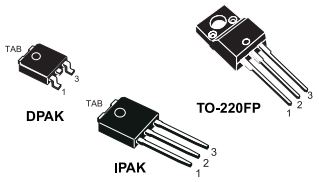
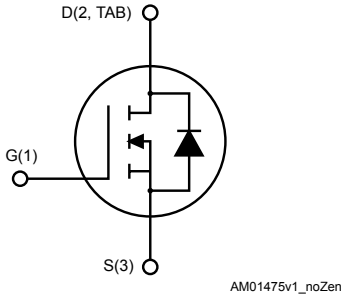
STD7NM60N, STF7NM60N, STU7NM60N

Datasheet

N-channel 600 V, 0.8 Ω typ., 5 A MDmesh™ II Power MOSFETs in DPAK, TO-220FP and IPAK packages





Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D	Package
STD7NM60N	600 V	0.9 Ω	5 A	DPAK
STF7NM60N				TO-220FP
STU7NM60N				IPAK

- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance

Applications

- Switching applications

Description

These devices are N-channel Power MOSFETs developed using the second generation of MDmesh™ technology. These revolutionary Power MOSFETs associate a vertical structure to the company's strip layout to yield one of the world's lowest on-resistance and gate charge. They are therefore suitable for the most demanding high-efficiency converters.

Product status link
STD7NM60N
STF7NM60N
STU7NM60N

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		DPAK, IPAK	TO-220FP	
V_{DS}	Drain-source voltage	600		V
V_{GS}	Gate-source voltage	±25		V
I_D	Drain current (continuous) at T_C = 25 °C	5	5 (1)	A
I_D	Drain current (continuous) at T_C = 100 °C	3	3 (1)	A
I_{DM} (2)	Drain current (pulsed)	20	20 (1)	A
P_{TOT}	Total dissipation at T_C = 25 °C	45	20	W
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat-sink (t = 1 s, T_C = 25 °C)		2.5	kV
dv/dt (3)	Peak diode recovery voltage slope	15		V/ns
T_j	Operating junction temperature range	-55 to 150		°C
T_{stg}	Storage temperature range			

1. *Limited by maximum junction temperature.*
2. *Pulse width limited by safe operating area.*
3. *I_{SD} ≤ 5 A, di/dt ≤ 100 A/µs, V_{DSpeak} ≤ $V_{(BR)DSS}$, V_{DD} = 80% $V_{(BR)DSS}$.*

Table 2. Thermal data

Symbol	Parameter	Value			Unit
		DPAK	TO-220FP	IPAK	
$R_{thj-case}$	Thermal resistance junction-case	2.78	6.25	2.78	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient		62.5	100	°C/W
$R_{thj-pcb}$ (1)	Thermal resistance junction-pcb	50			°C/W

1. *When mounted on 1inch² FR-4 board, 2 oz Cu.*

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AS} (1)	Avalanche current, repetitive or not-repetitive	2	A
E_{AS} (2)	Single pulse avalanche energy	119	mJ

1. *Pulse width limited by T_j max.*
2. *Starting T_j = 25 °C, I_D = I_{AS}, V_{DD} = 50 V.*

2 Electrical characteristics

(T_{CASE} = 25 °C unless otherwise specified)

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1 mA, V_{GS} = 0 V	600			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 600 V			1	µA
		V_{GS} = 0 V, V_{DS} = 600 V, T_C = 125 °C (1)			100	µA
I_{GSS}	Gate body leakage current	V_{DS} = 0 V, V_{GS} = ±20 V			100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10 V, I_D = 2.5 A		0.8	0.9	Ω

1. *Defined by design, not subject to production test.*

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 50 V, f = 1 MHz, V_{GS} = 0 V	-	363	-	pF
C_{oss}	Output capacitance			24.6		
C_{rss}	Reverse transfer capacitance			1.1		
$C_{oss\ eq.}$ (1)	Equivalent capacitance time related	V_{DS} = 0 to 480 V, V_{GS} = 0 V	-	130	-	pF
R_G	Intrinsic gate resistance	f = 1 MHz open drain	-	5.4	-	Ω
Q_g	Total gate charge	V_{DD} = 480 V, I_D = 5 A, V_{GS} = 0 to 10 V	-	14	-	nC
Q_{gs}	Gate-source charge			2.7		
Q_{gd}	Gate-drain charge			7.7		

1. *$C_{oss\ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}.*

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 300 V, I_D = 2.5 A, R_G = 4.7 Ω, V_{GS} = 10 V	-	7	-	ns
t_r	Rise time			10		
$t_{d(off)}$	Turn-off delay time			26		
t_f	Fall time			12		

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		5	A
I_{SDM} (1)	Source-drain current (pulsed)				20	
V_{SD} (2)	Forward on voltage	I_{SD} = 5 A, V_{GS} = 0 V	-		1.3	V
t_{rr}	Reverse recovery time	I_{SD} = 5 A, di/dt = 100 A/µs	-	213		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 60 V (see		1.5		µC
I_{RRM}	Reverse recovery current			14		A
t_{rr}	Reverse recovery time	I_{SD} = 5 A, di/dt = 100 A/µs	-	265		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 60 V, T_j = 150 °C(see		1.8		µC
I_{RRM}	Reverse recovery current			14		A

1. *Pulse width limited by safe operating area.*
2. *Pulsed: pulse duration = 300 µs, duty cycle 1.5%.*

2.1 Electrical characteristics curves

Figure 1. Safe operating area for DPAK and IPAK

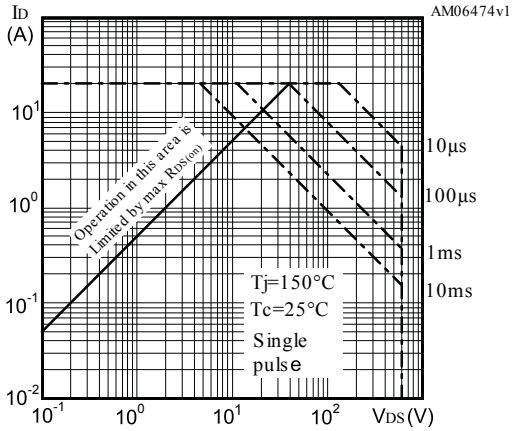


Figure 2. Thermal impedance for DPAK and IPAK

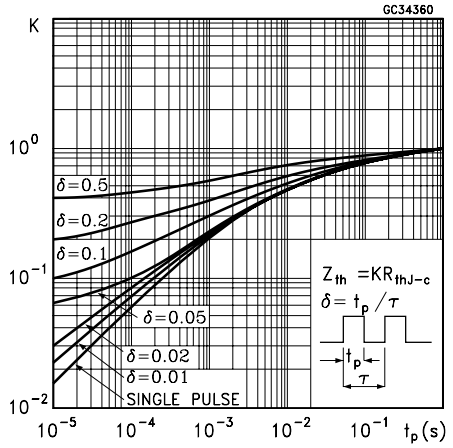


Figure 3. Safe operating area for TO-220FP

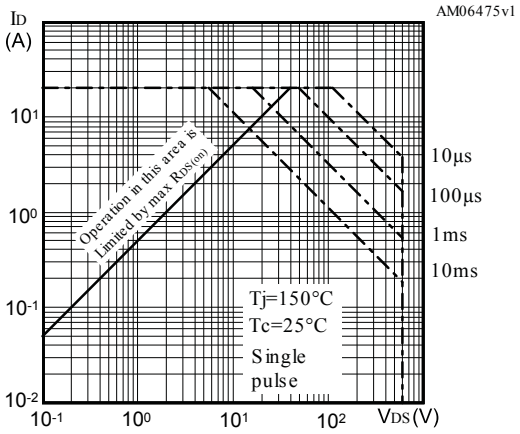


Figure 4. Thermal impedance for TO-220FP

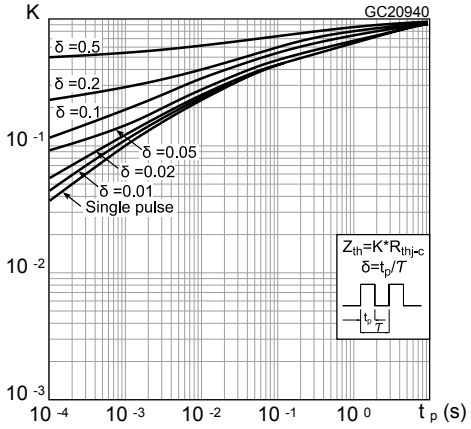


Figure 5. Output characterisics

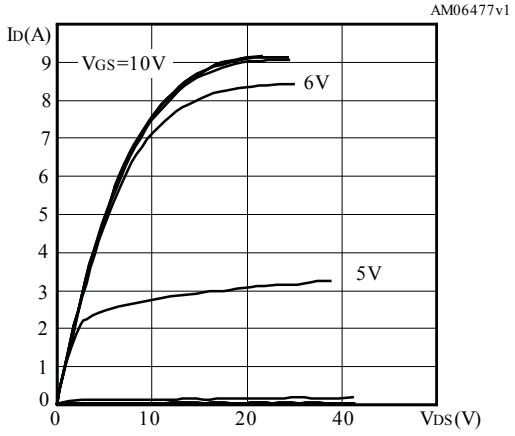
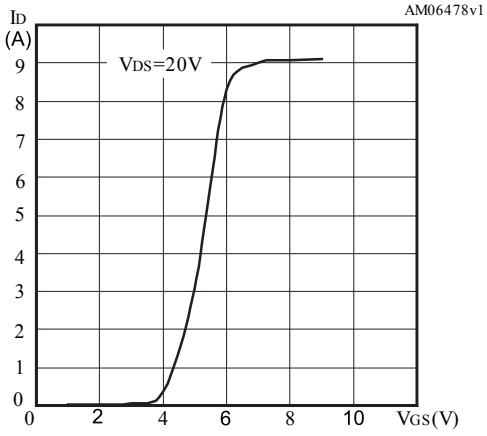


Figure 6. Transfer characteristics



5 Ordering information

Table 15. Order codes

Order code	Marking	Package	Packing
STD7NM60N	7NM60N	DPAK	Tape and reel
STF7NM60N		TO-220FP	Tube
STU7NM60N		IPAK	