

FNK N-Channel Enhancement Mode Power MOSFET

Description

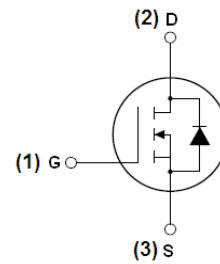
The FNK04N03K uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

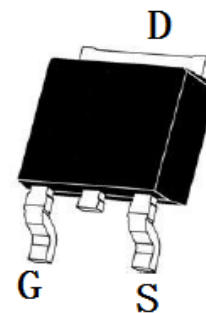
- $V_{DS} = 40V, I_D = 100A$
 $R_{DS(ON)} < 4.0m\Omega @ V_{GS} = 10V$
 $R_{DS(ON)} < 5.1m\Omega @ V_{GS} = 4.5V$
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

- Load switching
- Hard switched and high frequency circuits
- Uninterruptible power supply



Schematic diagram



TO-252 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
FNK04N03K	FNK04N03K	TO-252	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	100	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	77	A
Pulsed Drain Current	I_{DM}	400	A
Maximum Power Dissipation	P_D	120	W
Derating factor		0.8	W/ $^\circ C$
Single pulse avalanche energy ^(Note 5)	E_{AS}	1080	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	1.25	$^{\circ}\text{C/W}$
--	-----------------	------	----------------------

Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

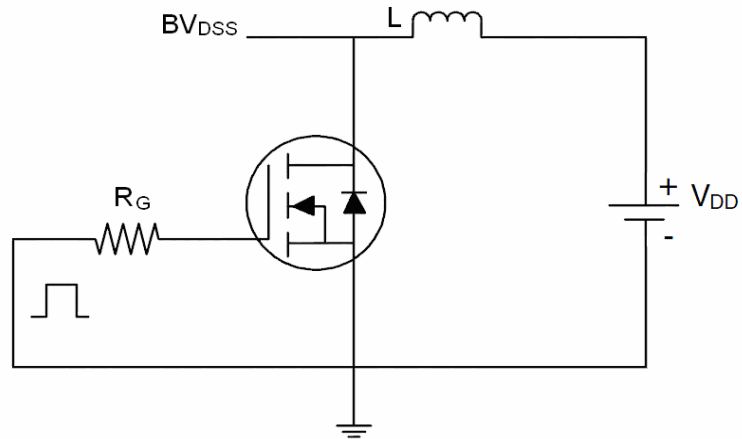
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	40	45	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.1	1.5	2.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =20A	-	2.9	4.0	mΩ
		V _{GS} =4.5V, I _D =20A	-	3.6	5.1	
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =20A	26	-	-	S
Dynamic Characteristics ^(Note4)						
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, F=1.0MHz	-	7315	-	PF
Output Capacitance	C _{oss}		-	675	-	PF
Reverse Transfer Capacitance	C _{rss}		-	560	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =20V, I _D =2A, R _L =1Ω V _{GS} =10V, R _G =3Ω	-	15	-	nS
Turn-on Rise Time	t _r		-	18	-	nS
Turn-Off Delay Time	t _{d(off)}		-	52	-	nS
Turn-Off Fall Time	t _f		-	23	-	nS
Total Gate Charge	Q _g	V _{DS} =20V, I _D =20A, V _{GS} =10V	-	75		nC
Gate-Source Charge	Q _{gs}		-	10.5		nC
Gate-Drain Charge	Q _{gd}		-	17		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V _{SD}	V _{GS} =0V, I _S =40A	-		1.2	V
Diode Forward Current ^(Note 2)	I _S		-	-	120	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 40A di/dt = 100A/μs ^(Note3)	-	42	-	nS
Reverse Recovery Charge	Q _{rr}		-	45	-	nC

Notes:

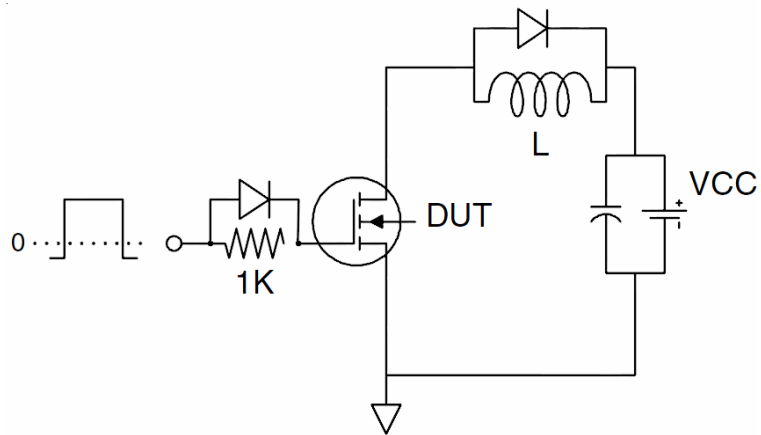
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. E_{AS} condition : $T_J=25^{\circ}\text{C}, V_{DD}=20V, V_G=10V, L=0.5mH, R_g=25\Omega$.

Test circuit

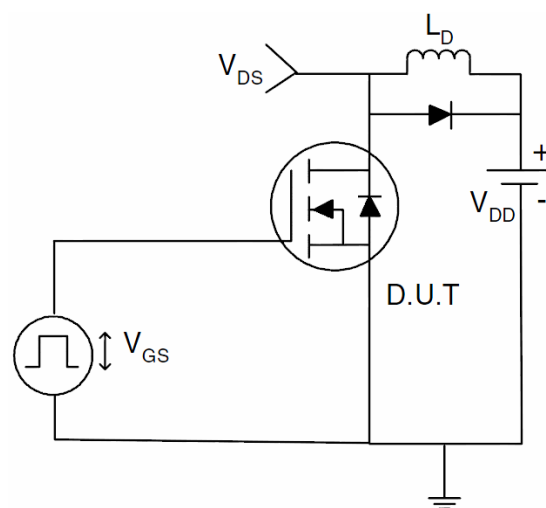
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

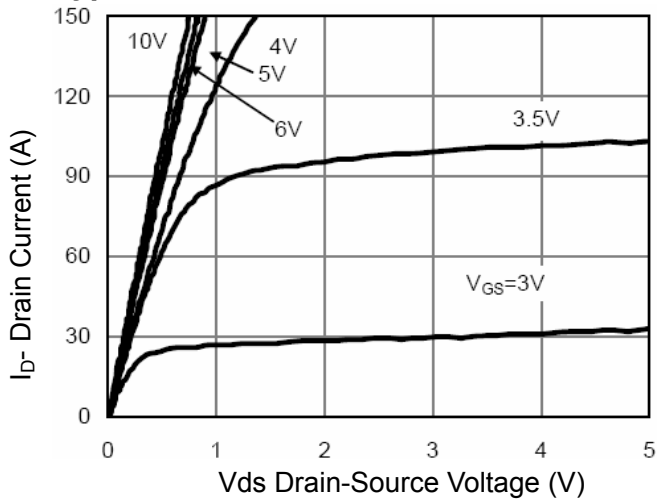


Figure 1 Output Characteristics

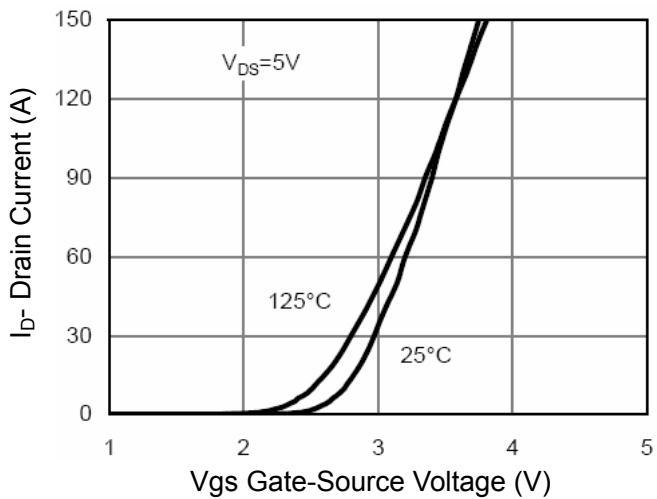


Figure 2 Transfer Characteristics

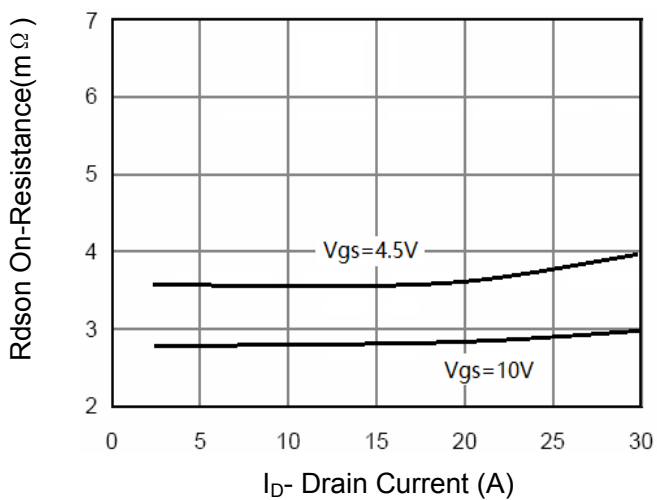


Figure 3 Rdson- Drain Current

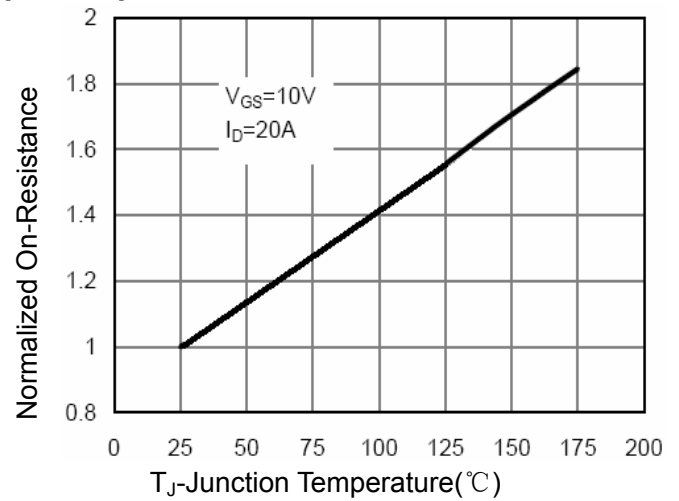


Figure 4 Rdson-Junction Temperature

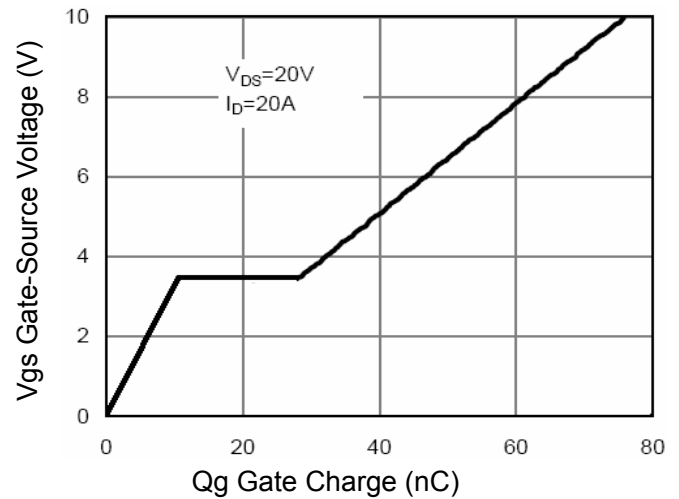


Figure 5 Gate Charge

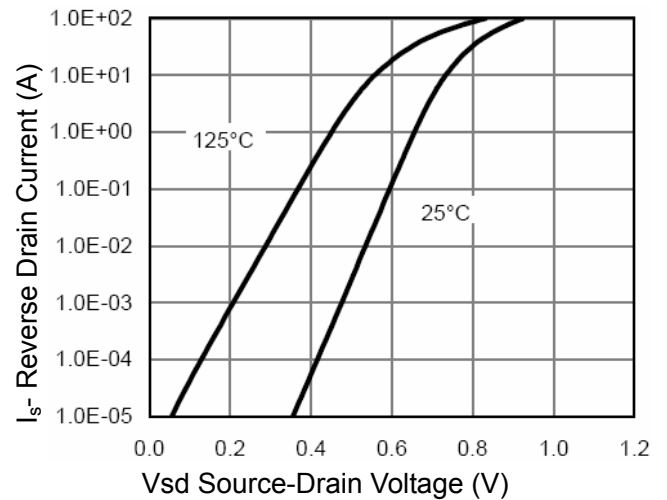
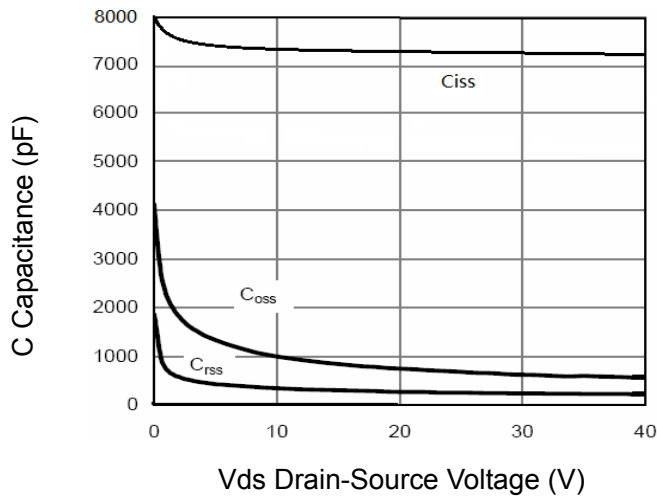
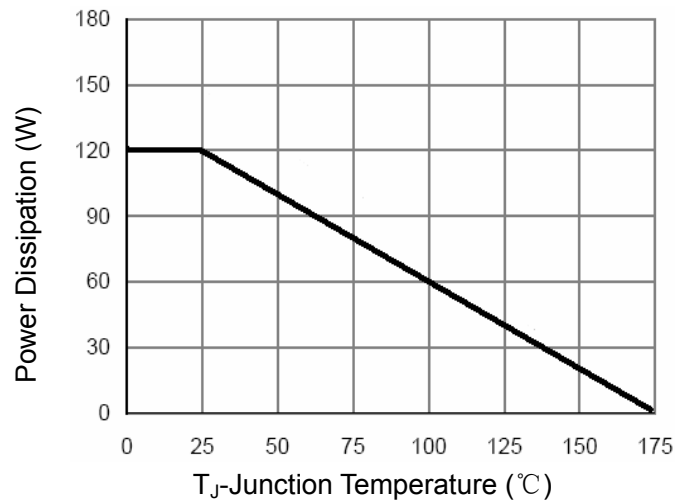
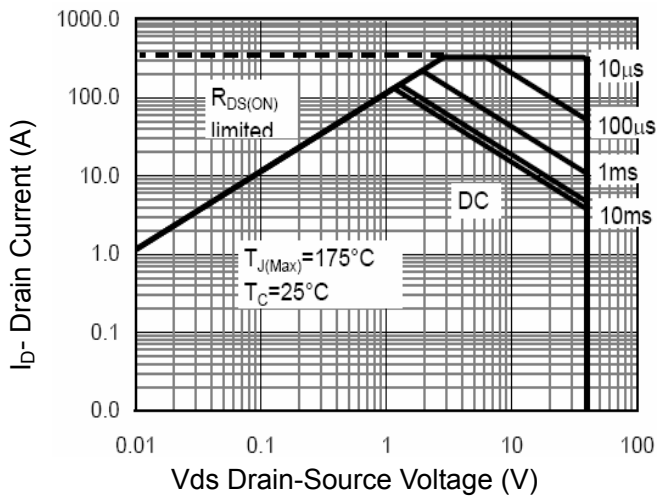
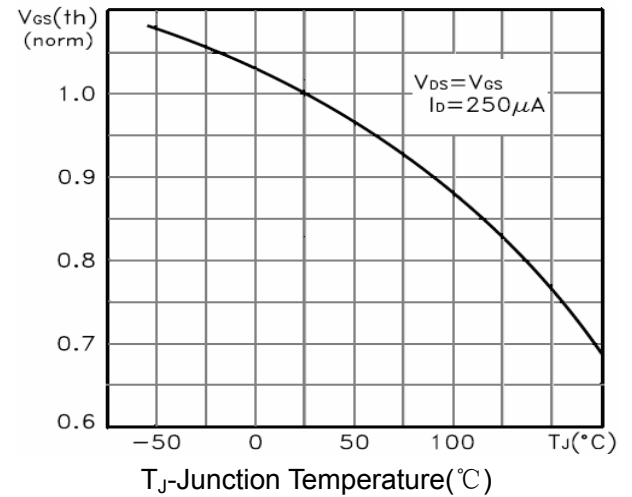
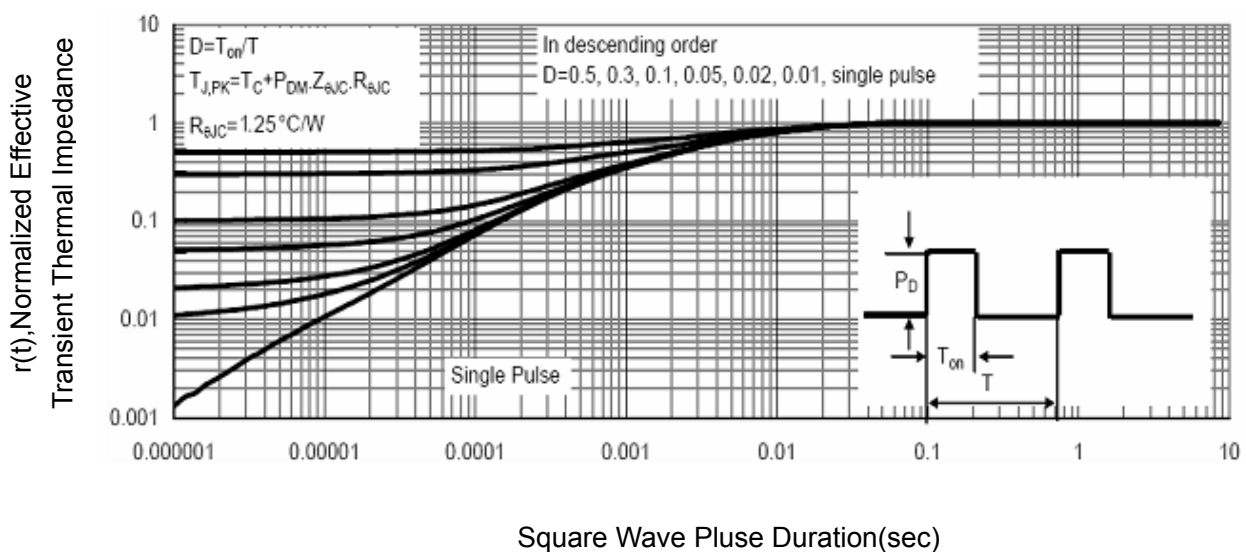
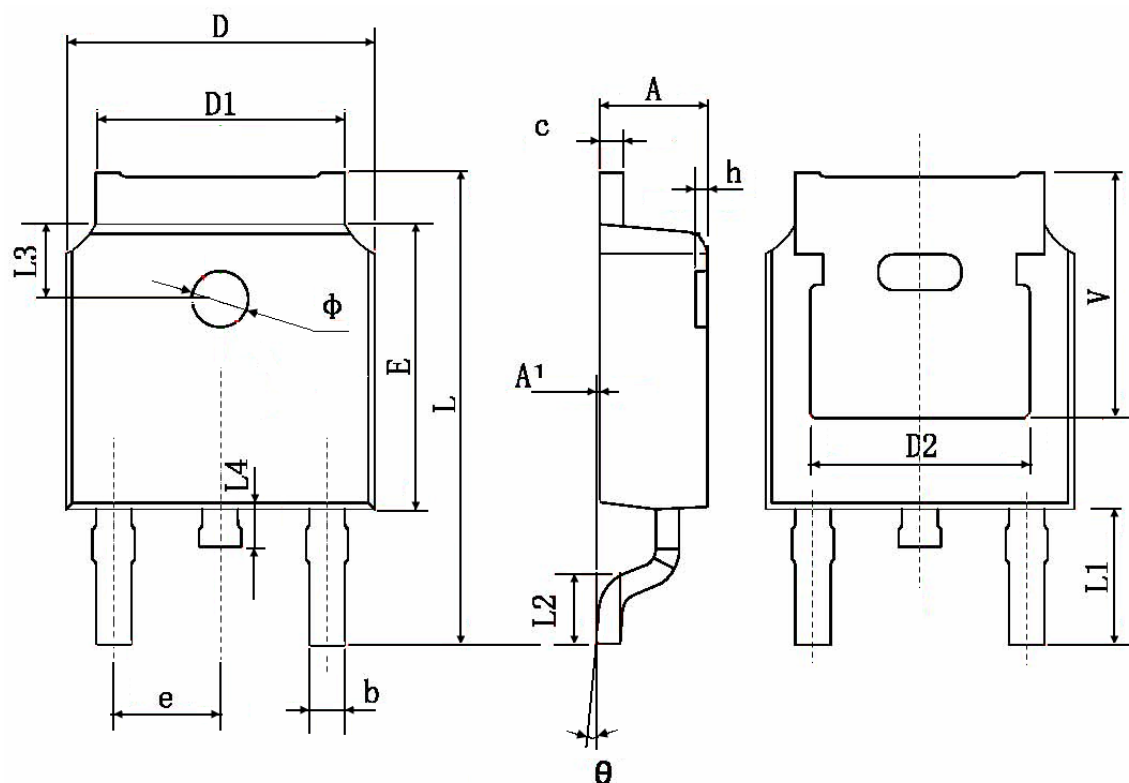


Figure 6 Source- Drain Diode Forward


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

TO-252 Package Information


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

Disclaimer:

- FNK reserves the right to make changes to the information herein for the improvement of the design and performance without further notice! Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current.
- All semiconductor products malfunction or fail with some probability under special conditions. When using FNK products in system design or complete machine manufacturing, it is the responsibility of the buyer to comply with the safety standards strictly and take essential measures to avoid situations in which a malfunction or failure of such Silan products could cause loss of body injury or damage to property.
- FNK will supply the best possible product for customers!