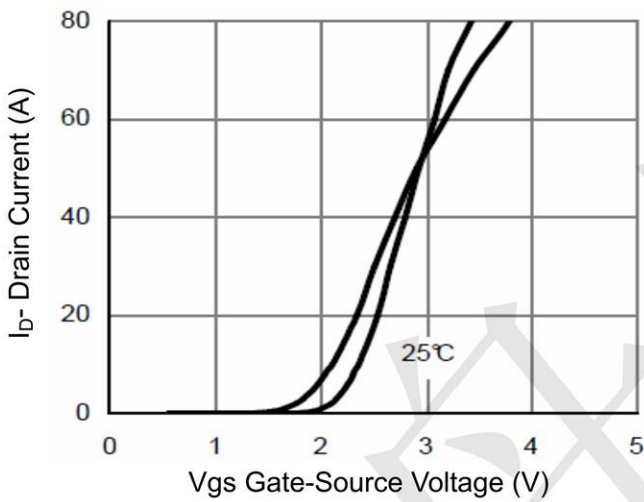# Typical Characteristics
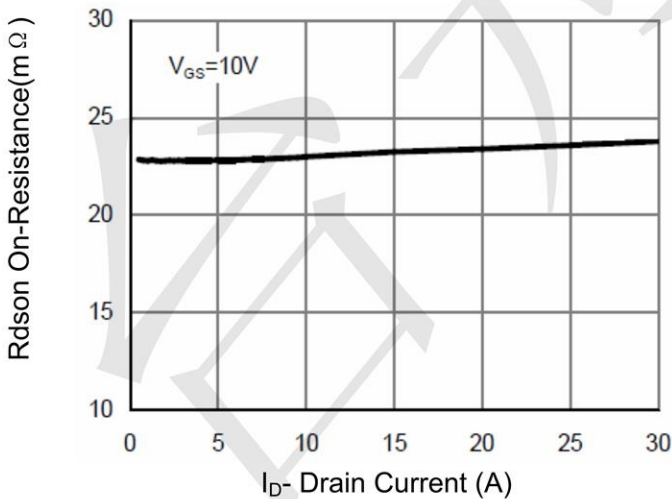

Figure 1 Output Characteristics

Figure 4 Rdson-Junction Temperature

Figure 2 Transfer Characteristics

Figure 5 Gate Charge

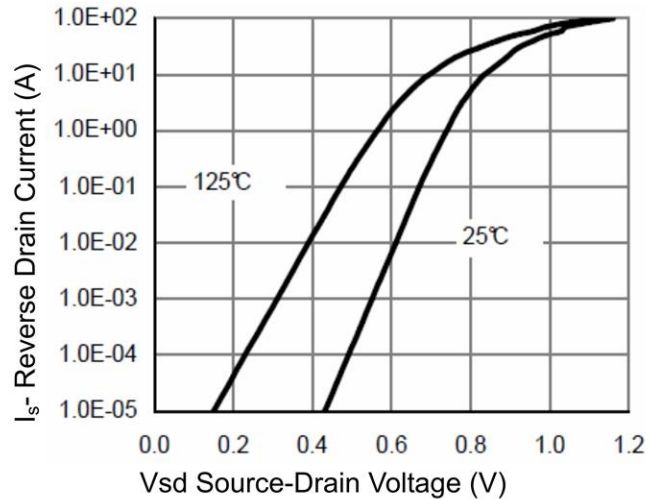**Figure 3 Rdson- Drain Current**

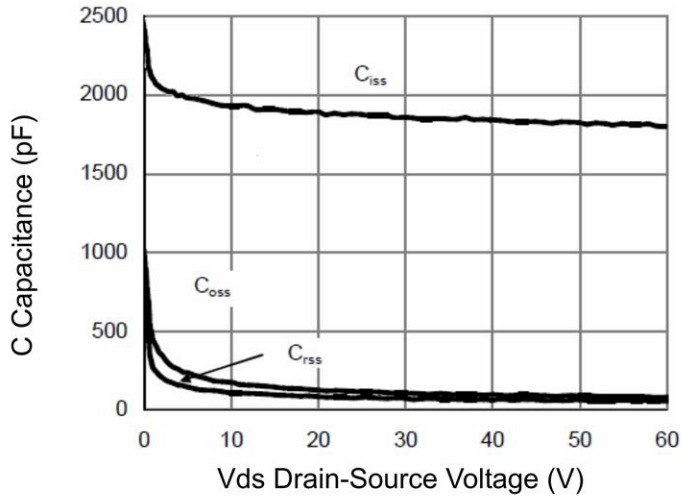**Figure 6 Source- Drain Diode Forward**

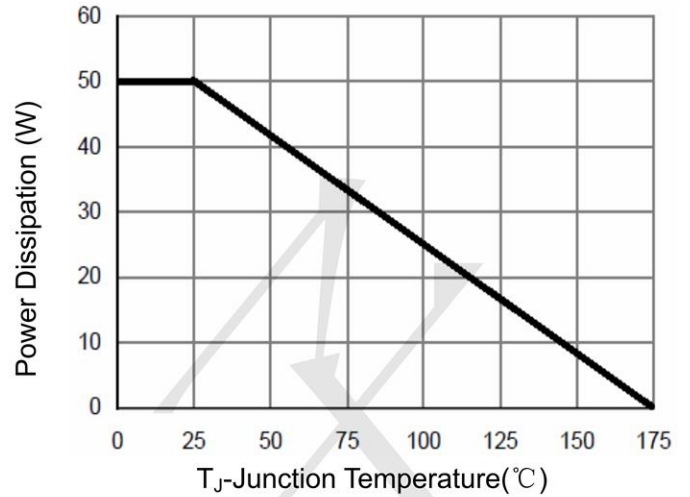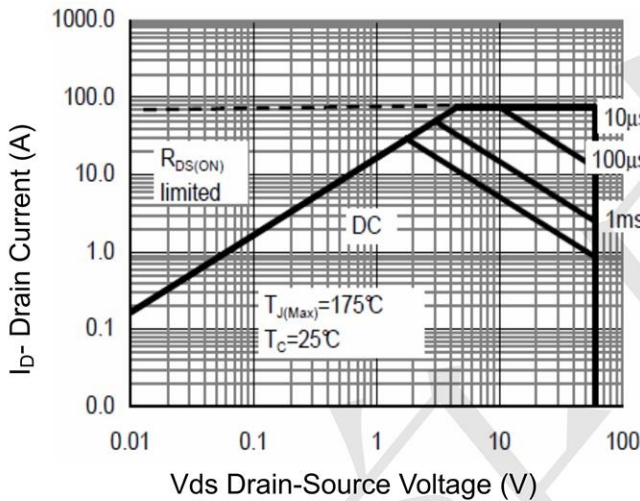**Figure 7 Capacitance vs Vds**

Figure 9 Power De-rating
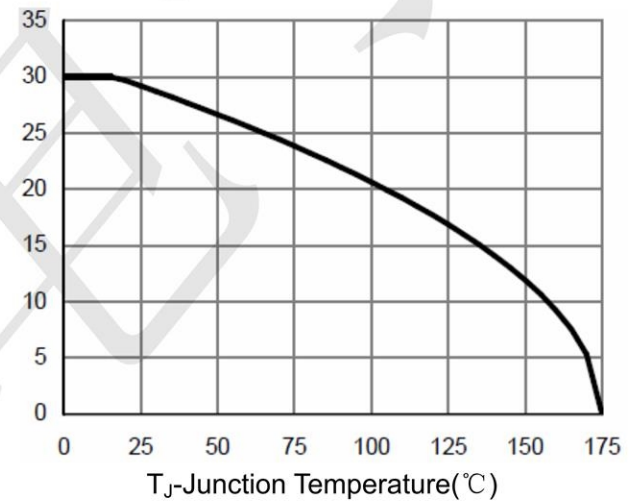
Figure 8 Safe Operation Area

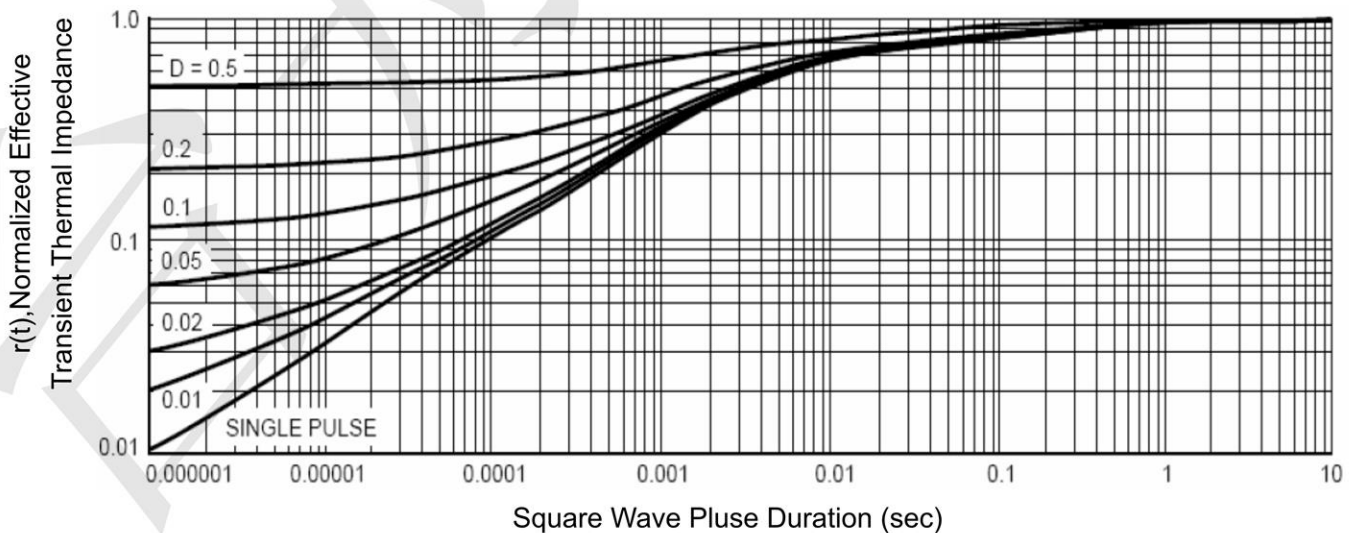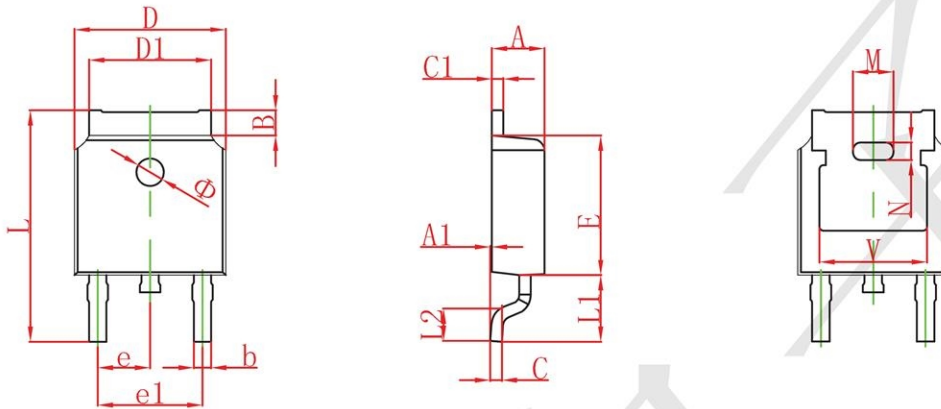**Figure 10 V$_{GS(th)}$ vs Junction Temperature**

Figure 11 Normalized Maximum Transient Thermal Impedance

TO252 Package Information

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.380	0.087	0.094
A1	0.000	0.100	0.000	0.004
B	0.800	1.400	0.031	0.055
b	0.710	0.810	0.028	0.032
c	0.460	0.560	0.018	0.022
c1	0.460	0.560	0.018	0.022
D	6.500	6.700	0.256	0.264
D1	5.130	5.460	0.202	0.215
E	6.000	6.200	0.236	0.244
e	2.286 TYP.		0.090 TYP.	
e1	4.327	4.727	0.170	0.186
M	1.778REF.		0.070REF.	
N	0.762REF.		0.018REF.	
L	9.800	10.400	0.386	0.409
L1	2.9REF.		0.114REF.	
L2	1.400	1.700	0.055	0.067
V	4.830 REF.		0.190 REF.	
Φ	1.100	1.300	0.043	0.051