

## FNK N-Channel Power MOSFET

### Description

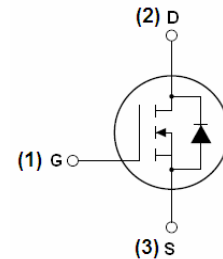
The FNK1404T uses advanced trench technology and design to provide excellent  $R_{ds(on)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

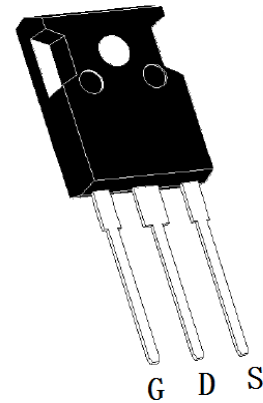
- $V_{DS} = 45V$ ,  $I_D = 205A$   
 $R_{ds(on)} < 4m\Omega$  @  $V_{gs} = 10V$  (Typ:  $2.8m\Omega$ )
- High density cell design for ultra low  $R_{ds(on)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high EAS
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

### Application

- E-Tools
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply



Schematic diagram



TO-247 top view

### Package Marking and Ordering Information

Device Marking	Device Package	Form	Minimum Quantity
FNK1404T	TO-247	Tube	1000

### Absolute Maximum Ratings

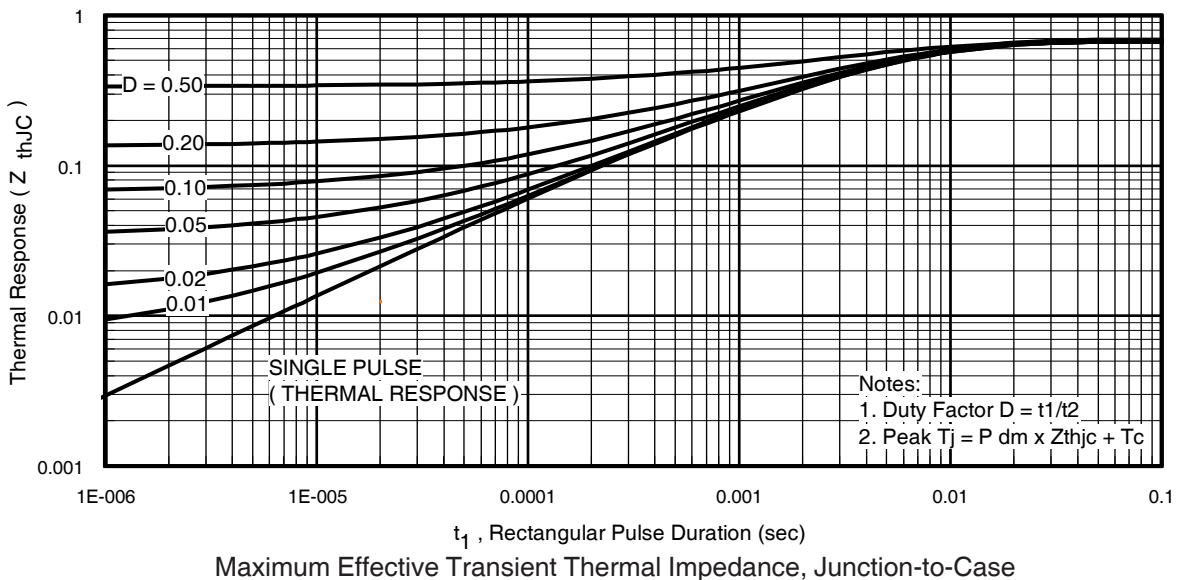
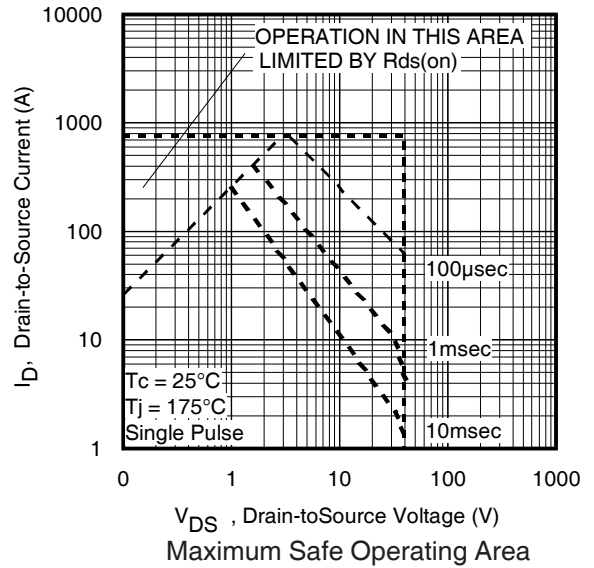
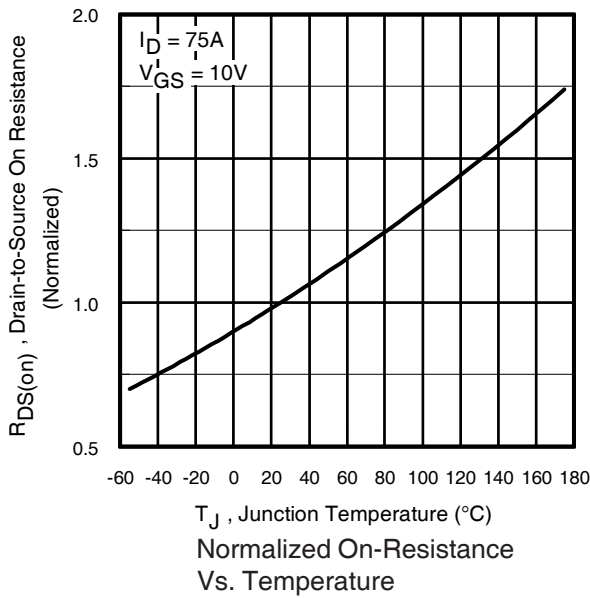
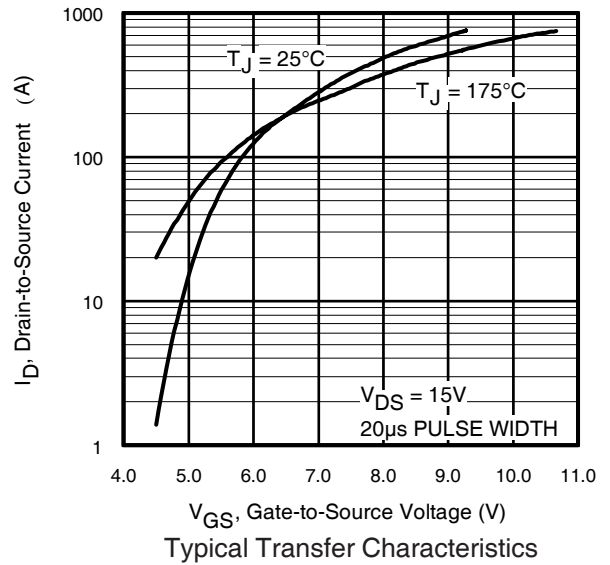
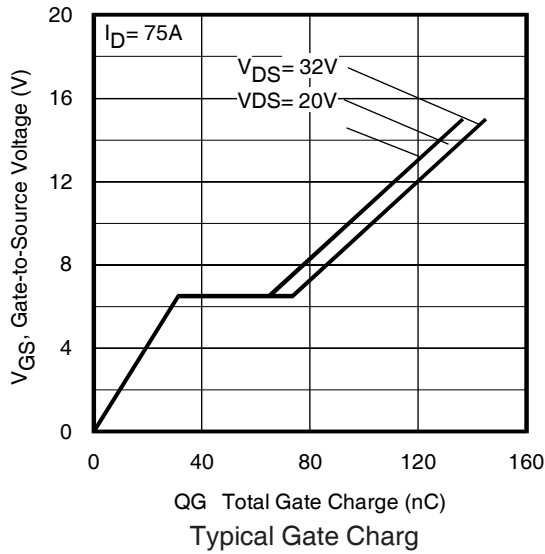
Symbol	Parameter	Max.	Unit
$V_{ds}$	Drain-Source Voltage	45	V
$V_{gs}$	Gate-Source Voltage	$\pm 20$	V
$I_D$ (25°C)	Drain Current-Continuous ( $T_c = 25^\circ C$ )	205	A
$I_D$ (100°C)	Drain Current-Continuous ( $T_c = 100^\circ C$ )	140	A
$I_{dm}$	Pulsed Drain Current (Note 1,3)	820	A
$P_d$	Maximum Power Dissipation	300	W
EAS	Single pulse avalanche energy (Note 5)	940	mJ
$T_j$	Operating Junction and Storage Temperature Range	-55—175	°C
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 2)	0.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	65	°C/W

I <sub>DSS</sub>	Zero Gate Voltage Drain Current	—	—	5	μA	V <sub>GS</sub> =0V, V <sub>DS</sub> =V <sub>DS</sub>
I <sub>GSS</sub>	Gate-Body Leakage Current	—	—	±100	nA	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.5	3.0	3.5	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA
R <sub>DS(on)</sub> @10	Drain-Source On-State Resistance	—	2.8	4.2	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =I <sub>D</sub> /4
g <sub>fs</sub>	Forward Transconductance	—	78	—	S	V <sub>DS</sub> =V <sub>DS</sub> /2, I <sub>D</sub> =I <sub>D</sub> /4
<b>Dynamic Characteristics (Note4)</b>						
C <sub>iss</sub>	Input Capacitance	—	8120	—	pF	V <sub>DS</sub> =V <sub>DS</sub> /2 V <sub>GS</sub> =0V F=1.0MHz
C <sub>oss</sub>	Output Capacitance	—	1370	—	pF	
C <sub>rss</sub>	Reverse Transfer Capacitance	—	910	—	pF	
<b>Switching Characteristics (Note 4)</b>						
T <sub>d(on)</sub>	Turn-on Delay Time	—	19	—	nS	V <sub>DS</sub> =V <sub>DS</sub> *0.75 I <sub>D</sub> =I <sub>D</sub> /2 R <sub>G</sub> =2.5Ω V <sub>GS</sub> =10V
T <sub>r</sub>	Turn-on Rise Time	—	206	—	nS	
T <sub>d(off)</sub>	Turn-Off Delay Time	—	53	—	nS	
T <sub>f</sub>	Turn-Off Fall Time	—	38	—	nS	
Q <sub>g</sub>	Total Gate Charge	—	135	200	nC	I <sub>D</sub> =I <sub>D</sub> /2 V <sub>DS</sub> =V <sub>DS</sub> *0.75 V <sub>GS</sub> =10V
Q <sub>gs</sub>	Gate-Source Charge	—	40	65	nC	
Q <sub>gd</sub>	Gate-Drain Charge	—	42	71	nC	
R <sub>g</sub>	Gate-Drain Charge	2.1	2.8	3.5	Ω	F=1MHz, open drain
<b>Drain-Source Diode Characteristics</b>						
V <sub>SD</sub>	Diode Forward Voltage (Note 3)	—	0.65	1	V	I <sub>S</sub> =I <sub>D</sub> /2, V <sub>GS</sub> =0V
T <sub>rr</sub>	Reverse Recovery Time	—	85	125	nS	I <sub>F</sub> =I <sub>D</sub> /2, V <sub>R</sub> =V <sub>DS</sub> *0.75 di/dt = 100A/μs
Q <sub>rr</sub>	Reverse Recovery Charge	—	173	240	nC	
T <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

### Notes:

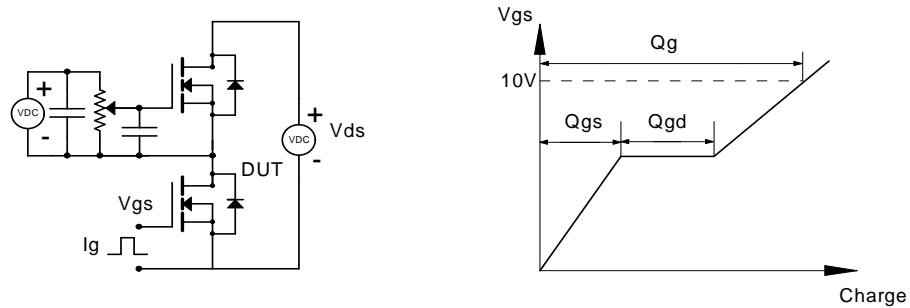
- ①.Repetitive Rating: Pulse width limited by maximum junction temperature.
- ②.Surface Mounted on FR4 Board, t ≤ 10 sec.
- ③.Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
- ④. Guaranteed by design, not subject to production
- ⑤. EAS condition : T<sub>j</sub>=25°C, V<sub>DD</sub>=40V, V<sub>G</sub>=10V, L=0.5mH, R<sub>g</sub>=25Ω

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

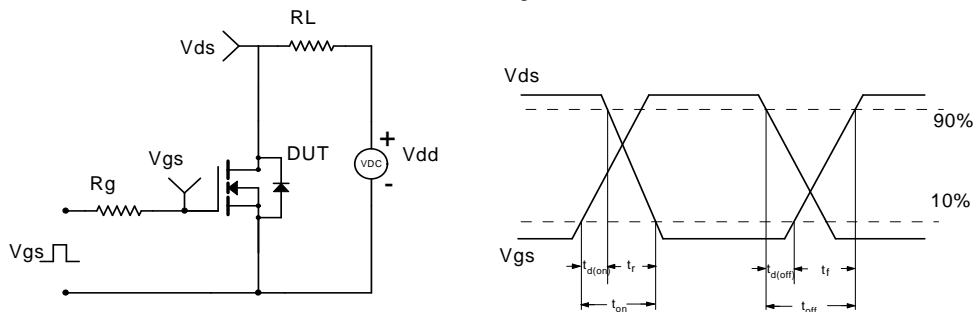


## TEST CIRCUIT

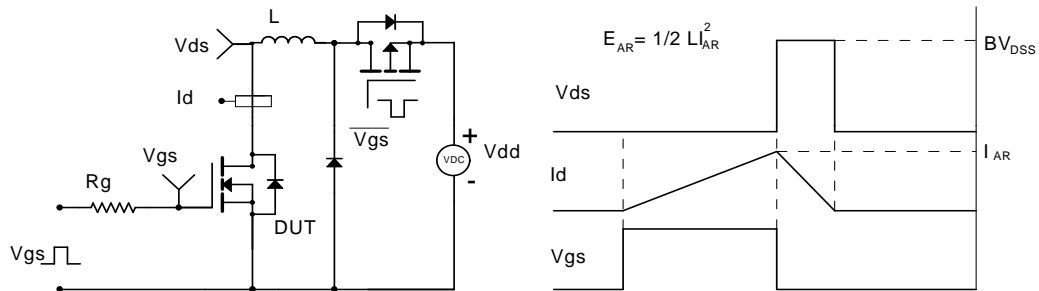
### Gate Charge Test Circuit & Waveform



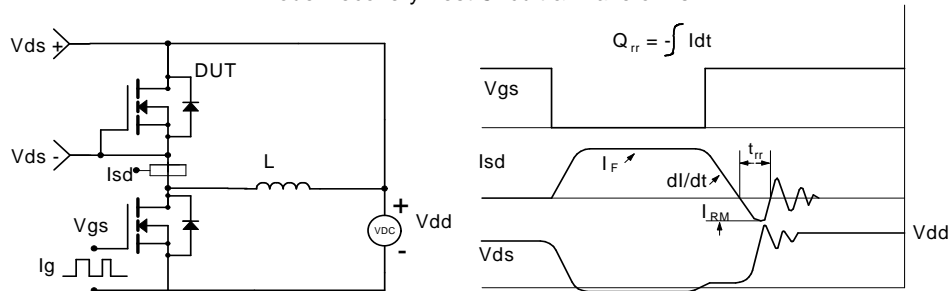
### Resistive Switching Test Circuit & Waveforms



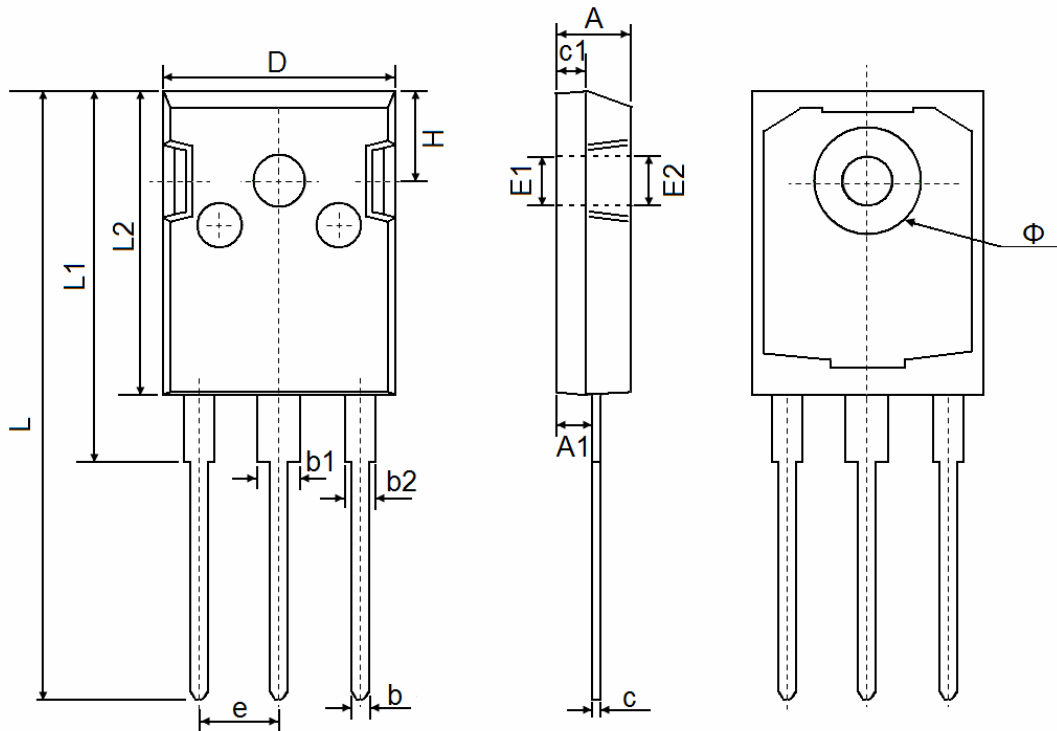
### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms



## TO-247 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
Φ	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	

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