

LOW VOLTAGE, LOW $R_{DS(on)}$ POWER MOSFETS IN A TO-3 PACKAGE



50V And 60V, Ultra Low $R_{DS(on)}$
Power MOSFETs In A TO-3 Package

FEATURES

- TO-3 Hermetic Package, .060 Dia. Leads
- Ultra Low $R_{DS(on)}$
- Low Conductive Loss/Low Gate Charge
- Available Screened To MIL-S-19500, TX, TXV And S Levels

DESCRIPTION

This series of hermetic packaged MOSFETs are ideally suited for low voltage applications; battery powered voltage power supplies, motor controls, dc to dc converters and synchronous rectification. The low conduction loss allows smaller heat sinking and the low gate charge simpler drive circuitry.

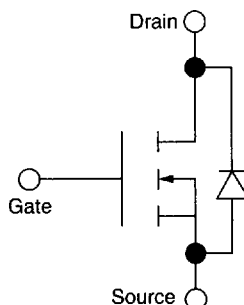
MAXIMUM RATINGS

PART NUMBER	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D * (A)
OM55N10NK	100	.030	35
OM60N10NK	100	.025	35
OM75N06NK	60	.016	35
OM75N05NK	50	.016	35

* Package Limitation

3.1

SCHEMATIC



OM60N10NK (T_C = 25°C unless otherwise specified)

Avalanche Characteristics		Min.	Typ.	Max.	Units	Test Conditions
I _{AR} Avalanche Current				60	A	(repetitive or non-repetitive, T _J = 25°C)
E _{AS} Single Pulse Avalanche Energy				720	mJ	(starting T _J = 25°C, I _B = I _{AR} , V _{GS} = 25 V)
E _{ARR} Repetitive Avalanche Energy				100	mJ	(pulse width limited by T _{Jmax} , δ < 1%)
I _{AR} Avalanche Current				37	A	(repetitive or non-repetitive, T _J = 100°C)
Electrical Characteristics - OFF						
V _{DRSS} Drain-Source Breakdown Voltage		100			V	I _B = 250 μA, V _{GS} = 0
I _{DSS} Zero Gate Voltage Drain Current (V _{GS} = 0)				250	μA	V _{DS} = Max. Rat.
I _{DSS} Drain Current (V _{GS} = 0)				1000	μA	V _{DS} = Max. Rat. x 0.8, T _C = 125°C
I _{SS} Gate-Body Leakage Current (V _{GS} = 0)				±100	nA	V _{DS} = ±20 V
Electrical Characteristics - ON*						
V _{GS(th)} Gate Threshold Voltage		2		4	V	V _{DS} = V _{GS} , I _B = 250 μA
R _{DS(on)} Static Drain-Source On Resistance				0.025	Ω	V _{GS} = 10 V, I _B = 30 A
I _{D(on)} On State Drain Current		60			A	T _C = 100°C
I _{D(on)} On State Drain Current					A	V _{DS} > I _{D(on)} × R _{DS(on)} , V _{GS} = 10 V
Electrical Characteristics - Dynamic						
g _{fs} Forward Transconductance		25			S	V _{DS} > I _{D(on)} × R _{DS(on)} , I _B = 30 A
C _{iss} Input Capacitance			4000		pF	V _{GS} = 25 V
C _{oss} Output Capacitance			1100		pF	V _{DS} = 0
C _{res} Reverse Transfer Capacitance			250		pF	f = 1 MHz
Electrical Characteristics - Switching On						
T _{don} Turn-On Time			90		nS	V _{DS} = 80 V, I _B = 30 A
t _r Rise Time			270		nS	R _G = 50 Ω, V _{GS} = 10 V
(di/dt) _{on} Turn-On Current Slope			270		A/μS	V _{DS} = 80 V, I _B = 30 A
Q _g Total Gate Charge			120		nC	R _G = 50 Ω, V _{GS} = 10 V
Q _g Total Gate Charge					nC	V _{DS} = 80 V, I _B = 30 A, V _{GS} = 10 V
Electrical Characteristics - Switching Off						
T _{r(off)} Off Voltage Rise Time			200		nS	V _{DS} = 80 V, I _B = 30 A
t _f Fall Time			210		nS	R _G = 50 Ω, V _{GS} = 10 V
t _{cross} Cross-Over Time			410		nS	
Electrical Characteristics - Source Drain Diode						
I _{SD} Source Drain Current				60	A	
I _{SDM} * Source Drain Current (pulsed)				240	A	
V _{SD} Forward On Voltage				1.6	V	I _{SD} = 60 A, V _{GS} = 0
t _r Reverse Recovery Time			180		nS	I _{SD} = 60 A, di/dt = 100 A/μs
Q _r Reverse Recovery Charge				1.8	μC	V _R = 80 A
I _{RRM} Reverse Recovery Current				10	A	

*Pulse Test: Pulse width < 300μsec, Duty Cycle ≤ 1.5%.

OM55N10NK (T_C = 25°C unless otherwise specified)

Avalanche Characteristics		Min.	Typ.	Max.	Units	Test Conditions
I _{AR} Avalanche Current				55	A	(repetitive or non-repetitive, T _J = 25°C)
E _{AS} Single Pulse Avalanche Energy				600	mJ	(starting T _J = 25°C, I _B = I _{AR} , V _{GS} = 25 V)
E _{ARR} Repetitive Avalanche Energy				100	mJ	(pulse width limited by T _{Jmax} , δ < 1%)
I _{AR} Avalanche Current				37	A	(repetitive or non-repetitive, T _J = 100°C)
Electrical Characteristics - OFF						
V _{DRSS} Drain-Source Breakdown Voltage		100			V	I _B = 250 μA, V _{GS} = 0
I _{DSS} Zero Gate Voltage Drain Current (V _{GS} = 0)				250	μA	V _{DS} = Max. Rat.
I _{DSS} Drain Current (V _{GS} = 0)				1000	μA	V _{DS} = Max. Rat. x 0.8, T _C = 125°C
I _{SS} Gate-Body Leakage Current (V _{GS} = 0)				±100	nA	V _{DS} = ±20 V
Electrical Characteristics - ON*						
V _{GS(th)} Gate Threshold Voltage		2		4	V	V _{DS} = V _{GS} , I _B = 250 μA
R _{DS(on)} Static Drain-Source On Resistance				0.03	Ω	V _{GS} = 10 V, I _B = 30 A
I _{D(on)} On State Drain Current		55			A	T _C = 100°C
I _{D(on)} On State Drain Current					A	V _{DS} > I _{D(on)} × R _{DS(on)} , V _{GS} = 10 V
Electrical Characteristics - Dynamic						
g _{fs} Forward Transconductance		25			S	V _{DS} > I _{D(on)} × R _{DS(on)} , I _B = 30 A
C _{iss} Input Capacitance			4000		pF	V _{GS} = 25 V
C _{oss} Output Capacitance			1100		pF	V _{DS} = 0
C _{res} Reverse Transfer Capacitance			250		pF	f = 1 MHz
Electrical Characteristics - Switching On						
T _{don} Turn-On Time			90		nS	V _{DS} = 80 V, I _B = 30 A
t _r Rise Time			270		nS	R _G = 50 Ω, V _{GS} = 10 V
(di/dt) _{on} Turn-On Current Slope			270		A/μS	V _{DS} = 80 V, I _B = 30 A
Q _g Total Gate Charge			120		nC	R _G = 50 Ω, V _{GS} = 10 V
Q _g Total Gate Charge					nC	V _{DS} = 80 V, I _B = 30 A, V _{GS} = 10 V
Electrical Characteristics - Switching Off						
T _{r(off)} Off Voltage Rise Time			200		nS	V _{DS} = 80 V, I _B = 30 A
t _f Fall Time			210		nS	R _G = 50 Ω, V _{GS} = 10 V
t _{cross} Cross-Over Time			410		nS	
Electrical Characteristics - Source Drain Diode						
I _{SD} Source Drain Current				55	A	
I _{SDM} * Source Drain Current (pulsed)				180	A	
V _{SD} Forward On Voltage				1.5	V	I _{SD} = 55 A, V _{GS} = 0
t _r Reverse Recovery Time			180		nS	I _{SD} = 55 A, di/dt = 100 A/μs
Q _r Reverse Recovery Charge				1.8	μC	V _R = 80 A
I _{RRM} Reverse Recovery Current				10	A	

*Pulse Test: Pulse width < 300μsec, Duty Cycle ≤ 1.5%.

OM75N05NK ($T_C = 25^\circ\text{C}$ unless otherwise specified)

Avalanche Characteristics		Min.	Typ.	Max.	Units	Test Conditions
I_{AR}	Avalanche Current			70	A	(repetitive or non-repetitive, $T_J = 25^\circ\text{C}$)
E_{AS}	Single Pulse Avalanche Energy			900	mJ	(starting $T_J = 25^\circ\text{C}$, $I_b = I_{AR}$, $V_{GS} = 25\text{ V}$)
E_{AR}	Repetitive Avalanche Energy			200	mJ	(pulse width limited by T_{Jmax} , $\delta < 1\%$)
I_{AF}	Avalanche Current			40	A	(repetitive or non-repetitive, $T_J = 100^\circ\text{C}$)
Electrical Characteristics - OFF						
V_{DRSS}	Drain-Source Breakdown Voltage	50			V	$I_b = 250\text{ }\mu\text{A}$, $V_{GS} = 0$
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)			250	μA	$V_{DS} = \text{Max. Rat.}$
	Drain Current ($V_{GS} = 0$)			1000	μA	$V_{DS} = \text{Max. Rat.} \times 0.8$, $T_C = 125^\circ\text{C}$
I_{DSS}	Gate-Body Leakage Current ($V_{GS} = 0$)			± 100	nA	$V_{DS} = \pm 20\text{ V}$
Electrical Characteristics - ON*						
$V_{GS(th)}$	Gate Threshold Voltage	2		4	V	$V_{DS} = V_{GS}$, $I_b = 250\text{ }\mu\text{A}$
$R_{DS(on)}$	Static Drain-Source On Resistance			0.016	Ω	$V_{GS} = 10\text{ V}$, $I_b = 40\text{ A}$
	Resistance			0.032	Ω	$T_C = 100^\circ\text{C}$
$I_{D(on)}$	On State Drain Current	75			A	$V_{GS} > I_{D(on)} \times R_{DS(on)}$, $V_{GS} = 10\text{ V}$
Electrical Characteristics - Dynamic						
g_{fs}	Forward Transconductance	25			S	$V_{GS} > I_{D(on)} \times R_{DS(on)}$, $I_b = 40\text{ A}$
C_{iss}	Input Capacitance		4100		pF	$V_{DS} = 25\text{ V}$
C_{oss}	Output Capacitance		1800		pF	$V_{GS} = 0$
C_{rsw}	Reverse Transfer Capacitance		420		pF	$f = 1\text{ MHz}$
Electrical Characteristics - Switching On						
$T_{d(on)}$	Turn-On Time		190		nS	$V_{DS} = 20\text{ V}$, $I_b = 40\text{ A}$
t_r	Rise Time		900		nS	$R_g = 50\text{ }\Omega$, $V_{GS} = 10\text{ V}$
$(di/dt)_{on}$	Turn-On Current Slope		150		A/ μS	$V_{DS} = 20\text{ V}$, $I_b = 40\text{ A}$
					A/ μS	$R_g = 50\text{ }\Omega$, $V_{GS} = 10\text{ V}$
Q_{on}	Total Gate Charge		130		nC	$V_{DS} = 20\text{ V}$, $I_b = 40\text{ A}$, $V_{GS} = 10\text{ V}$
Electrical Characteristics - Switching Off						
$T_{d(off)}$	Off Voltage Rise Time		360		nS	$V_{DS} = 35\text{ V}$, $I_b = 75\text{ A}$
t_f	Fall Time		280		nS	$R_g = 50\text{ }\Omega$, $V_{GS} = 10\text{ V}$
t_{cross}	Cross-Over Time		600		nS	
Electrical Characteristics - Source Drain Diode						
I_{SD}	Source Drain Current			75	A	
I_{SDM}	Source Drain Current (pulsed)			300	A	
V_{SD}	Forward On Voltage			1.5	V	$I_{SD} = 75\text{ A}$, $V_{GS} = 0$
t_r	Reverse Recovery Time		120		nS	$I_{SD} = 75\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{S}$
					nS	$V_A = 20\text{ V}$
Q_{rr}	Reverse Recovery Charge		0.45		μC	
t_{rrM}	Reverse Recovery Current		6.5		A	

*Pulse Test: Pulse width < 300 μs , Duty Cycle $\leq 1.5\%$.

OM75N06NK ($T_C = 25^\circ\text{C}$ unless otherwise specified)

Avalanche Characteristics		Min.	Typ.	Max.	Units	Test Conditions
I_{AR}	Avalanche Current			70	A	(repetitive or non-repetitive, $T_J = 25^\circ\text{C}$)
E_{AS}	Single Pulse Avalanche Energy			900	mJ	(starting $T_J = 25^\circ\text{C}$, $I_b = I_{AR}$, $V_{GS} = 25\text{ V}$)
E_{AR}	Repetitive Avalanche Energy			200	mJ	(pulse width limited by T_{Jmax} , $\delta < 1\%$)
I_{AF}	Avalanche Current			40	A	(repetitive or non-repetitive, $T_J = 100^\circ\text{C}$)
Electrical Characteristics - OFF						
V_{DRSS}	Drain-Source Breakdown Voltage	60			V	$I_b = 250\text{ }\mu\text{A}$, $V_{GS} = 0$
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)			250	μA	$V_{DS} = \text{Max. Rat.}$
	Drain Current ($V_{GS} = 0$)			1000	μA	$V_{DS} = \text{Max. Rat.} \times 0.8$, $T_C = 125^\circ\text{C}$
I_{DSS}	Gate-Body Leakage Current ($V_{GS} = 0$)			± 100	nA	$V_{DS} = \pm 20\text{ V}$
Electrical Characteristics - ON*						
$V_{GS(th)}$	Gate Threshold Voltage	2		4	V	$V_{DS} = V_{GS}$, $I_b = 250\text{ }\mu\text{A}$
$R_{DS(on)}$	Static Drain-Source On Resistance			0.016	Ω	$V_{GS} = 10\text{ V}$, $I_b = 40\text{ A}$
	Resistance			0.032	Ω	$T_C = 100^\circ\text{C}$
$I_{D(on)}$	On State Drain Current	75			A	$V_{GS} > I_{D(on)} \times R_{DS(on)}$, $V_{GS} = 10\text{ V}$
Electrical Characteristics - Dynamic						
g_{fs}	Forward Transconductance	25			S	$V_{GS} > I_{D(on)} \times R_{DS(on)}$, $I_b = 40\text{ A}$
C_{iss}	Input Capacitance		4100		pF	$V_{DS} = 25\text{ V}$
C_{oss}	Output Capacitance		1800		pF	$V_{GS} = 0$
C_{rsw}	Reverse Transfer Capacitance		420		pF	$f = 1\text{ MHz}$
Electrical Characteristics - Switching On						
$T_{d(on)}$	Turn-On Time		190		nS	$V_{DS} = 25\text{ V}$, $I_b = 40\text{ A}$
t_r	Rise Time		900		nS	$R_g = 50\text{ }\Omega$, $V_{GS} = 10\text{ V}$
$(di/dt)_{on}$	Turn-On Current Slope		150		A/ μS	$V_{DS} = 25\text{ V}$, $I_b = 40\text{ A}$
					A/ μS	$R_g = 50\text{ }\Omega$, $V_{GS} = 10\text{ V}$
Q_{on}	Total Gate Charge		130		nC	$V_{DS} = 25\text{ V}$, $I_b = 40\text{ A}$, $V_{GS} = 10\text{ V}$
Electrical Characteristics - Switching Off						
$T_{d(off)}$	Off Voltage Rise Time		360		nS	$V_{DS} = 40\text{ V}$, $I_b = 75\text{ A}$
t_f	Fall Time		280		nS	$R_g = 50\text{ }\Omega$, $V_{GS} = 10\text{ V}$
t_{cross}	Cross-Over Time		600		nS	
Electrical Characteristics - Source Drain Diode						
I_{SD}	Source Drain Current			75	A	
I_{SDM}	Source Drain Current (pulsed)			300	A	
V_{SD}	Forward On Voltage			1.5	V	$I_{SD} = 75\text{ A}$, $V_{GS} = 0$
t_r	Reverse Recovery Time		120		nS	$I_{SD} = 75\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{S}$
					nS	$V_A = 25\text{ V}$
Q_{rr}	Reverse Recovery Charge		0.45		μC	
t_{rrM}	Reverse Recovery Current		6.5		A	

*Pulse Test: Pulse width < 300 μs , Duty Cycle $\leq 1.5\%$.

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

	Parameter	60N10NK	55N10NK	75N06NK	75N05NK	Units
V _{DS}	Drain-Source Voltage	100	100	60	50	V
V _{DGR}	Drain-Gate Voltage (R _{GS} = 1 MΩ)	100	100	60	50	V
I _D @ T _C = 25°C	Continuous Drain Current ²	60	55	75	75	A
I _D @ T _C = 100°C	Continuous Drain Current ²	37	33	45	45	A
I _{DM}	Pulsed Drain Current ¹	180	180	225	225	A
P _D @ T _C = 25°C	Maximum Power Dissipation	130	130	130	130	W
P _D @ T _C = 100°C	Maximum Power Dissipation	55	55	55	55	W
Junction To Case	Linear Derating Factor	1.00	1.00	1.00	1.00	W/°C
T _J	Operating and					
T _{stg}	Storage Temperature Range	-55 to 150	-55 to 150	-55 to 150	-55 to 150	°C
Lead Temperature	(1/16" from case for 10 secs.)	300	300	300	300	°C

1 Pulse Test: Pulse width ≤ 300 μsec. Duty Cycle ≤ 2%. 2 Package Limited.

THERMAL RESISTANCE (Maximum) at T_A = 25°C

R _{thJC}	Junction-to-Case	1.0	°C/W	
R _{thJA}	Junction-to-Ambient	30	°C/W	Free Air Operation

PACKAGE LIMITATIONS

	Parameter		Unit
I _D	Continous Drain Current	35	A
	Linear Derating Factor, Junction-to-Ambient	.033	W/°C

3.1

MECHANICAL OUTLINE

