

General Description

The TF040N03MG uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

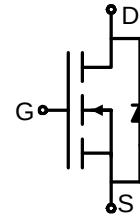
Features

- Advance device constructure
- Low $R_{DS(ON)}$ to minimize conduction loss
- Low Gate Charge for fast switching
- Low Thermal resistance

Application

Synchronous Rectification for AC-DC/DC-DC converter
Power Tools

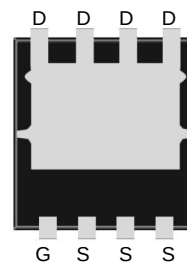
Product Summary



$$V_{DS} = 30V \quad I_D = 60A$$

$$R_{DS(10V \text{ TYP})} = 4.0m\Omega$$

$$R_{DS(4.5V \text{ TYP})} = 5.7m\Omega$$



PDFNWB3.3x3.3-8L

Package Marking and Ordering Information:

Part NO.	TF040N03MG
Marking1	040N03MG:TF040N03MG
Marking2	TF:tuofeng; Y:year code; X:Week; AA:device code;
Basic ordering unit (pcs)	5000

Absolute Maximum Ratings ($T_C = 25^\circ C$)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	$I_D @ T_C = 25^\circ C$	60	A
	$I_D @ T_C = 75^\circ C$	42	A
	$I_D @ T_C = 100^\circ C$	36	A
Pulsed Drain Current ①	I_{DM}	180	A
Total Power Dissipation	$P_D @ T_C = 25^\circ C$	37	W
Total Power Dissipation	$P_D @ T_A = 25^\circ C$	2.0	W
Operating Junction Temperature	T_J	-55 to 150	$^\circ C$
Storage Temperature	T_{STG}	-55 to 150	$^\circ C$
Single Pulse Avalanche Energy	E_{AS}	50	mJ

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	3.5	° C/W
Thermal resistance, junction - ambient	R_{thJA}	-	-	45	° C/W
Soldering temperature, wavesoldering for 8 s	T_{sold}	-	-	265	° C

●Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	30	-	-	V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\mu A$	1.1	1.5	2.1	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 30V, V_{GS} = 0V$	-	-	1.0	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	± 100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 20A$	-	4.0	5.0	m Ω
		$V_{GS} = 4.5V, I_D = 15A$	-	5.7	7.0	m Ω
Forward Transconductance	g_{FS}	$V_{DS} = 25V, I_D = 15A$	-	15	-	S
Source-drain voltage	V_{SD}	$I_S = 15A$	-	0.80	1.20	V

●Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Input capacitance	C_{iss}	$f = 1MHz$ $V_{DS} = 15V$ $V_{GS} = 0V$	-	750	-	pF
Output capacitance	C_{oss}		-	333	-	
Reverse transfer capacitance	C_{rss}		-	32.0	-	

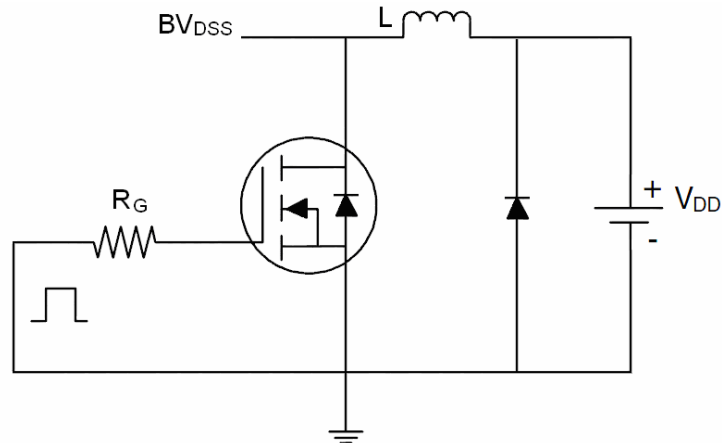
●Switching Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 15V$ $I_D = 15A$ $R_G = 3.0\Omega$ $V_{GS} = 10V$	-	4.4	-	nS
Rise time	t_r		-	23.6	-	
Turn-off delay time	$t_{d(off)}$		-	13.0	-	
Fall time	t_f		-	6.2	-	

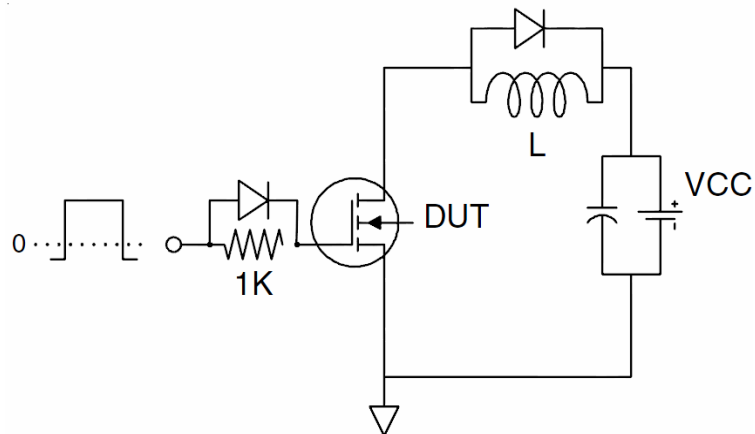
Note: ① Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$;

Test Circuit

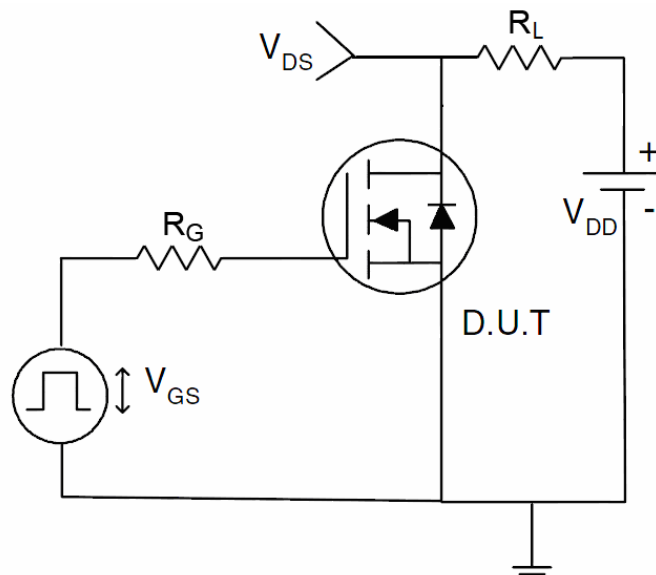
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

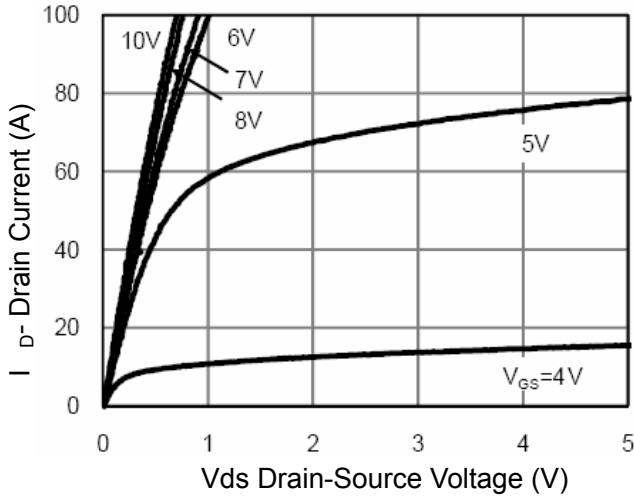


Figure 1 Output Characteristics

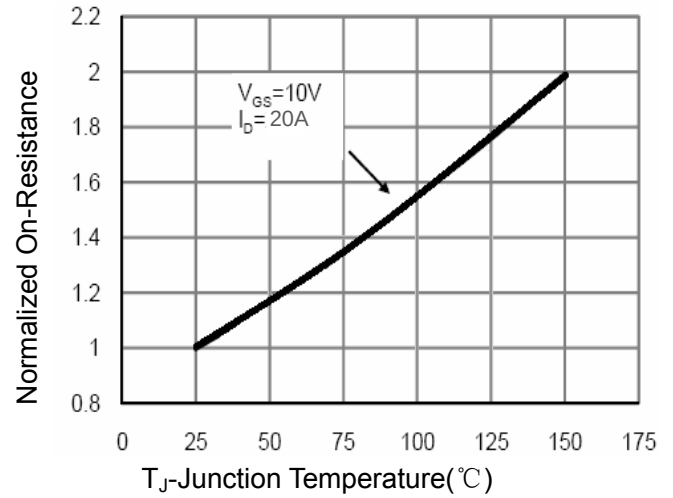


Figure 4 Rdson-Junction Temperature

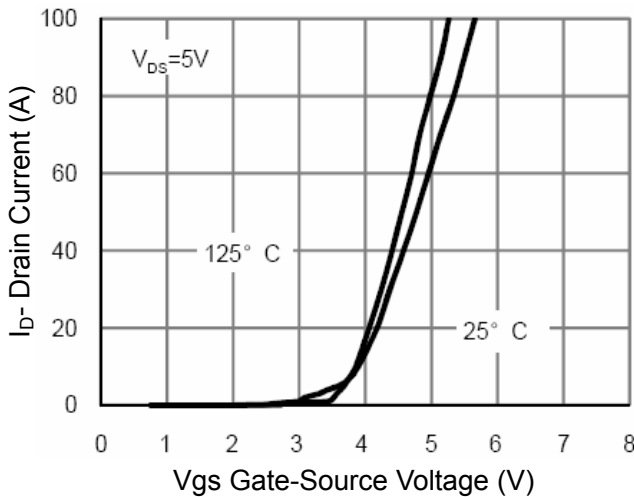


Figure 2 Transfer Characteristics

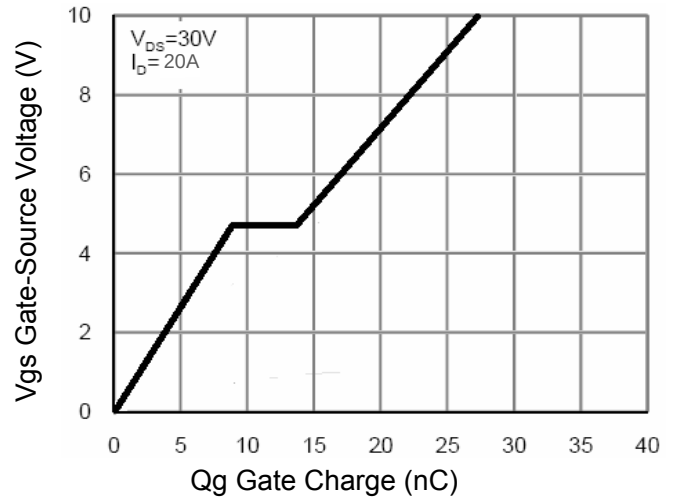


Figure 5 Gate Charge

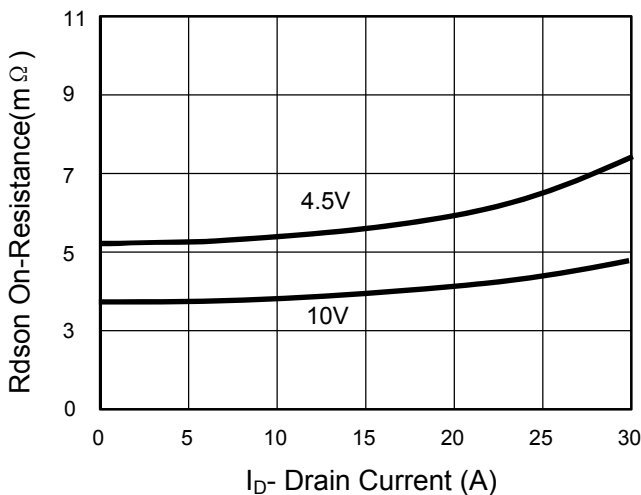


Figure 3 Rdson- Drain Current

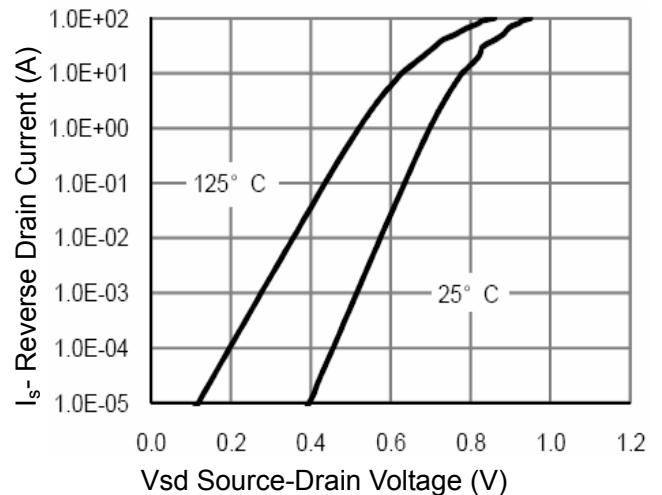


Figure 6 Source- Drain Diode Forward

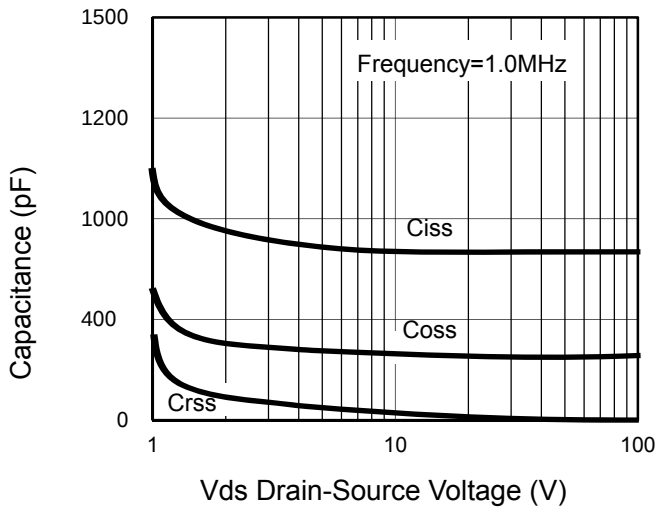


Figure 7 Capacitance vs Vds

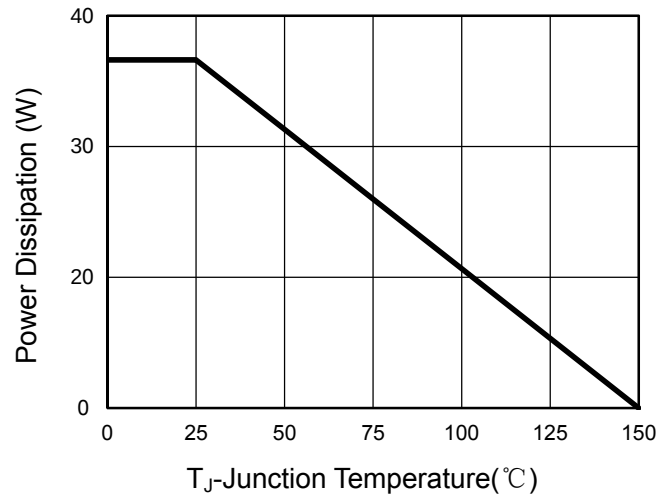


Figure 9 Power De-rating

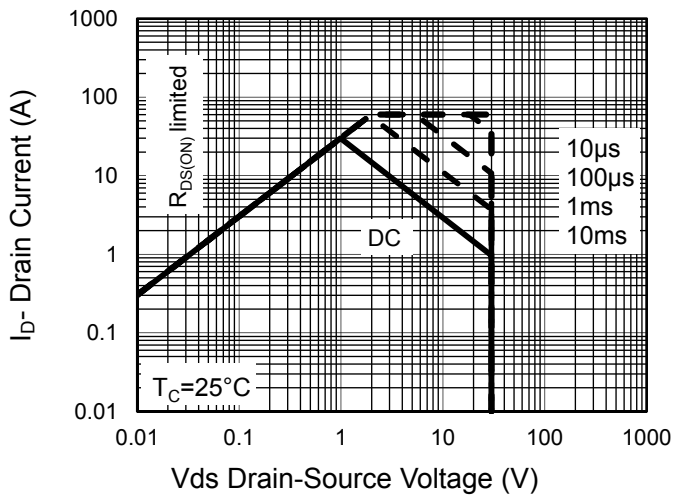


Figure 8 Safe Operation Area

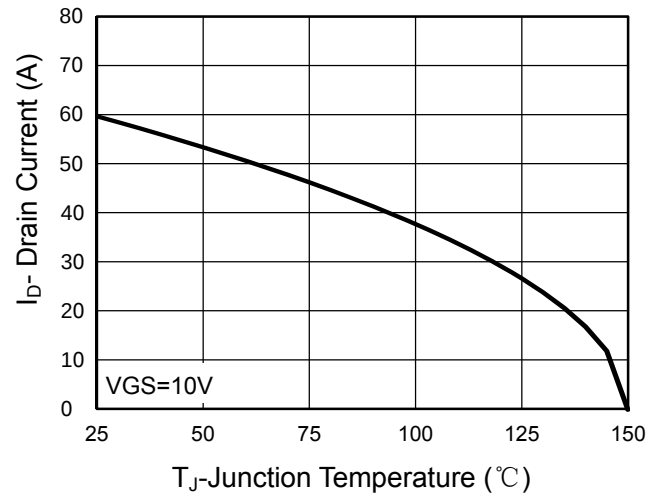


Figure 10 Current De-rating

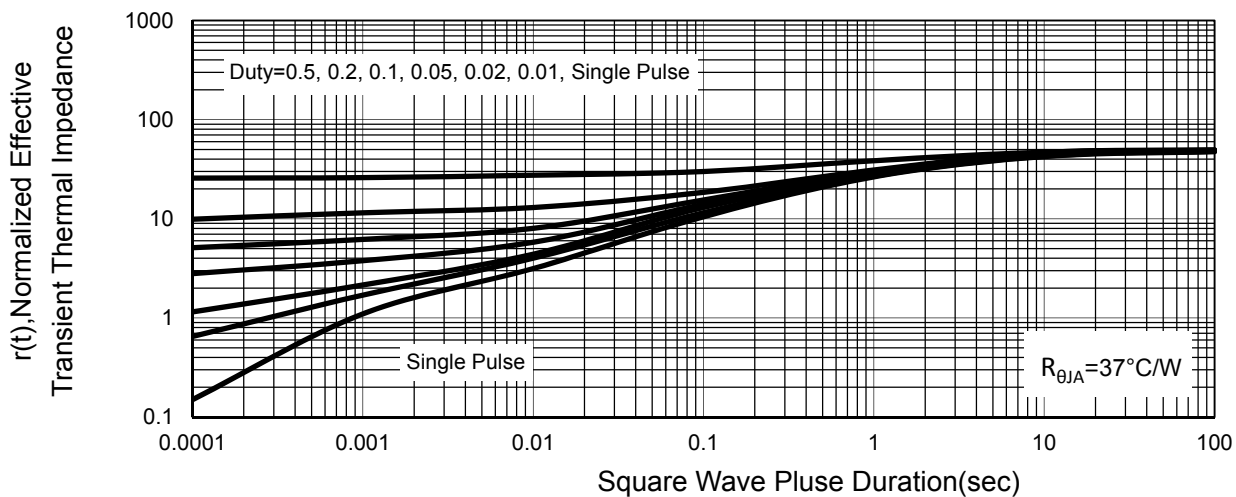
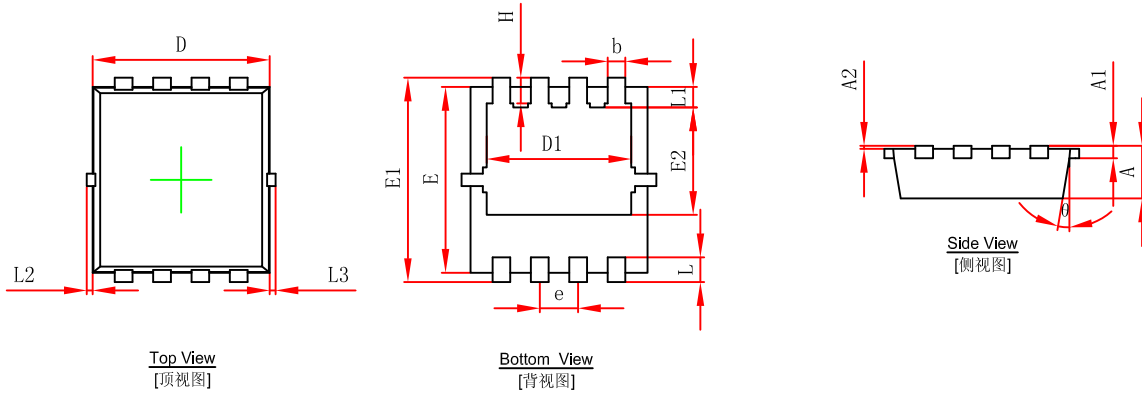


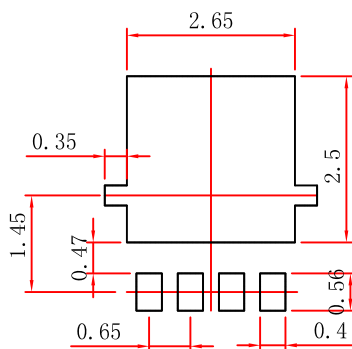
Figure 11 Normalized Maximum Transient Thermal Impedance

PDFNWB3.3x3.3-8L Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.650	0.850	0.026	0.033
A1	0.152 REF.		0.006 REF.	
A2	0~0.05		0~0.002	
D	2.900	3.100	0.114	0.122
D1	2.300	2.600	0.091	0.102
E	2.900	3.100	0.114	0.122
E1	3.150	3.450	0.124	0.136
E2	1.535	1.935	0.060	0.076
b	0.200	0.400	0.008	0.016
e	0.550	0.750	0.022	0.030
L	0.300	0.500	0.012	0.020
L1	0.180	0.480	0.007	0.019
L2	0~0.100		0~0.004	
L3	0~0.100		0~0.004	
H	0.315	0.515	0.012	0.020
θ	9°	13°	9°	13°

PDFNWB3.3x3.3-8L Suggested Pad Layout



Note:

1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.