



## ISL9N306AP3/ISL9N306AS3ST

### N-Channel Logic Level PWM Optimized UltraFET® Trench Power MOSFETs

#### General Description

This device employs a new advanced trench MOSFET technology and features low gate charge while maintaining low on-resistance.

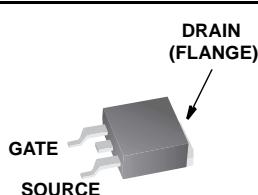
Optimized for switching applications, this device improves the overall efficiency of DC/DC converters and allows operation to higher switching frequencies.

#### Applications

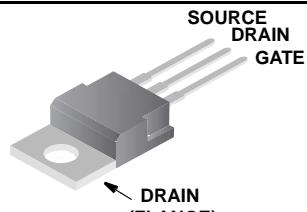
- DC/DC converters

#### Features

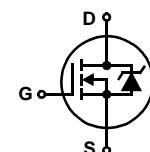
- Fast switching
- $r_{DS(ON)} = 0.0052\Omega$  (Typ),  $V_{GS} = 10V$
- $r_{DS(ON)} = 0.0085\Omega$  (Typ),  $V_{GS} = 4.5V$
- $Q_g$  (Typ) = 30nC,  $V_{GS} = 5V$
- $Q_{gd}$  (Typ) = 11nC
- $C_{iss}$  (Typ) = 3400pF



TO-263AB



TO-220AB



#### MOSFET Maximum Ratings $T_A = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current Continuous ( $T_C = 25^\circ C$ , $V_{GS} = 10V$ )	75	A
	Continuous ( $T_C = 100^\circ C$ , $V_{GS} = 4.5V$ )	61	A
	Continuous ( $T_C = 25^\circ C$ , $V_{GS} = V$ , $R_{\theta JC} = 43^\circ C/W$ )	18	A
	Pulsed	Figure 4	A
$P_D$	Power dissipation Derate above $25^\circ C$	125	W
		0.83	$W/\text{ }^\circ C$
$T_J$ , $T_{STG}$	Operating and Storage Temperature	-55 to 175	$^\circ C$

#### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case TO-220, TO-263	1.2	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-220, TO-263	62	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-263, 1in <sup>2</sup> copper pad area	43	$^\circ C/W$

#### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
N306AS	ISL9N306AS3ST	TO-263AB	330mm	24mm	800 units
N306AP	ISL9N306AP3	TO-220AB	Tube	N/A	50 units

**Electrical Characteristics**  $T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$B_{VDSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	30	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 25\text{V}$ $V_{GS} = 0\text{V}$ $T_C = 150^\circ\text{C}$	-	-	1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA

**On Characteristics**

$V_{GS(\text{TH})}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1	-	3	V
$r_{DS(\text{ON})}$	Drain to Source On Resistance	$I_D = 75\text{A}, V_{GS} = 10\text{V}$ $I_D = 61\text{A}, V_{GS} = 4.5\text{V}$	-	0.0052 0.0085	0.0060 0.0095	$\Omega$

**Dynamic Characteristics**

$C_{ISS}$	Input Capacitance	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	-	3400	-	pF
$C_{OSS}$	Output Capacitance		-	650	-	pF
$C_{RSS}$	Reverse Transfer Capacitance		-	300	-	pF
$Q_{g(\text{TOT})}$	Total Gate Charge at 10V		-	60	90	nC
$Q_{g(5)}$	Total Gate Charge at 5V	$V_{DD} = 15\text{V}$	-	30	45	nC
$Q_{g(\text{TH})}$	Threshold Gate Charge	$I_D = 61\text{A}$	-	3.0	4.5	nC
$Q_{gs}$	Gate to Source Gate Charge	$I_g = 1.0\text{mA}$	-	10	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	11	-	nC

**Switching Characteristics** ( $V_{GS} = 4.5\text{V}$ )

$t_{ON}$	Turn-On Time	$V_{DD} = 15\text{V}, I_D = 18\text{A}$ $V_{GS} = 4.5\text{V}, R_{GS} = 4.3\Omega$	-	-	131	ns
$t_{d(\text{ON})}$	Turn-On Delay Time		-	16	-	ns
$t_r$	Rise Time		-	70	-	ns
$t_{d(\text{OFF})}$	Turn-Off Delay Time		-	34	-	ns
$t_f$	Fall Time		-	30	-	ns
$t_{OFF}$	Turn-Off Time		-	-	97	ns

**Switching Characteristics** ( $V_{GS} = 10\text{V}$ )

$t_{ON}$	Turn-On Time	$V_{DD} = 15\text{V}, I_D = 18\text{A}$ $V_{GS} = 10\text{V}, R_{GS} = 4.3\Omega$	-	-	80	ns
$t_{d(\text{ON})}$	Turn-On Delay Time		-	10	-	ns
$t_r$	Rise Time		-	43	-	ns
$t_{d(\text{OFF})}$	Turn-Off Delay Time		-	62	-	ns
$t_f$	Fall Time		-	29	-	ns
$t_{OFF}$	Turn-Off Time		-	-	137	ns

**Unclamped Inductive Switching**

$t_{AV}$	Avalanche Time	$I_D = 3.6\text{A}, L = 3\text{mH}$	240	-	-	$\mu\text{s}$
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**Drain-Source Diode Characteristics**

$V_{SD}$	Source to Drain Diode Voltage	$I_{SD} = 61\text{A}$	-	-	1.25	V
		$I_{SD} = 25\text{A}$	-	-	1.0	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 61\text{A}, dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	35	ns
$Q_{RR}$	Reverse Recovered Charge	$I_{SD} = 61\text{A}, dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	30	nC

## Typical Characteristic

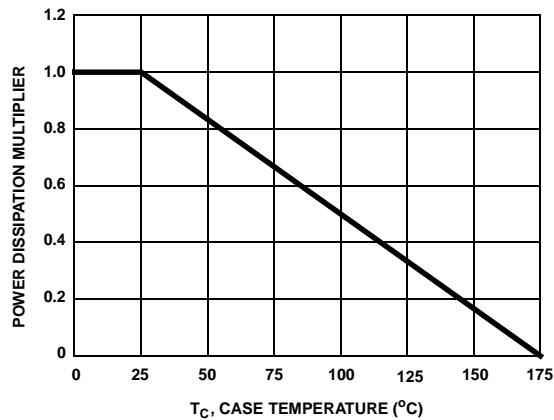


Figure 1. Normalized Power Dissipation vs Ambient Temperature

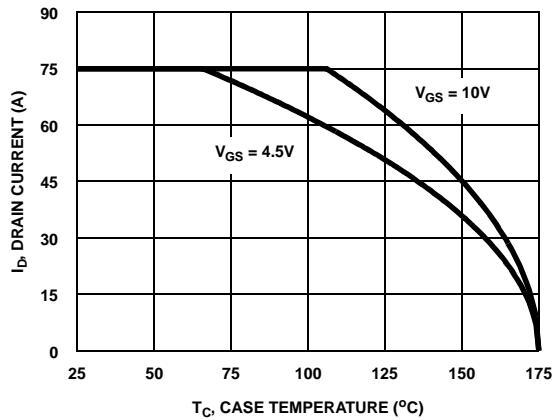


Figure 2. Maximum Continuous Drain Current vs Case Temperature

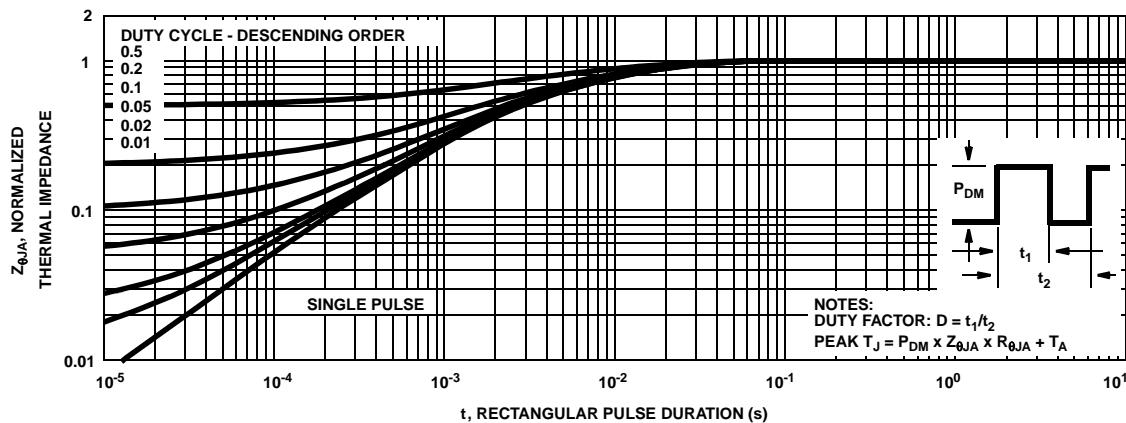


Figure 3. Normalized Maximum Transient Thermal Impedance

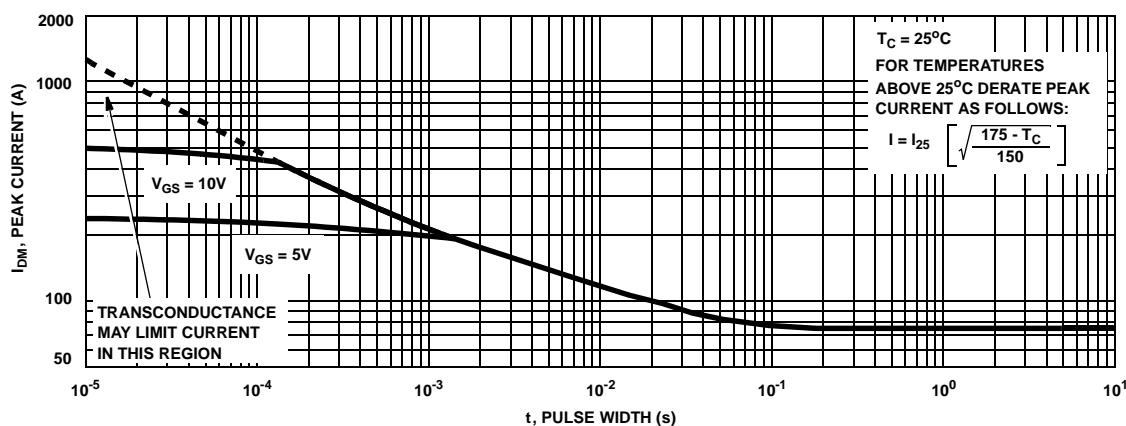


Figure 4. Peak Current Capability