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NTE2380 (N-Ch) & NTE2381 (P-Ch) Complementary Silicon Gate MOSFETs Enhancement Mode, High Speed Switch TO-220 Type Package

Description:

The NTE2380 (N-Ch) and NTE2381 (P-Ch) are complementary TMOS power FETs in a TO220 type package designed for high voltage, high speed power switching applications such as switching regulators, converters, solenoid, and relay drivers.

Features:

- Silicon Gate for Fast Switching Speeds
- Rugged – SOA is Power Dissipation Limited
- Source-to-Drain Diode Characterized for Use With Inductive Loads

Absolute Maximum Ratings:

Drain-Source Voltage, V_{DSS}	500V
Drain-Gate Voltage ($R_{GS} = 1M\Omega$), V_{DGR}	500V
Gate-Source Voltage, V_{GS}	
NTE2380	$\pm 20V$
NTE2381	$\pm 30V$
Drain Current, I_D	
Continuous	
NTE2380	2.5A
NTE2381	2.7A
Pulsed	
NTE2380	10A
NTE2381	10.8A
Total Power Dissipation ($T_C = +25^\circ C$), P_D	
NTE2380	40W
Derate Above $25^\circ C$	$0.32W/^\circ C$
NTE2381	85W
Derate Above $25^\circ C$	$0.68W/^\circ C$
Operating Temperature Range, T_{opr}	
NTE2380	-55° to $+150^\circ C$
NTE2381	-65° to $+150^\circ C$
Storage Temperature Range, T_{stg}	
NTE2380	-55° to $+150^\circ C$
NTE2381	-65° to $+150^\circ C$
Thermal Resistance, Junction-to-Ambient, R_{thJA}	$62.5^\circ C/W$
Thermal Resistance, Junction-to-Case, R_{thJC}	
NTE2380	$3.12^\circ C/W$
NTE2381	$2.4^\circ C/W$
Maximum Lead Temperature (During Soldering, 1/8" from case, 5sec), T_L	$+300^\circ C$

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF Characteristics						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0, I_D = 0.25\text{mA}$	500	-	-	V
Zero Gate Voltage Drain Current NTE2380	I_{DSS}	$V_{DS} = 500\text{V}, V_{GS} = 0$	-	-	0.25	mA
NTE2381			-	-	1	μA
NTE2380		$V_{DS} = 400\text{V}, V_{GS} = 0, T_J = +125^\circ\text{C}$	-	-	1.0	mA
NTE2381			-	-	10	μA
Gate-Body Leakage Current, Forward NTE2380	I_{GSSF}	$V_{GSF} = 20\text{V}, V_{DS} = 0$	-	-	500	nA
NTE2381		$V_{GSF} = 30\text{V}, V_{DS} = 0$	-	-	100	nA
Gate-Body Leakage Current, Reverse NTE2380	I_{GSSR}	$V_{GSF} = 20\text{V}, V_{DS} = 0$	-	-	500	nA
NTE2381		$V_{GSF} = 30\text{V}, V_{DS} = 0$	-	-	100	nA
ON Characteristics (Note 1)						
Gate Threshold Voltage NTE2380	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 0.25\text{mA}$	2.0	-	4.0	V
NTE2381			3.0	-	5.0	V
Static Drain-Source On-Resistance NTE2380	$r_{DS(on)}$	$V_{GS} = 10\text{V}, I_D = 1\text{A}$	-	-	3	Ω
NTE2381		$V_{GS} = 10\text{V}, I_D = 1.35\text{A}$	-	3.9	4.9	Ω
Forward Transconductance NTE2380	g_{FS}	$V_{DS} \geq 7.5\text{V}, I_D = 1\text{A}$	1	-	-	mhos
NTE2381		$V_{DS} = 50\text{V}, I_D = 1.35\text{A}$	-	2.35	-	mhos
Dynamic Characteristics						
Input Capacitance NTE2380	C_{iss}	$V_{DS} = 25\text{V}, V_{GS} = 0, f = 1\text{MHz}$	-	-	400	pF
NTE2381			-	510	660	pF
Output Capacitance NTE2380	C_{oss}		-	-	150	pF
NTE2381			-	70	90	pF
Reverse Transfer Capacitance NTE2380	C_{rss}		-	-	40	pF
NTE2381			-	9.5	12	pF
Switching Characteristics (Note 1)						
Turn-On Time NTE2380	$t_{d(on)}$	$V_{DD} \approx 200\text{V}, I_D = 1\text{A}, R_{gen} = 50\Omega$	-	-	60	ns
NTE2381		$V_{DD} = 250\text{V}, I_D = 2.7\text{A}, R_{gen} = 25\Omega$	-	12	35	ns
Rise Time NTE2380	t_r	$V_{DD} \approx 200\text{V}, I_D = 1\text{A}, R_{gen} = 50\Omega$	-	-	50	ns
NTE2381		$V_{DD} = 250\text{V}, I_D = 2.7\text{A}, R_{gen} = 25\Omega$	-	56	120	ns
Turn-Off Time NTE2380	$t_{d(off)}$	$V_{DD} \approx 200\text{V}, I_D = 1\text{A}, R_{gen} = 50\Omega$	-	-	60	ns
NTE2381		$V_{DD} = 250\text{V}, I_D = 2.7\text{A}, R_{gen} = 25\Omega$	-	35	80	ns
Fall Time NTE2380	t_f	$V_{DD} \approx 200\text{V}, I_D = 1\text{A}, R_{gen} = 50\Omega$	-	-	30	ns
NTE2381		$V_{DD} = 250\text{V}, I_D = 2.7\text{A}, R_{gen} = 25\Omega$	-	45	100	ns

Note 1. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

Electrical Characteristics (Cont'd): ($T_C = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Switching Characteristics (Cont'd) (Note 1)						
Total Gate Charge NTE2380	Q_g	$V_{GS} = 10\text{V}, V_{DS} = 400\text{V},$ $I_D = \text{Rated } I_D$	-	12	15	ns
NTE2381			-	18	23	ns
Gate-Source Charge NTE2380	Q_{gs}		-	6	-	ns
NTE2381			-	3.6	-	ns
Gate-Drain Charge NTE2380	Q_{gd}		-	6	-	ns
NTE2381			-	9.2	-	ns
Source Drain Diode Characteristics (Note 1)						
Forward On-Voltage NTE2380	V_{SD}	$I_S = \text{Rated } I_D, V_{GS} = 0$	-	-	1.6	V
NTE2381			-	-	2.7	V
Forward Turn-On Time	t_{on}		Limited by stray inductance			
Reverse Recovery Time NTE2380	t_{rr}		-	500	-	ns
NTE2381		-	270	-	ns	
Internal Package Inductance						
Internal Drain Inductance	L_d	Measured from contact screw on tab to center of die	-	3.5	-	nH
		Measured from the drain lead 0.25" from package to center of die	-	4.5	-	nH
Internal Source Inductance	L_s	Measured from the source lead 0.25" from package to center of pad	-	7.5	-	nH

Note 1. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.



