NIKO-SEM

P-Channel Logic Level Enhancement Mode Field Effect Transistor

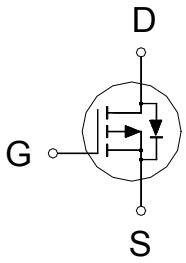
P4004ED

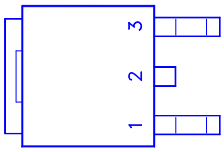
TO-252(DPAK)

Halogen-Free & Lead-Free

PRODUCT SUMMARY

$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D
-40V	40mΩ	-21A





1. GATE
2. DRAIN
3. SOURCE

RoHS Compliant

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

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS	UNITS
Drain-Source Voltage		V_{DS}	-40	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C = 25 °C	I_D	-21	A
	T_C = 70 °C		-17	
Pulsed Drain Current[1]		I_{DM}	-70	
Avalanche Current		I_{AS}	-27	
Avalanche Energy [2]	L = 0.1mH	E_{AS}	36	mJ
Power Dissipation	T_C = 25 °C	P_D	30	W
	T_C = 70 °C		20	
Junction & Storage Temperature Range		T_J, T_{stg}	-55 to 150	°C

THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNITS
Junction-to-Case	$R_{\theta JC}$		4.1	°C / W
Junction-to-Ambient	$R_{\theta JA}$		40	°C / W

[1]Pulse width limited by maximum junction temperature.
[2]V_{DD} = -20V . Starting T_J = 25°C.

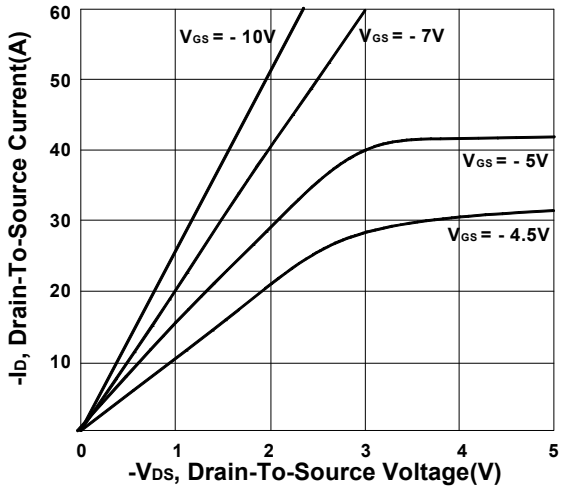
ELECTRICAL CHARACTERISTICS (T_J = 25 °C, Unless Otherwise Noted)

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
STATIC						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = -250μA	-40			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250μA	-2.0	-2.5	-3	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0V, V_{GS} = ±20V			±250	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = -32V, V_{GS} = 0V			1	μA
		V_{DS} = -30V, V_{GS} = 0V, T_J = 125 °C			10	
On-State Drain Current[1]	$I_{D(ON)}$	V_{DS} = -5V, V_{GS} = -10V	-70			A

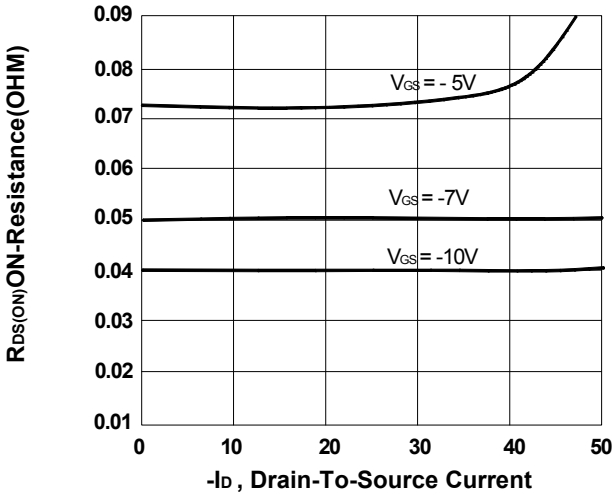
Drain-Source On-State Resistance[1]	$R_{DS(ON)}$	V_{GS} = -5V, I_D = -8A		65	73	mΩ
		V_{GS} = -7V, I_D = -8A		35	50	
		V_{GS} = -10V, I_D = -10A		30	40	
Forward Transconductance[1]	g_{fs}	V_{DS} = -10V, I_D = -10A		20		S
DYNAMIC						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = -20V, f = 1MHz		1090		pF
Output Capacitance	C_{oss}			175		
Reverse Transfer Capacitance	C_{rss}			91		
Total Gate Charge[2]	$Q_{g(V_{GS} = -10V)}$	V_{DS} = 0.5$V_{(BR)DSS}$, I_D = -18A		17		nC
Total Gate Charge[2]	$Q_{g(V_{GS} = -4.5V)}$			8.5		
Gate-Source Charge[2]	Q_{gs}			5.5		
Gate-Drain Charge[2]	Q_{gd}			3		
Gate Resistance	R_g	V_{GS} = 0V, V_{DS} = 0V, f = 1MHz		4.95		Ω
Turn-On Delay Time[2]	$t_{d(on)}$	V_{DS} = -20V, R_L = 2Ω $I_D \cong$ -10A, V_{GS} = -10V, R_{GS} = 6Ω		6		nS
Rise Time[2]	t_r			16		
Turn-Off Delay Time[2]	$t_{d(off)}$			26		
Fall Time[2]	t_f			10		
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T_J = 25 °C)						
Continuous Current	I_S				-21	A
Forward Voltage[1]	V_{SD}	I_F = -1A, V_{GS} = 0V			-1	V
Reverse Recovery Time	t_{rr}	I_F = -10 A, dI_F/dt = 100A / μS		15.5		nS
Reverse Recovery Charge	Q_{rr}			7.9		nC

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

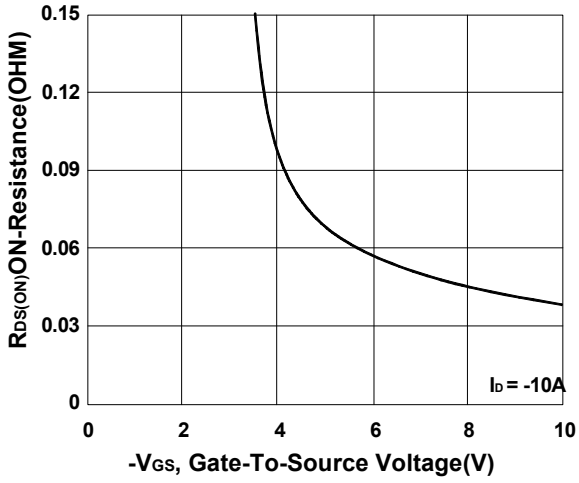
Output Characteristics



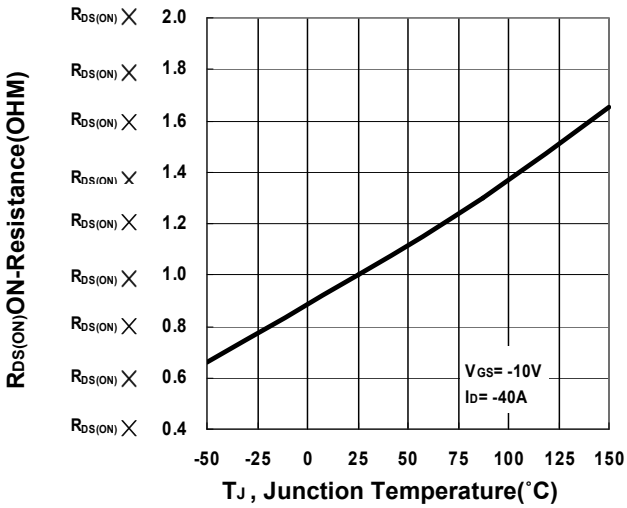
On-Resistance VS Drain Current



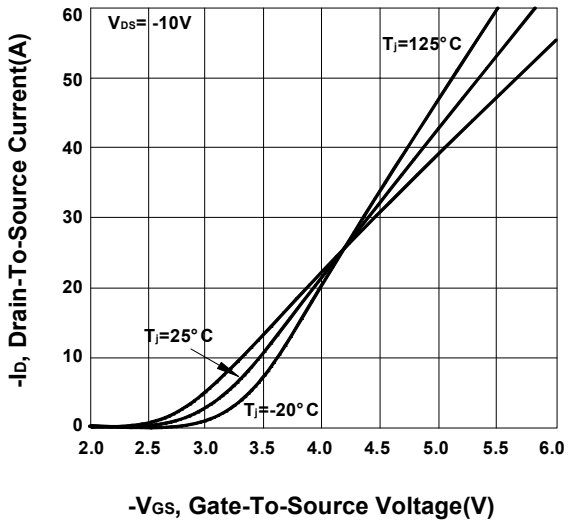
On-Resistance VS Gate-To-Source



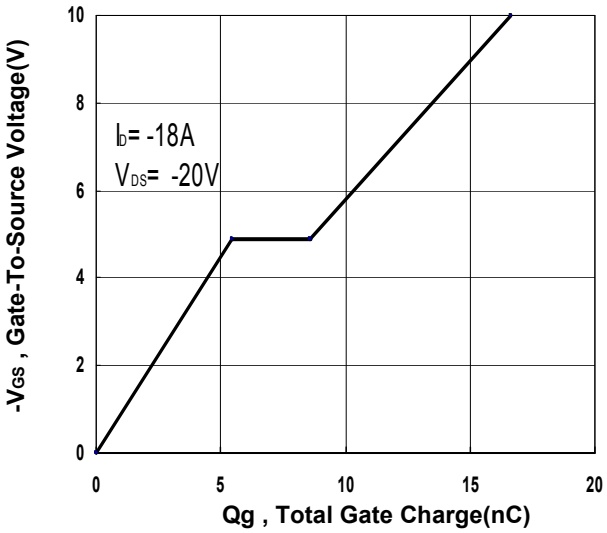
On-Resistance VS Temperature



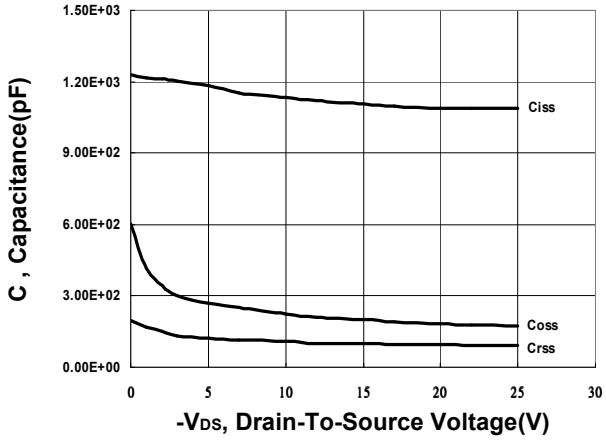
Transfer Characteristics



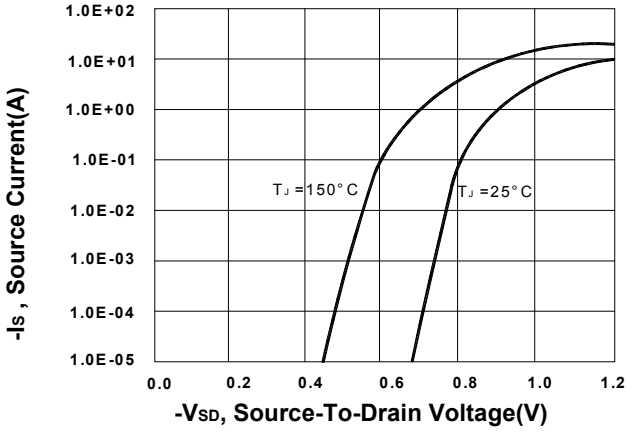
Gate charge Characteristics



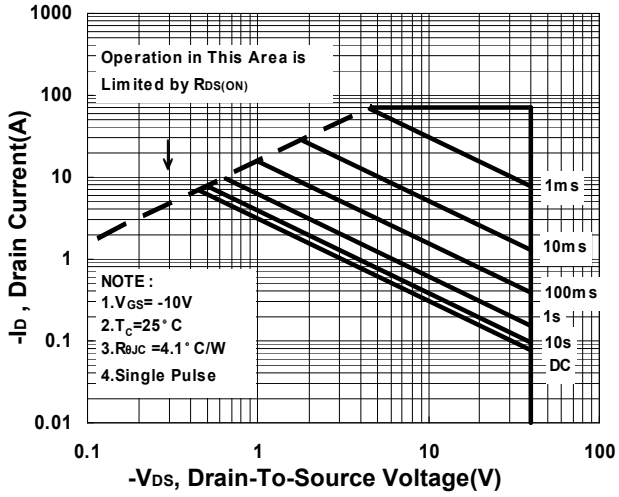
Capacitance Characteristic



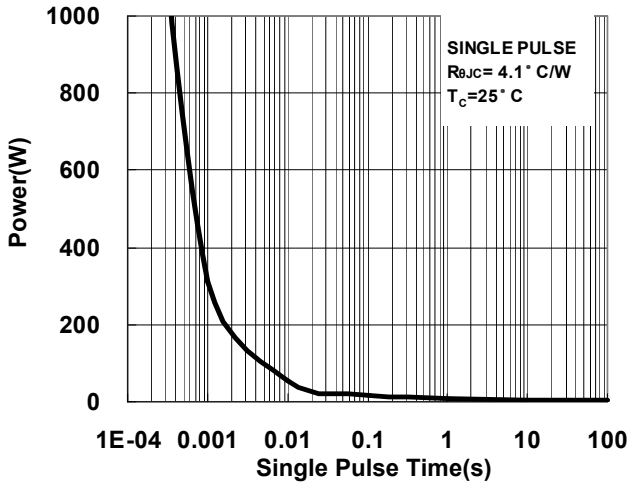
Body Diode Forward Voltage VS Source current



Safe Operating Area



Single Pulse Maximum Power Dissipation



Transient Thermal Response Curve