

Features

- $V_{DS} = 40V$, $I_D = 300A$
 $R_{DS(ON)} = 0.95m\Omega$ (typ.) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 1.5m\Omega$ (typ.) @ $V_{GS} = 4.5V$
- Low $R_{DS(ON)}$ to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance
- Wettable Flanks

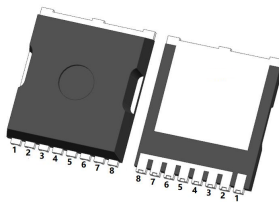
Application

- BLDC Motor driver
- SMPS 2nd Synchronous Rectifier
- DC-DC Converter

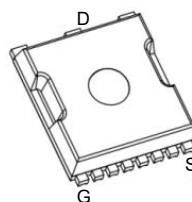


Package

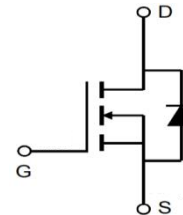
Top View



Top View



Schematic diagram



Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
TF010N04TG	TF010N04TG	TOLL-8	-	-	-

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

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current	$T_C = 25^\circ C$	I_D	300	A
	$T_C = 100^\circ C$		210	
Pulsed Drain Current ¹		I_{DM}	960	A
Single Pulse Avalanche Energy ²		EAS	550	mJ
Total Power Dissipation	$T_C = 25^\circ C$	P_D	280	W
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	$^\circ C$
Thermal Resistance from Junction-to-Ambient ³		$R_{\theta JA}$	35	$^\circ C/W$
Thermal Resistance from Junction-to-Case		$R_{\theta JC}$	0.9	$^\circ C/W$

Electrical Characteristics ($T_J = 25^\circ\text{C}$, 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	40	-	-	V
Gate-body Leakage current		I _{GSS}	V _{DS} = 0V, V _{GS} = ±20V	-	-	±100	nA
Zero Gate Voltage Drain Current	T _J =25°C	I _{DSS}	V _{DS} = 36V, V _{GS} = 0V	-	-	1	μA
	T _J =100°C			-	-	100	
Gate-Threshold Voltage		V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250μA	1.0	1.6	2.5	V
Drain-Source on-Resistance ⁴		R _{DS(on)}	V _{GS} = 10V, I _D = 30A	-	0.95	1.3	mΩ
			V _{GS} = 4.5V, I _D =20A	-	1.50	2.3	
Dynamic Characteristics ⁵							
Input Capacitance		C _{iss}	V _{DS} = 20V, V _{GS} =0V, f =1MHz	-	7150	-	pF
Output Capacitance		C _{oss}		-	1750	-	
Reverse Transfer Capacitance		C _{rss}		-	202	-	
Gate Resistance		R _g	f=1MHz	-	1.3	-	Ω
Switching Characteristics ⁵							
Total Gate Charge		Q _g	V _{GS} = 10V, V _{DS} = 20V, I _D = 50A	-	112.6	-	nC
Gate-Source Charge		Q _{gs}		-	22.8	-	
Gate-Drain Charge		Q _{gd}		-	17.5	-	
Turn-on Delay Time		t _{d(on)}	V _{GS} =10V, V _{DD} = 20V, R _G = 3Ω, I _D = 50A	-	23.0	-	ns
Rise Time		t _r		-	15.1	-	
Turn-off Delay Time		t _{d(off)}		-	89.1	-	
Fall Time		t _f		-	29.0	-	
Body Diode Reverse Recovery Time		t _{rr}	I _F =50A, di/dt = 100A/μs	-	61.0	-	ns
Body Diode Reverse Recovery Charge		Q _{rr}		-	92.0	-	nC
Drain-Source Body Diode Characteristics							
Diode Forward Voltage ⁴		V _{SD}	I _S = 30A, V _{GS} = 0V	-	-	1.2	V
Continuous Source Current	T _C =25°C	I _S	-	-	-	200	A

Notes:

1. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)} = 150^\circ\text{C}$.
2. The EAS data shows Max. rating . The test condition is $V_{DD} = 20V, V_{GS} = 10V, L = 0.5\text{mH}, I_{AS} = 30A$.
3. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
5. This value is guaranteed by design hence it is not included in the production test.

Typical Characteristics

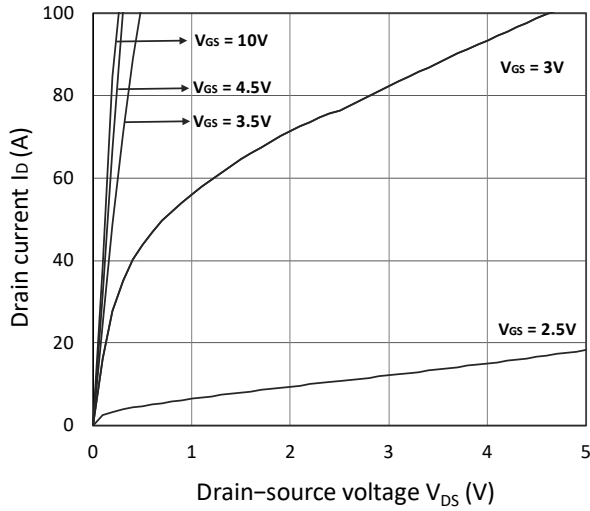


Figure 1. Output Characteristics

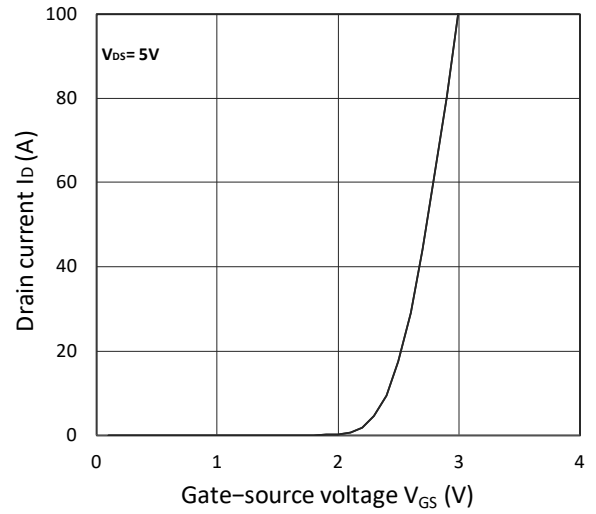


Figure 2. Transfer Characteristics

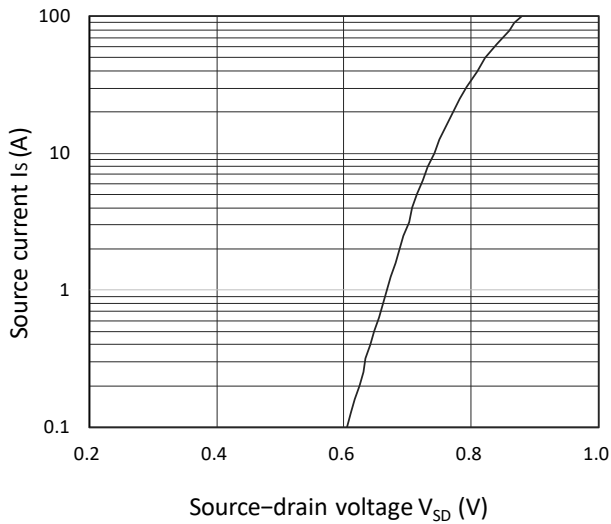


Figure 3. Forward Characteristics of Reverse

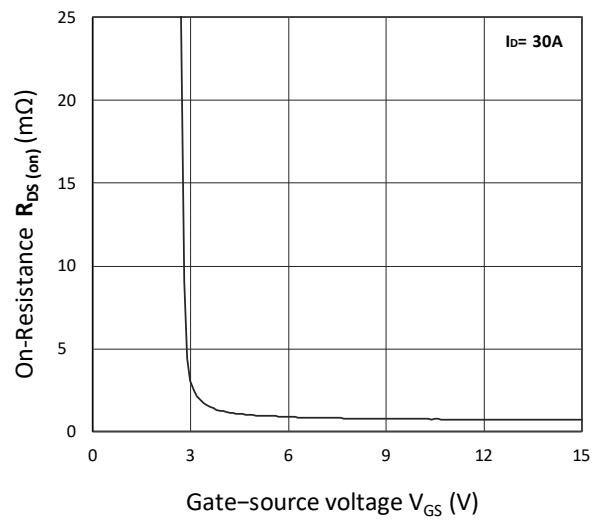


Figure 4. $R_{DS(ON)}$ vs. V_{GS}

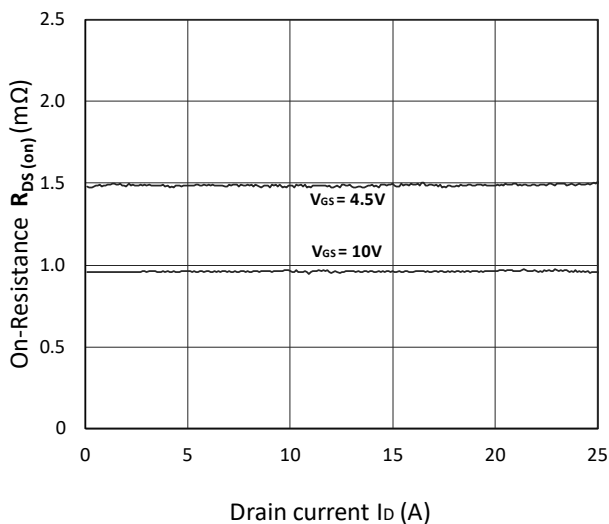


Figure 5. $R_{DS(ON)}$ vs. I_D

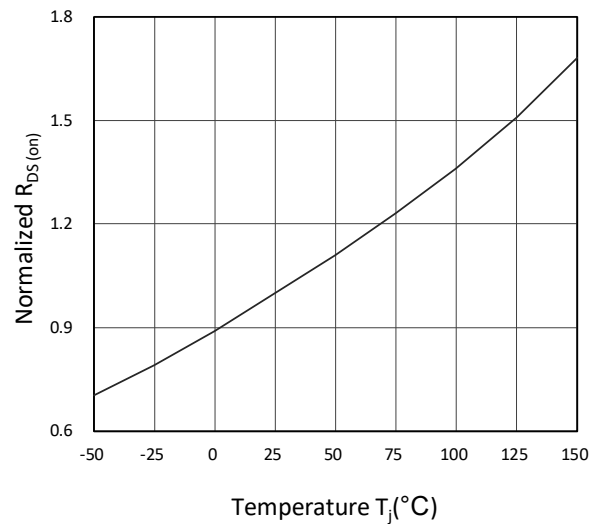


Figure 6. Normalized $R_{DS(ON)}$ vs. Temperature

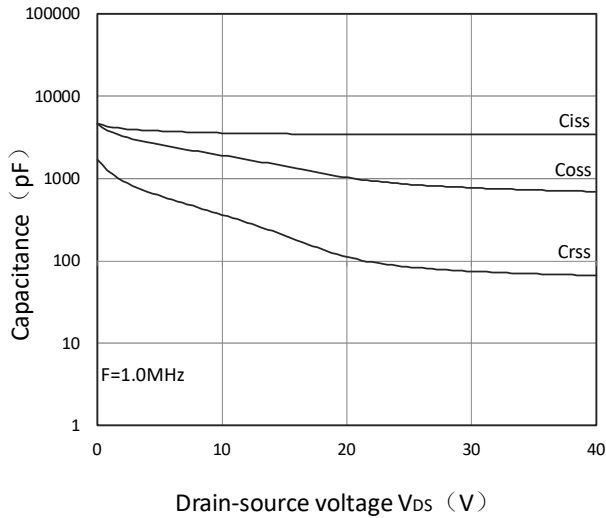


Figure 7. Capacitance Characteristics

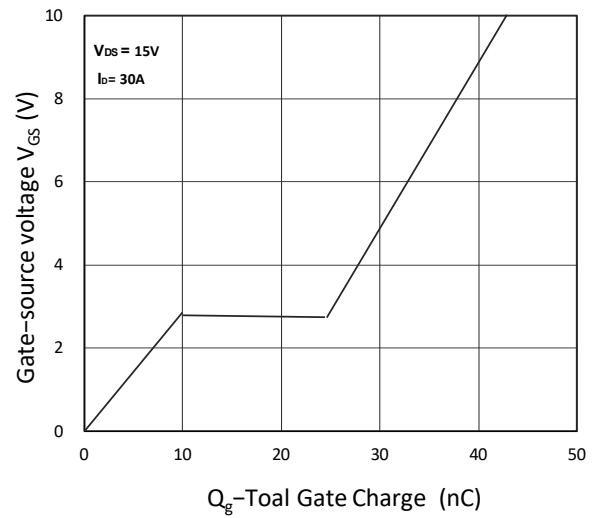


Figure 8. Gate Charge Characteristics

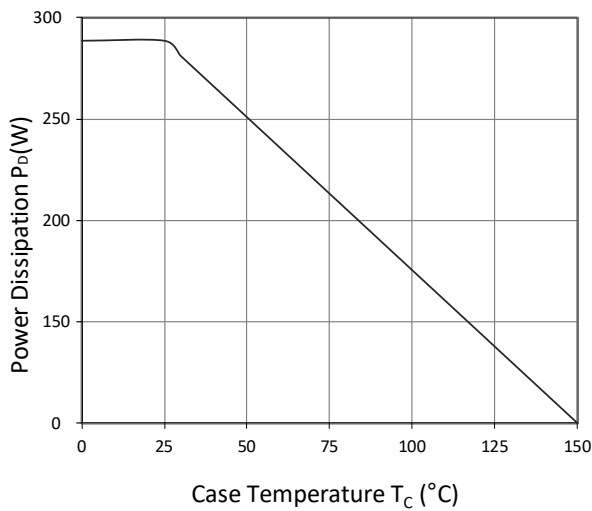


Figure 9. Power Dissipation

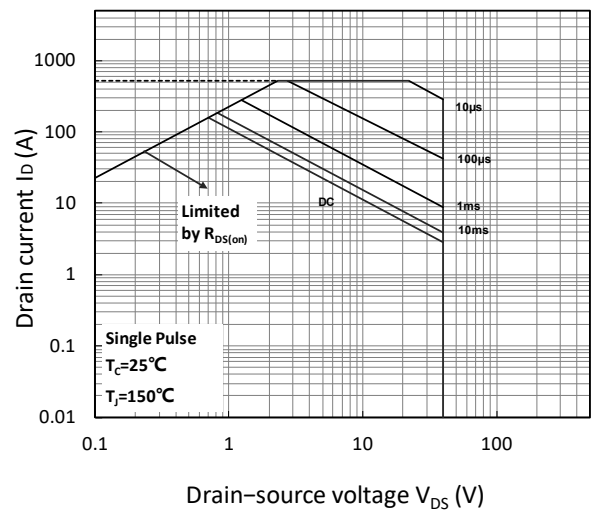


Figure 10. Safe Operating Area

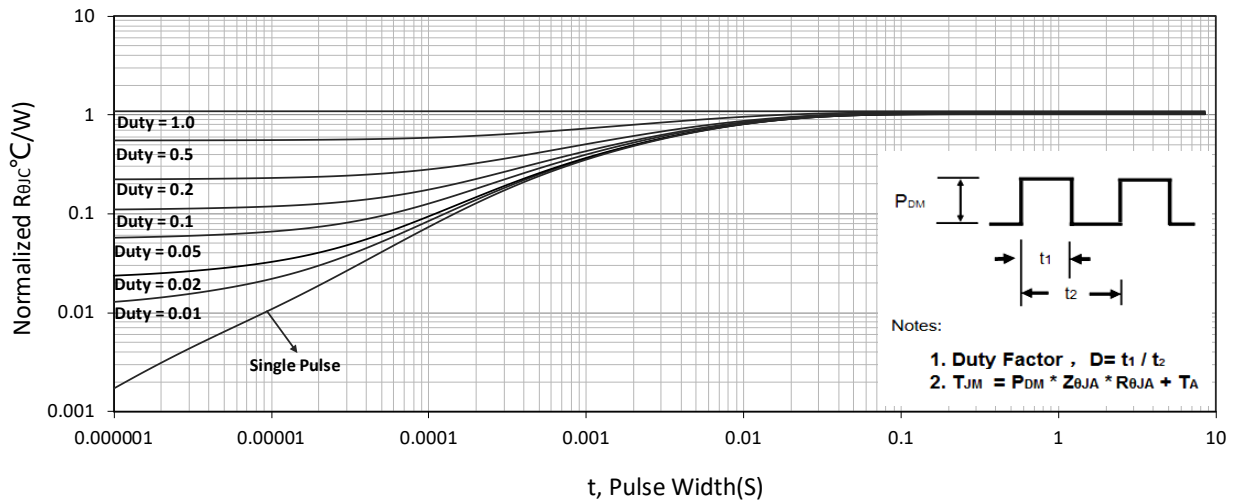


Figure 11. Normalized Maximum Transient Thermal Impedance

Test Circuit

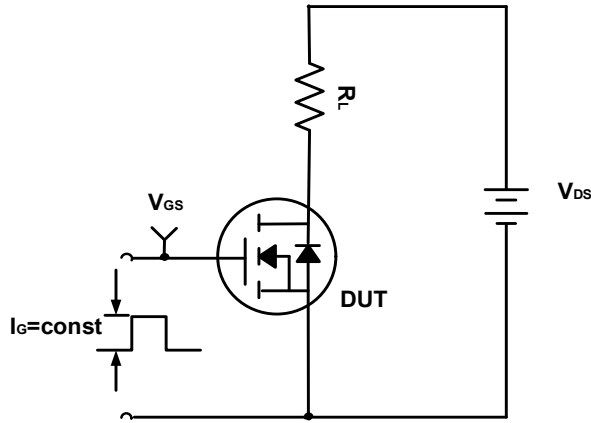


Figure A. Gate Charge Test Circuit & Waveforms

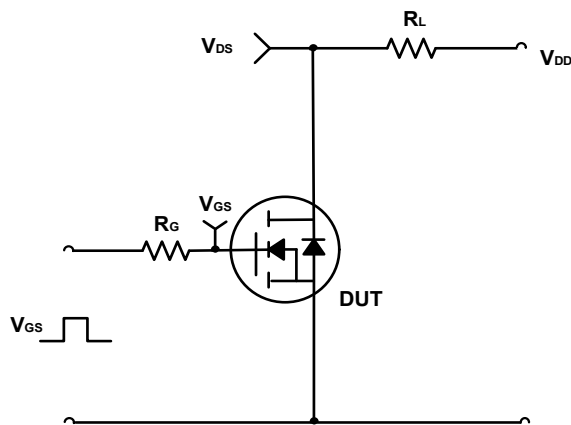


Figure B. Switching Test Circuit & Waveforms

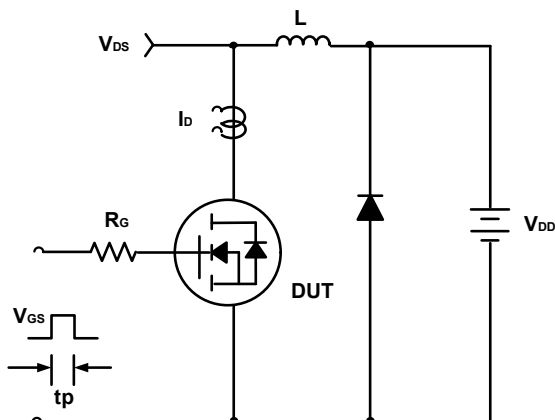
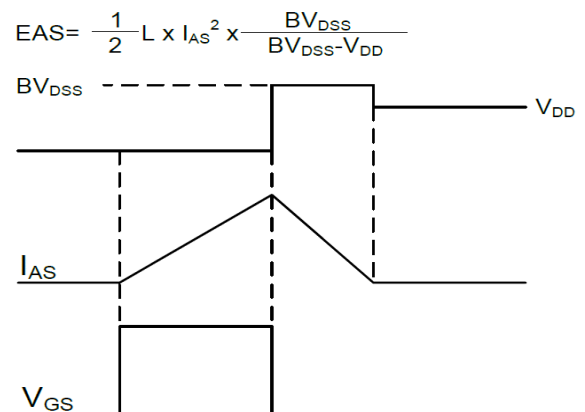
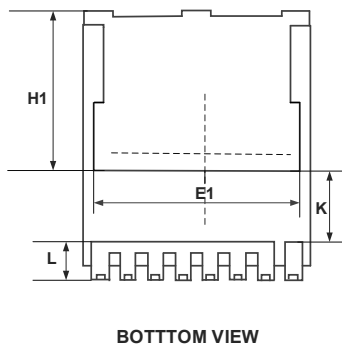
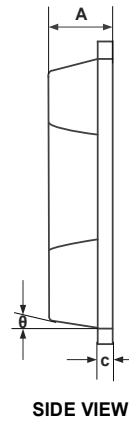
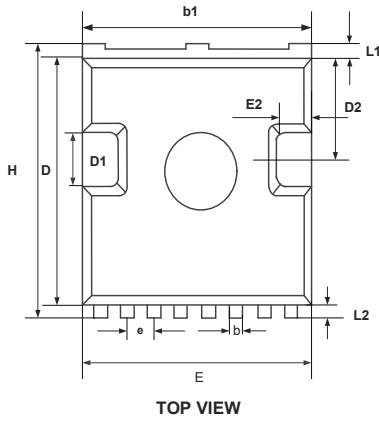


Figure C. Unclamped Inductive Switching Circuit & Waveforms

$$EAS = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$


Mechanical Dimensions for TOLL



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	2.20	2.40
b	0.60	0.90
b1	9.70	9.90
c	0.40	0.60
D	10.20	10.60
D1	3.10	3.50
D2	4.45	4.75
E	9.70	10.10
E1	7.80BSC	
E2	0.50	0.70
e	1.200 BSC	
H	11.45	11.90
H1	6.75 BSC	
K	3.10 REF	
L	1.70	2.10
L1	0.60	0.80
L2	0.50	0.70
θ	10° REF	