

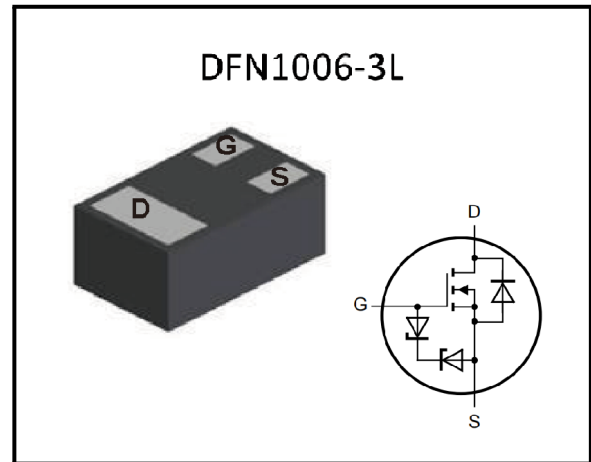
2N7002KN

N-Channel MOSFET

Features

- $V_{DS}=60V$
- $I_D=0.35A$
- $R_{DS(ON)} @V_{GS}=10V, TYP=1.5\Omega$
- $R_{DS(ON)} @V_{GS}=4.5V, TYP=1.7\Omega$
- Logic-level compatible
- Very fast switching
- Trench MOSFET technology
- ElectroStatic Discharge (ESD) protection > 2kV HBM

Package



Applications

- Relay driver
- Low-side loadswitch
- High-speed line driver
- Switching circuits

Marking

72K

Ordering information

Order code	Package	Marking	Base qty	Delivery mode
2N7002KN	DFN1006-3L	72K	10K	Tape and reel

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

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Continuous Drain Current	0.35	A
I_{DM}	Peak Continuous Drain Current	0.9	A
P_D	Maximum Power Dissipation	250	mW
T_J	Junction Temperature	-55 to + 150	$^\circ C$
T_{stg}	Storage Temperature	-55 to + 150	$^\circ C$
$R_{\theta JA}$	Junction-to-Ambient Thermal Resistance	500	$^\circ C/W$

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Electrical Characteristics (@T_A=25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	60	—	—	V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250uA	1	1.6	2.5	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 60V, V _{GS} = 0V	—	—	1	uA
I _{GSS1}	Gate Body Leakage Current	V _{GS} =±20V, V _{DS} = 0V	—	—	±10	uA
I _{GSS2}		V _{GS} =±10V, V _{DS} = 0V	—	—	±1	uA
I _{GSS3}		V _{GS} =±5V, V _{DS} = 0V	—	—	±0.3	uA
R _{DS(on)}	Drain-Source On-State Resistance	V _{GS} = 10V, I _D = 0.3A	—	1.5	2	Ω
		V _{GS} = 4.5V, I _D = 0.2A	—	1.7	2.4	
g _{fs}	Forward Transconductance	V _{DS} =10V, I _D =0.2A	—	0.6	—	S
R _G	Internal Gate Resistance (AC)	f = 2.5MHZ	—	2.5	—	Ω
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =10V, V _{GS} =0V, f = 1MHZ	—	23.6	—	pF
C _{oss}	Output Capacitance		—	4.6	—	
C _{rss}	Reverse Transfer Capacitance		—	3	—	
Q _g	Gate to Drain Charge	V _{DS} =30V, V _{GS} =10V, I _D =0.2A	—	1	—	nC
Q _{gs}	Gate to Source Charge		—	0.12	—	
Q _{gd}	Gate to Drain Charge		—	0.18	—	
T _{d(on)}	Turn-on delay time	V _{DS} =50V, V _{GS} =10V, I _D =0.2A, R _G =6Ω	—	4.7	—	ns
T _r	Turn-on Rise time		—	4.3	—	
T _{d(off)}	Turn -Off Delay Time		—	6.9	—	
T _f	Turn -Off Fall time		—	2.9	—	
Source-Drain Diode						
V _{SD}	Diode Forward Voltage	I _S =0.2A, V _{GS} =0V	—	0.87	1.2	V



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Typical Performance Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise noted)

Figure 1: Normalized total power dissipation as a function of junction temperature

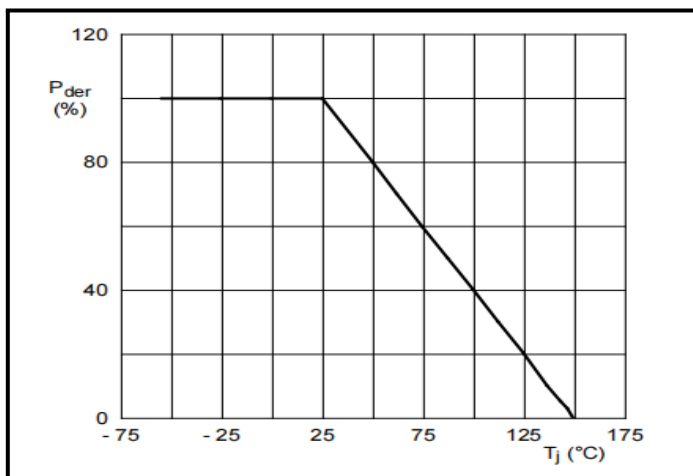


Figure 2: Normalized continuous drain current as a function of junction temperature

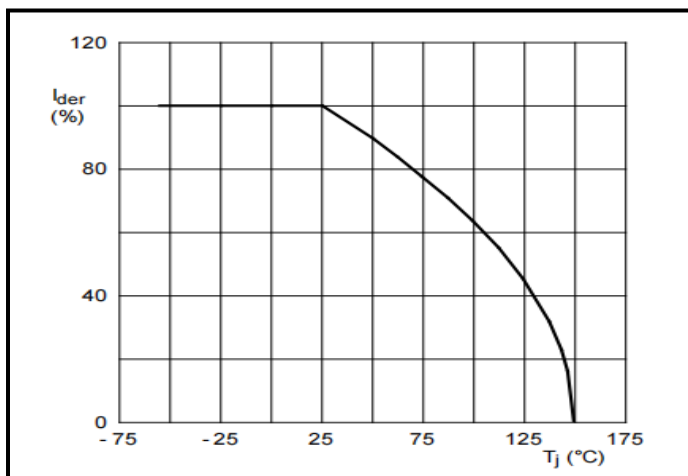
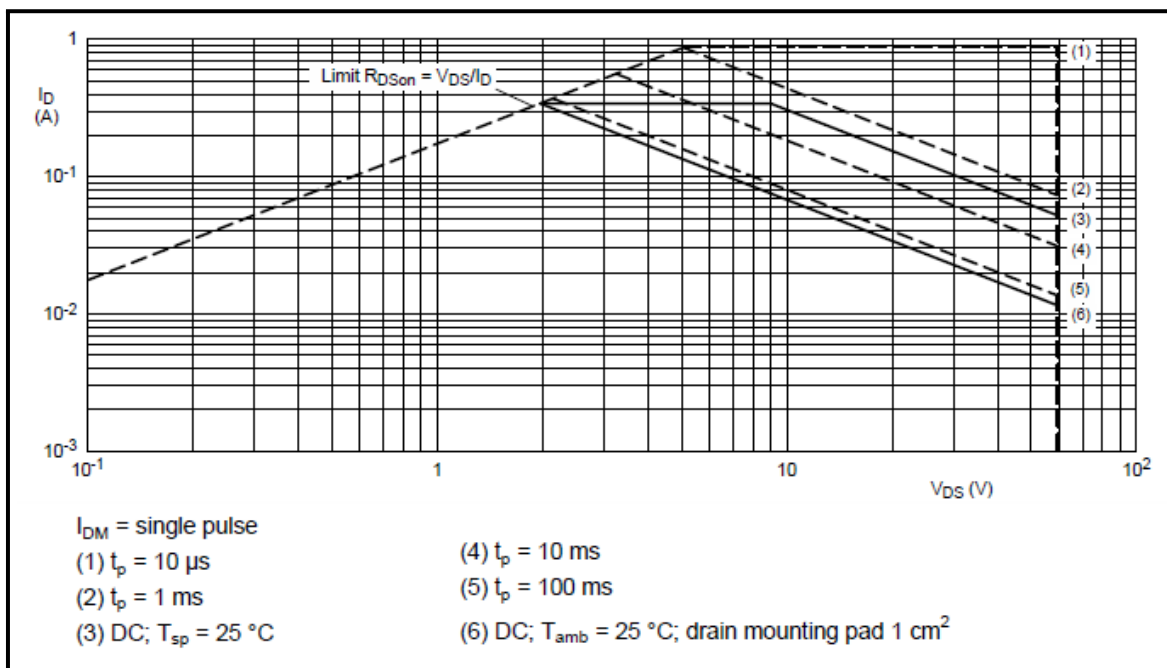


Figure 3: Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage



Typical Performance Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise noted)

Figure 4: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

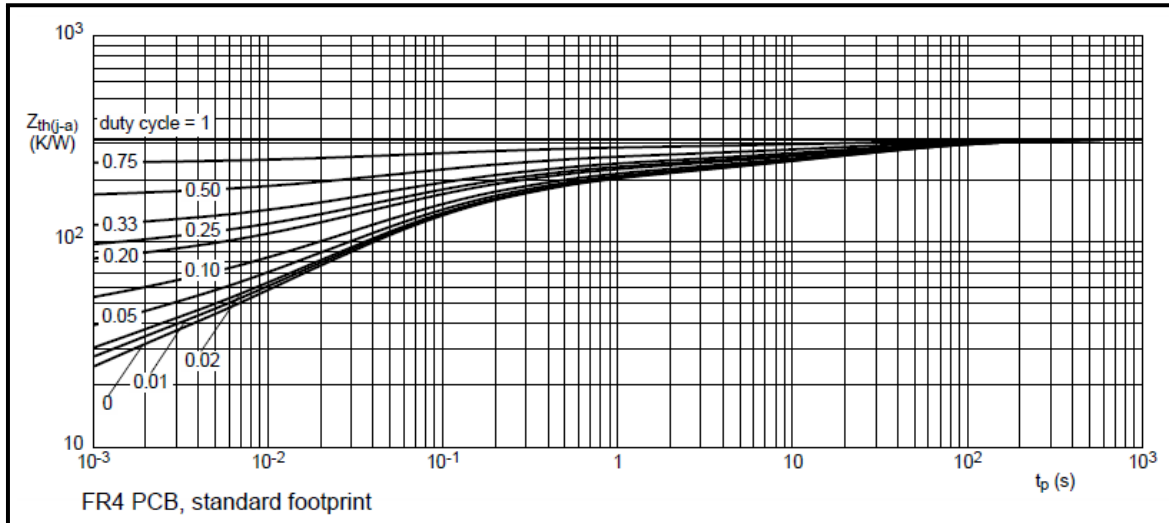
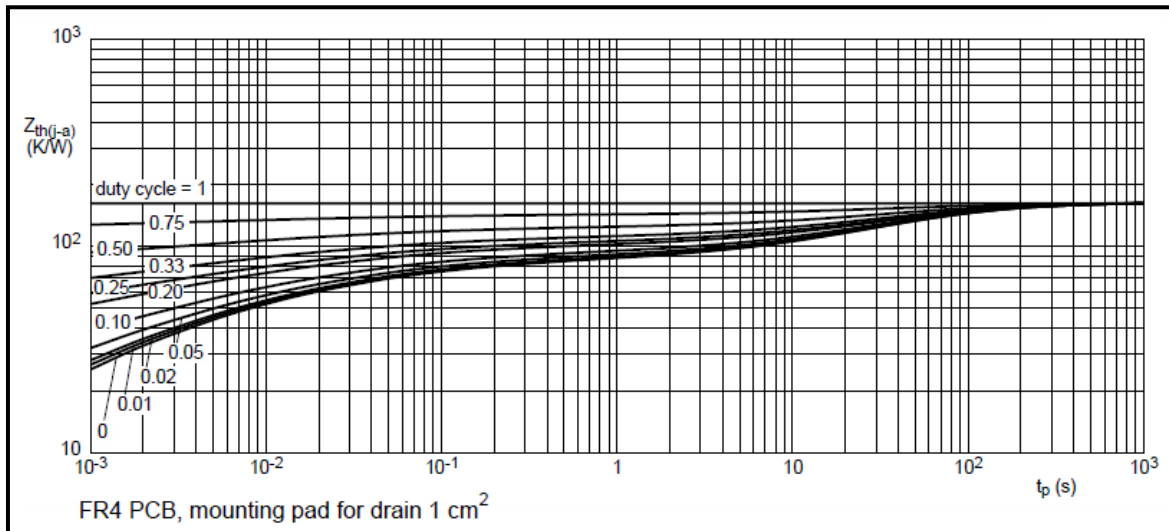


Figure 5: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



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Typical Performance Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise noted)

Figure 6: Output characteristics: drain current as a function of drain-source voltage; typical values

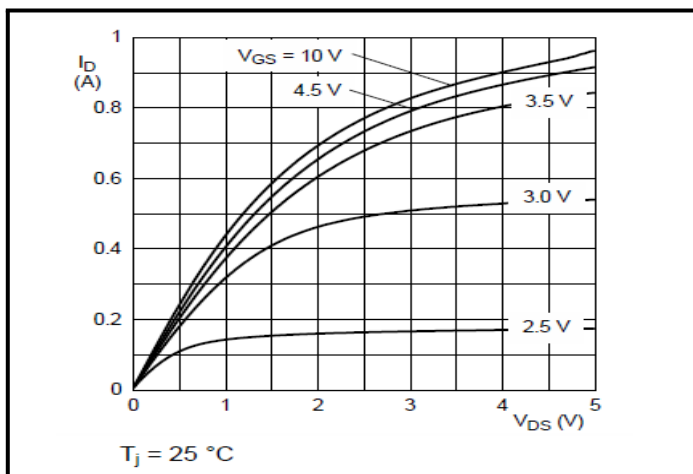


Figure 8: Drain-source on-state resistance as a function of drain current; typical values

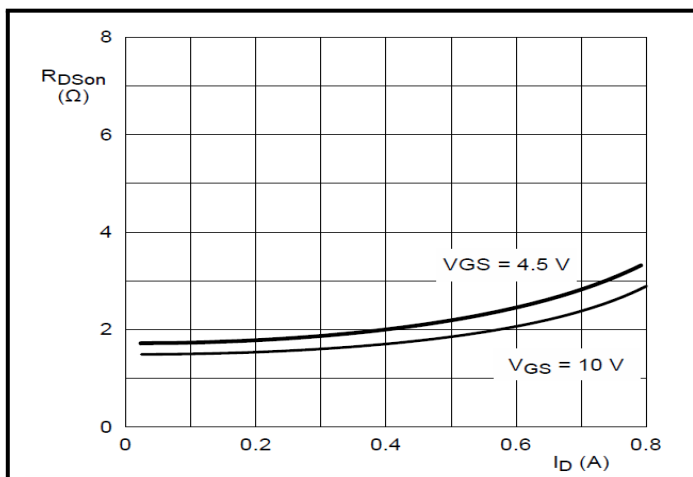


Figure 7: Sub-threshold drain current as a function of gate-source voltage

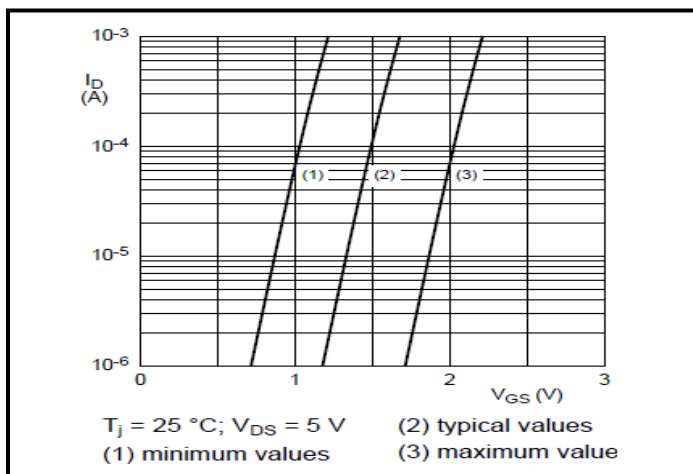
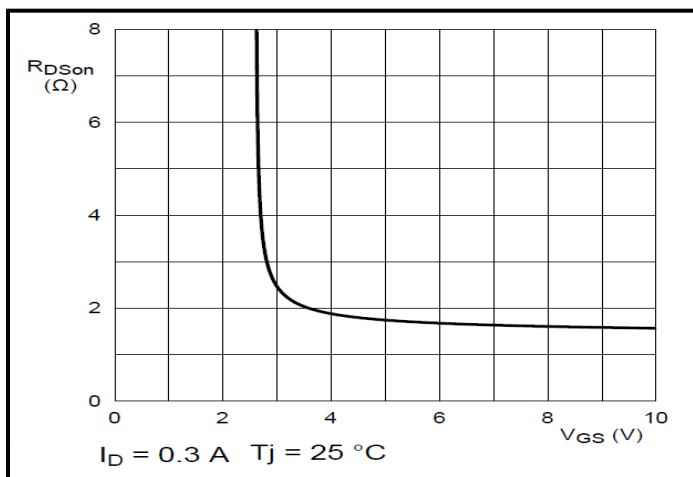


Figure 9: Drain-source on-state resistance as a function of drain current; typical values



Typical Performance Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise noted)

Figure 10: Transfer characteristics: drain current as a function of gate-source voltage; typical values

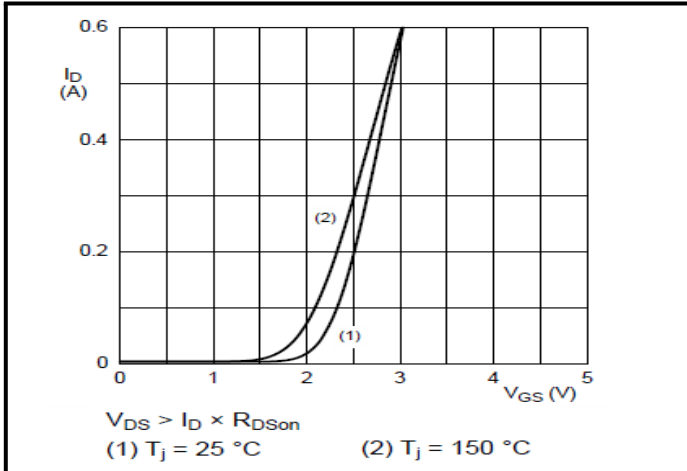


Figure 12: Gate-source threshold voltage as a function of junction temperature

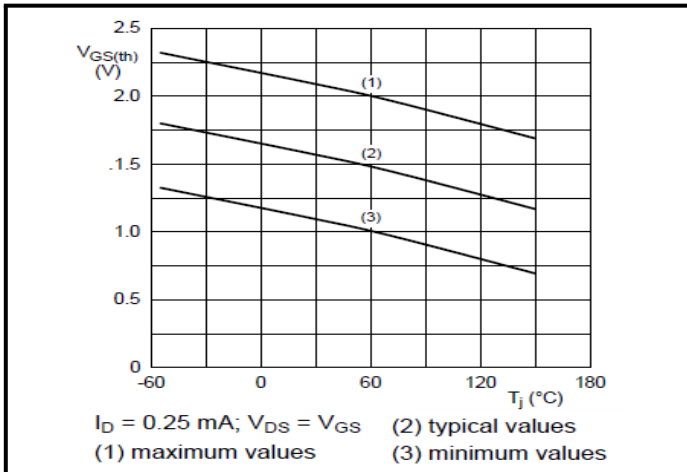


Figure 11: Normalized drain-source on-state resistance as a function of junction temperature; typical values

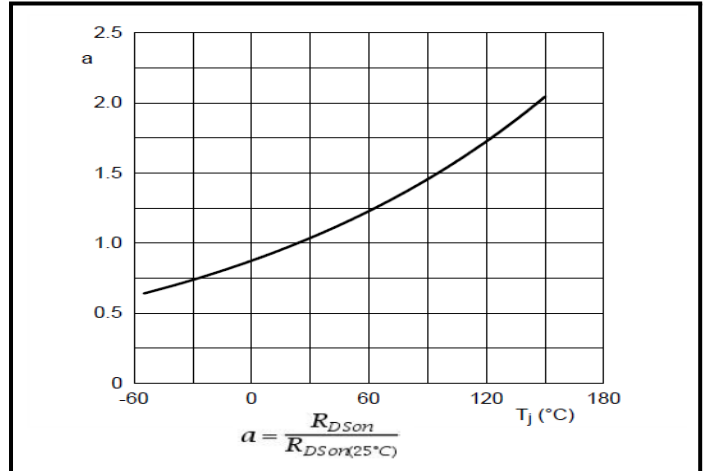
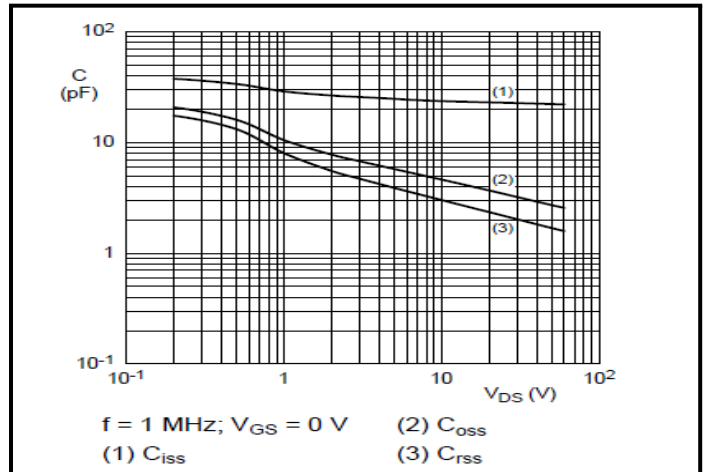


Figure 13: Input, output and reverse transfer capacitances as a function of drain-source voltage



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Typical Performance Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise noted)

Figure 14: Gate-source voltage as a function of gate charge; typical values

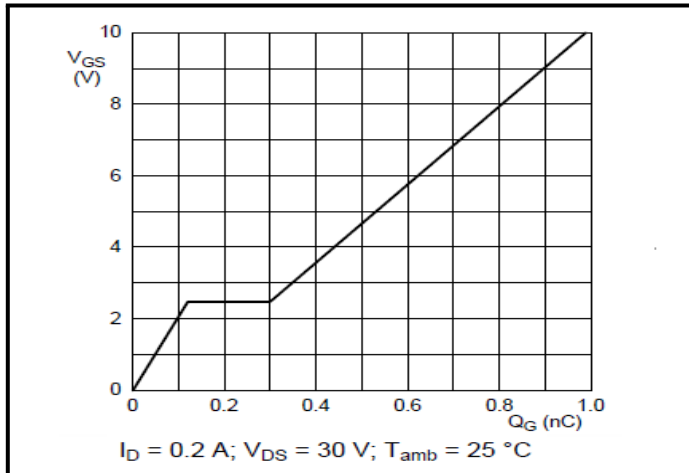


Figure 16: Source current as a function of source-drain voltage; typical values

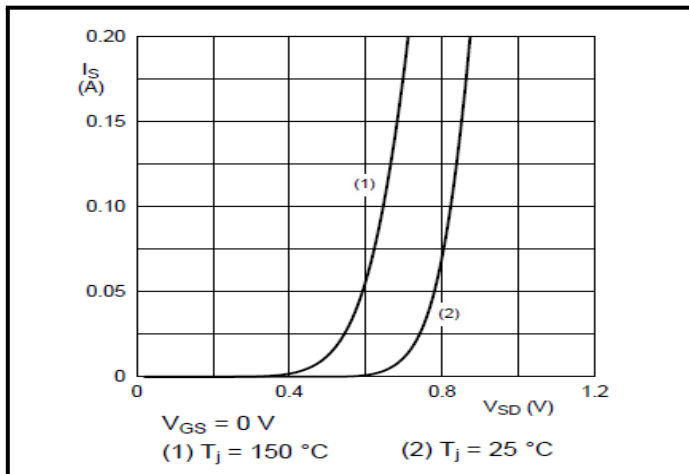


Figure 15: MOSFET transistor: Gate charge waveform definitions

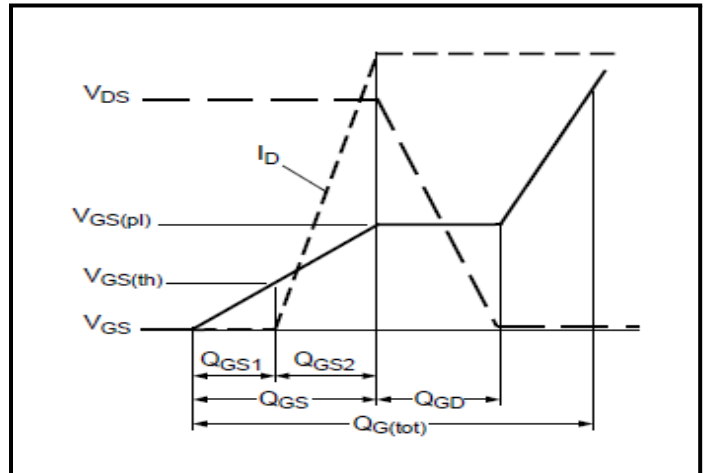
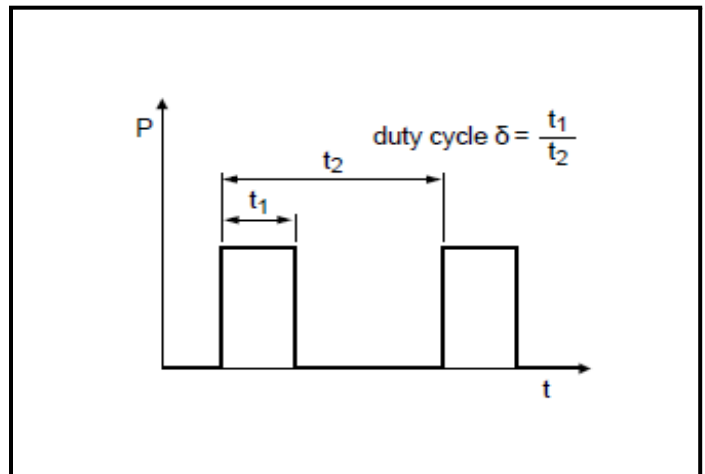


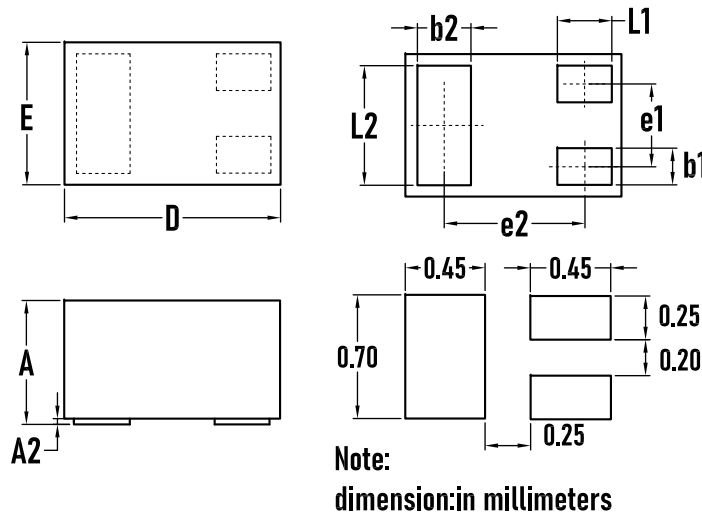
Figure 17: Test information: Duty cycle definition



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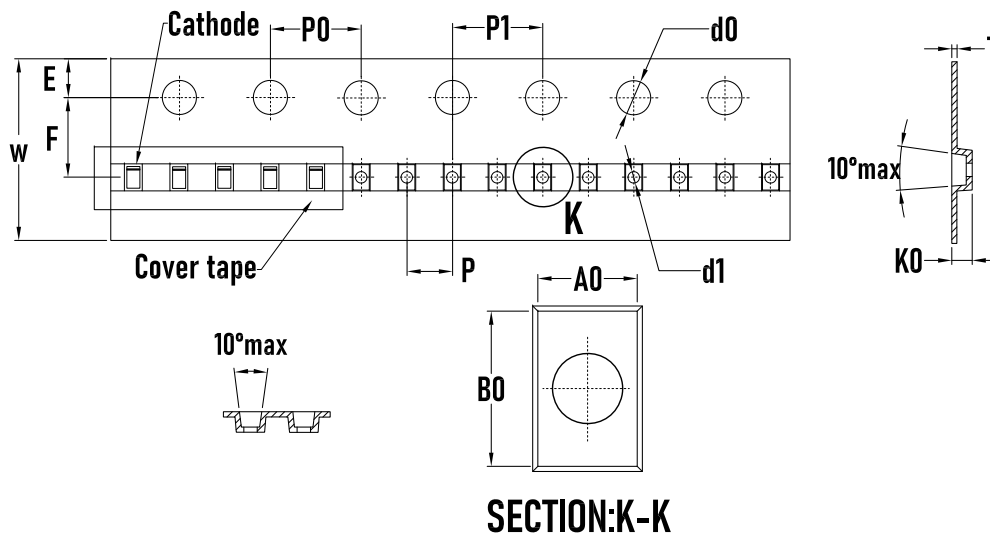
N-Channel MOSFET

Outline Drawing –DFN1006-3L



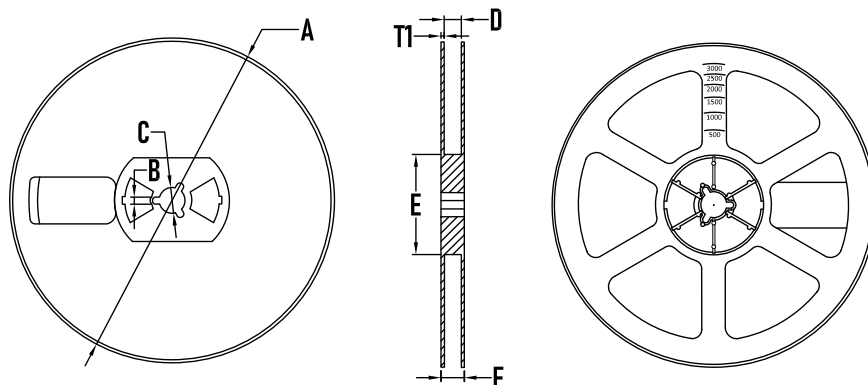
SYMBOL	MILLIMETER		
	MIN.	Typ.	MAX.
A	0.40	—	0.50
A2	0.00	—	.05
b1	0.10	0.15	0.20
b2	0.20	0.25	0.30
D	0.95	1.00	1.05
E	0.55	0.60	0.65
e1	0.350BSC		
e2	0.675BSC		
L1	0.20	0.30	0.40
L2	0.40	0.50	0.60

Packaging Tape - DFN1006



SYMBOL	MILLIMETER
A0	0.71±0.05
B0	1.11±0.05
d0	1.5 ^{+0.1} ₋₀
d1	0.50±0.05
E	1.75±0.10
F	3.50±0.05
K0	0.56±0.05
P	2.00±0.05
P0	4.00±0.10
P1	2.00±0.05
W	8.00 ^{+0.03} _{-0.01}
T	0.2±0.015

Packaging Reel



SYMBOL	MILLIMETER
A	178±1
B	3.5±0.2
C	14.3±0.2
D	9.8 ⁺² ₋₁
E	54.5±0.5
F	12.4±0.2
T1	1.0±0.2
Quantity	10000PCS

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