NIKO-SEM

N-Channel Enhancement Mode Field Effect Transistor

P2020YD
TO-252
Halogen-Free & Lead-Free

PRODUCT SUMMARY

$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D
200V	95mΩ	20A
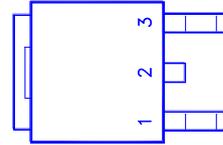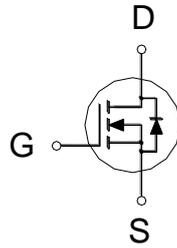
1: GATE
2: DRAIN
3: SOURCE

ABSOLUTE MAXIMUM RATINGS (T_A = 25 ° C Unless Otherwise Noted)

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS	UNITS
Drain-Source Voltage		V_{DS}	200	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C = 25 ° C	I_D	20	A
	T_C = 100 ° C		12.7	
Pulsed Drain Current[1]		I_{DM}	50	
Avalanche Current		I_{AS}	7.7	
Avalanche Energy	L = 1mH	E_{AS}	30	mJ
Power Dissipation	T_C = 25 ° C	P_D	96	W
	T_C = 100 ° C		38	
Junction & Storage Temperature Range		T_J, T_{stg}	-55 to 150	° C

THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNITS
Junction-to-Ambient	$R_{\theta JA}$		62.5	° C / W
Junction-to-Case	$R_{\theta JC}$		1.3	

[1]Pulse width limited by maximum junction temperature.

### .ELECTRICAL CHARACTERISTICS (T_J = 25 ° C, Unless Otherwise Noted)

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
STATIC						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250µA	200			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250µA	1.3	1.8	2.3	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0V, V_{GS} = ±20V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 200V, V_{GS} = 0V			1	µA
		V_{DS} = 160V, V_{GS} = 0V, T_J = 125 ° C			10	
Drain-Source On-State Resistance[1]	$R_{DS(ON)}$	V_{GS} = 4.5V, I_D = 10A		73	100	mΩ
		V_{GS} =10V, I_D = 10A		71	95	

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Forward Transconductance[1]	g_{fs}	$V_{DS} = 10V$, $I_D = 10A$		54		S
DYNAMIC						
Input Capacitance	C_{iss}	$V_{GS} = 0V$, $V_{DS} = 25V$, $f = 1MHz$		2050		pF
Output Capacitance	C_{oss}			157		
Reverse Transfer Capacitance	C_{rss}			71		
Total Gate Charge[2]	$Q_{g(VGS=10V)}$	$V_{DS} = 160V$, $I_D = 20A$		42		nC
	$Q_{g(VGS=4.5V)}$			21		
Gate-Source Charge[2]	Q_{gs}			6		
Gate-Drain Charge[2]	Q_{gd}			10		
Turn-On Delay Time[2]	$t_{d(on)}$	$V_{DS} = 100V$, $I_D \cong 10A$, $V_{GS} = 10V$, $R_{GEN} = 25\Omega$		18		nS
Rise Time[2]	t_r			43		
Turn-Off Delay Time[2]	$t_{d(off)}$			62		
Fall Time[2]	t_f			104		
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_J = 25°C$)						
Continuous Current	I_S				20	A
Forward Voltage[1]	V_{SD}	$I_F = 20A$, $V_{GS} = 0V$			1	V
Diode Reverse Recovery Time	t_{rr}	$I_F = 20A$, $dI/dt=100A/\mu s$		88		nS
Diode Reverse Recovery Charge	Q_{rr}			236		nC

[1]Pulse test : Pulse Width $\leq$ 300 μsec, Duty Cycle $\leq$ 2%.
[2]Independent of operating temperature.

N-Channel Enhancement Mode
Field Effect Transistor

Output Characteristics

VGS=10V
VGS=9V
VGS=8V
VGS=7V
VGS=6V
VGS=5V
VGS=4.5V

VGS=3.1V

VGS=2.9V

VGS=2.7V

I_D, Drain-To-Source Current(A)

V_{DS}, Drain-To-Source Voltage(V)
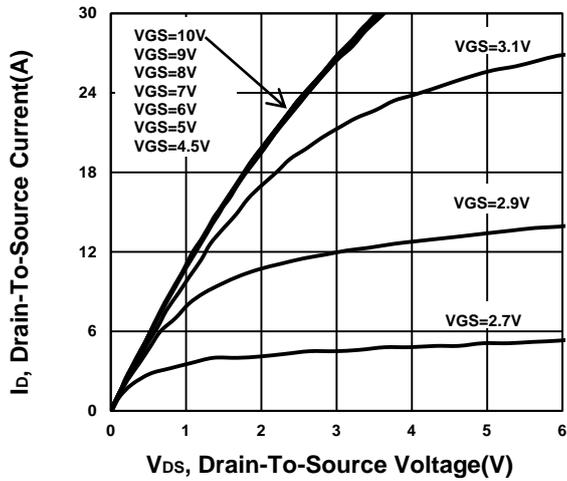
Transfer Characteristics

25℃

125℃

-20℃

I_D, Drain-To-Source Current(A)

V_{GS}, Gate-To-Source Voltage(V)
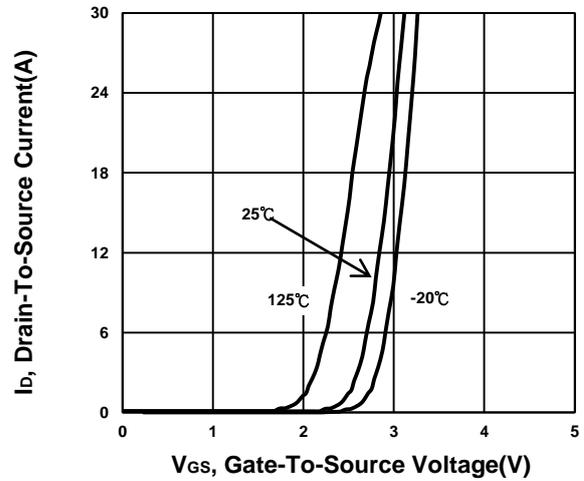
On-Resistance VS Gate-To-Source Voltage

ID=10A

$R_{DS(ON)}$ON-Resistance(OHM)

V_{GS}, Gate-To-Source Voltage(V)
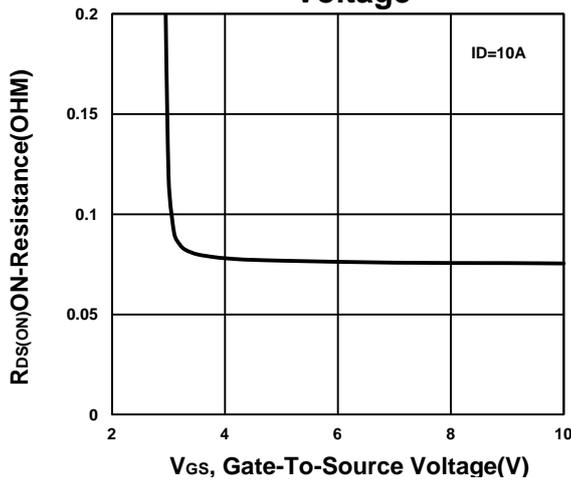
On-Resistance VS Drain Current

VGS=4.5V

VGS=10V

$R_{DS(ON)}$ON-Resistance(OHM)

I_D, Drain-To-Source Current(A)
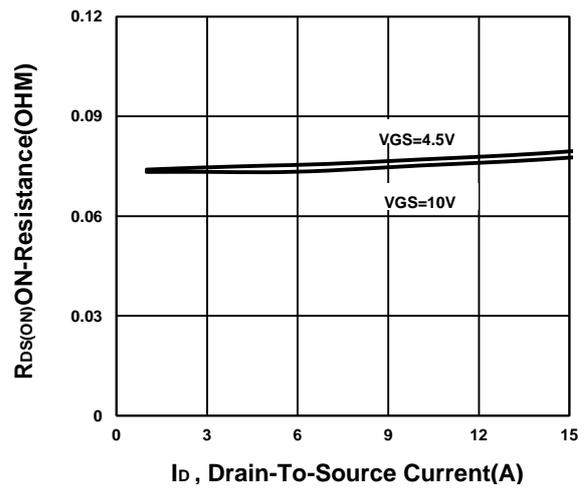
On-Resistance VS Temperature

VGS=10V
ID=10A

Normalized Drain to Source ON-Resistance

T_J, Junction Temperature(˚C)
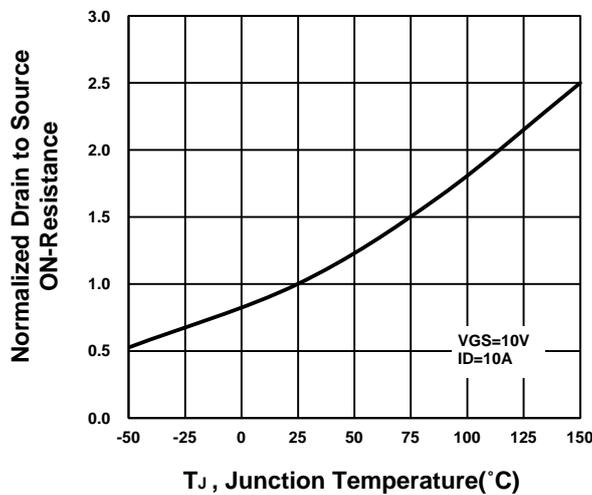
Capacitance Characteristic

CISS

COSS
CRSS

C, Capacitance(pF)

V_{DS}, Drain-To-Source Voltage(V)

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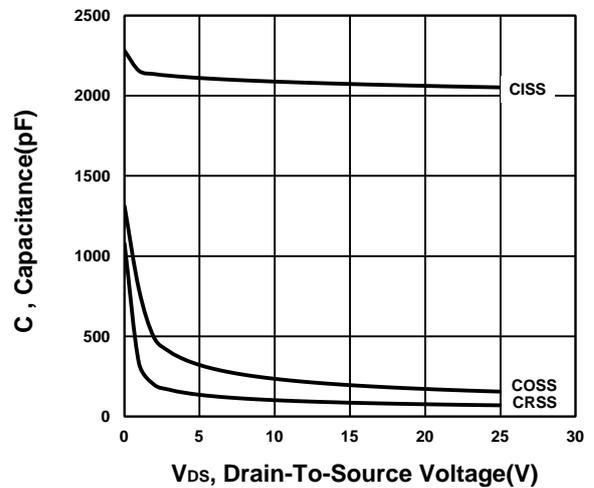
Gate charge Characteristics

VDS=160V
ID=20A

V_{GS} , Gate-To-Source Voltage(V)

Qg , Total Gate Charge(nC)
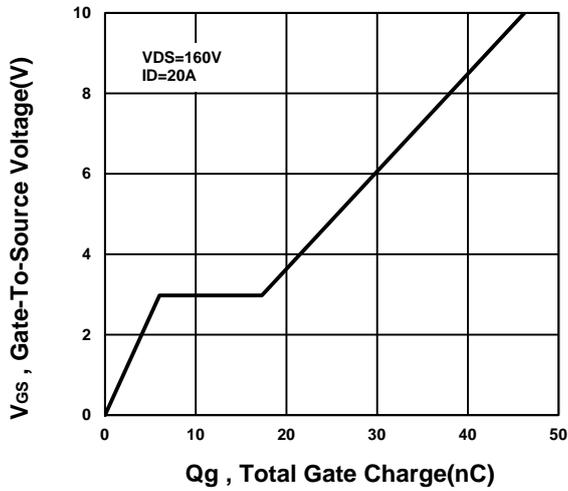
Source-Drain Diode Forward Voltage

150℃

25℃

I_S , Source Current(A)

V_{SD}, Source-To-Drain Voltage(V)

Safe Operating Area

1ms
10ms
100ms
DC

Operation in This Area is Limited by RDS(ON)

NOTE :
1.VGS = 10V
2.TC =25℃
3.RθJC = 1.3 ˚C/W
4.Single Pulse

I_D , Drain Current(A)

V_{DS}, Drain-To-Source Voltage(V)
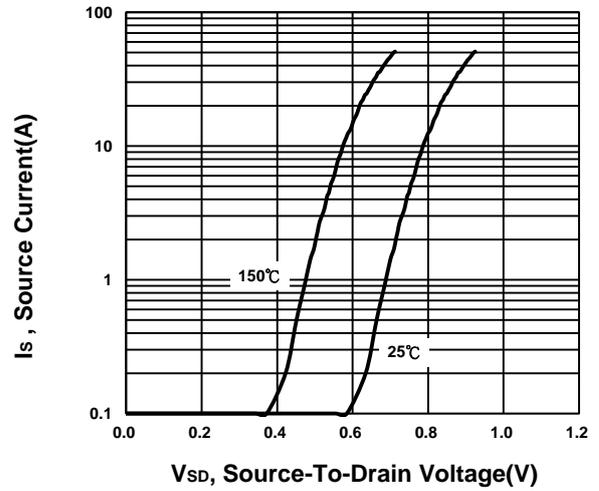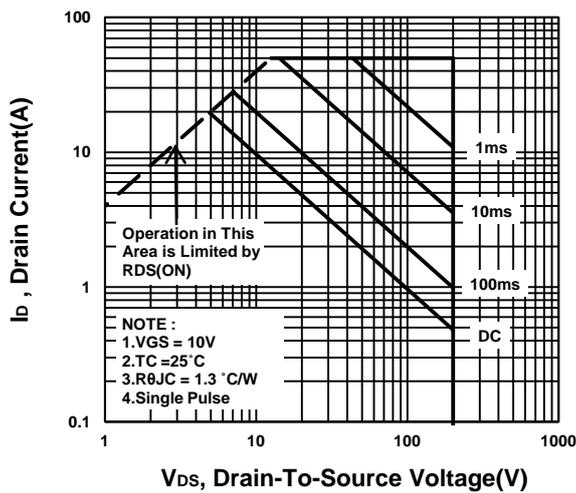
Single Pulse Maximum Power Dissipation

Single Pulse
RθJC = 1.3 ˚C/W
TC = 25˚C

Power(W)

Single Pulse Time(s)
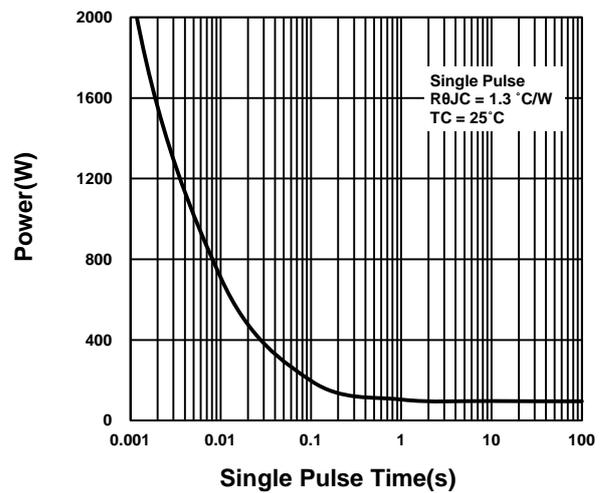
Transient Thermal Response Curve

Duty cycle=0.5
0.2
0.1
0.05
0.02
0.01
single pulse

Notes

P_{DM}
t1
t2

1.Duty cycle, D= t1 / t2
2.RthJC = 1.3 ℃/W
3.TJ-TC = P*RthJC(t)
4.RthJC(t) = r(t)*RthJC

r(t) , Normalized Effective Transient Thermal Resistance

T_1 , Square Wave Pulse Duration(S)