

## Features

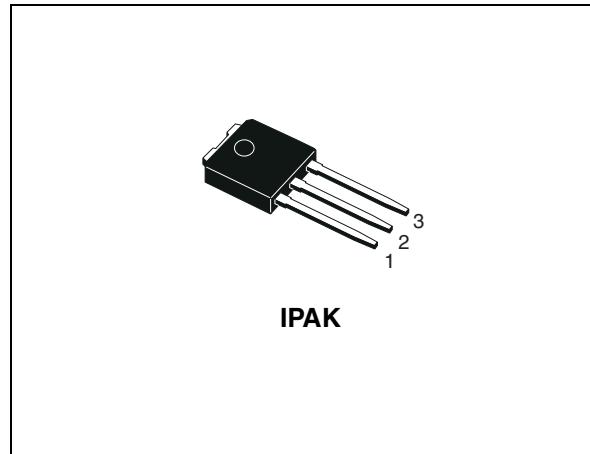
- Extremely high dv/dt capability
- 100% avalanche tested
- Gate charge minimized
- New high voltage benchmark

## Application

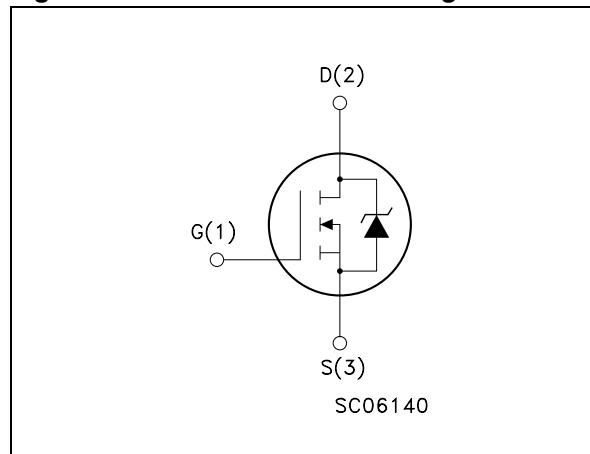
- Switching applications

## Description

The SuperMESH™ series is obtained through an extreme optimization of ST's well established strip-based PowerMESH™ layout. In addition to pushing on-resistance significantly down, special care is taken to ensure a very good dv/dt capability for the most demanding applications. Such series complements ST full range of high voltage Power MOSFETs including revolutionary MDmesh™ products.



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order code	Marking	Package	Packaging
STD2NC45-1	D2NC45	IPAK	Tube

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	450	V
$V_{GS}$	Gate- source voltage	$\pm 30$	V
$I_D$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	1.5	A
$I_D$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	0.95	A
$I_{DM}^{(1)}$	Drain current (pulsed)	6	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	30	W
	Derating factor	0.24	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	3	V/ns
$T_{stg}$	Storage temperature	-65 to 150	$^\circ\text{C}$
$T_j$	Max. operating junction temperature		$^\circ\text{C}$

1. Pulse width limited by safe operating area  
 2.  $I_{SD} \leq 0.5\text{A}$ ,  $di/dt \leq 100 \text{ A}/\mu\text{s}$ ,  $V_{DD} = 80\% V_{(BR)DSS}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	4.1	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	100	$^\circ\text{C}/\text{W}$
$T_I$	Maximum lead temperature for soldering purpose	275	$^\circ\text{C}$

**Table 4. Avalanche characteristics**

Symbol	Parameter	Value	Unit
$I_{AS}$	Avalanche current, repetitive or not-repetitive (pulse width limited by $T_j$ Max)	1.5	A
$E_{AS}$	Single pulse avalanche energy (starting $T_j=25^\circ\text{C}$ , $I_D=I_{AS}$ , $V_{DD}=50\text{V}$ )	25	mJ

## 2 Electrical characteristics

( $T_{CASE} = 25^\circ\text{C}$  unless otherwise specified)

**Table 5. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\mu\text{A}, V_{GS} = 0$	450			V
$I_{DSS}$	Zero gate voltage Drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating}, T_C = 125^\circ\text{C}$			1 50	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 30\text{V}$			$\pm 100$	nA
$V_{GS(\text{th})}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	2.3	3	3.7	V
$R_{DS(\text{on})}$	Static drain-source on resistance	$V_{GS} = 10\text{V}, I_D = 0.5\text{A}$		4.1	4.5	$\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} > I_{D(\text{on})} \times R_{DS(\text{on})\text{max}}, I_D = 0.5\text{A}$	-	1.1		S
$C_{iss}$ $C_{oss}$ $C_{rss}$	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25\text{V}, f = 1 \text{ MHz}, V_{GS} = 0$	-	160 27.5 4.7		pF pF pF
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 360\text{V}, I_D = 1.5\text{A}, V_{GS} = 10\text{V}, R_G = 4.7\Omega$	-	7 1.3 3.2	10	nC nC nC

1. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

**Table 7. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(\text{on})}$ $t_r$	Turn-on delay time Rise time	$V_{DD} = 225\text{V}, I_D = 0.5\text{A}$ $R_G = 4.7\Omega, V_{GS} = 10\text{V}$	-	6.7 4	-	ns ns
$t_{r(V_{off})}$ $t_f$ $t_c$	Off-voltage rise time Fall time Cross-over time	$V_{DD} = 360\text{V}, I_D = 1.5\text{A}, R_G = 4.7\Omega, V_{GS} = 10\text{V}$	-	8.5 12 18	-	ns ns ns

**Table 8. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		1.5	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				6.0	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 1.5A, V_{GS} = 0$	-		1.6	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 1.5A, dI/dt = 100A/\mu s$		225		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 100V, T_j = 150^\circ C$	-	530		$\mu C$
$I_{RRM}$	Reverse recovery current			4.7		A

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300  $\mu s$ , duty cycle 1.5 %

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area for IPAK

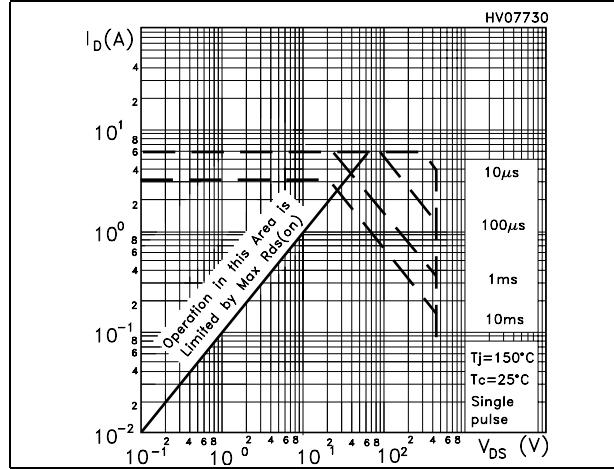


Figure 4. Output characteristics

Figure 3. Thermal impedance for IPAK

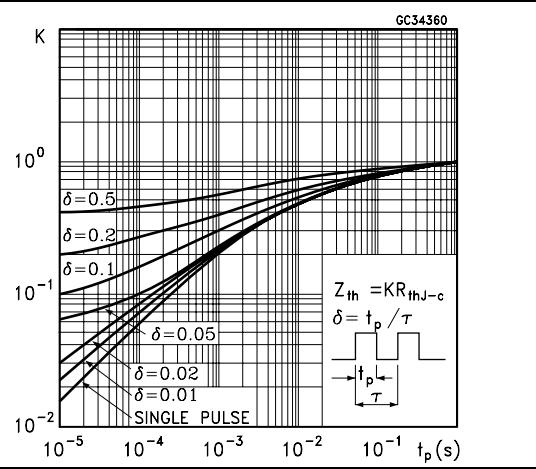


Figure 5. Transfer characteristics

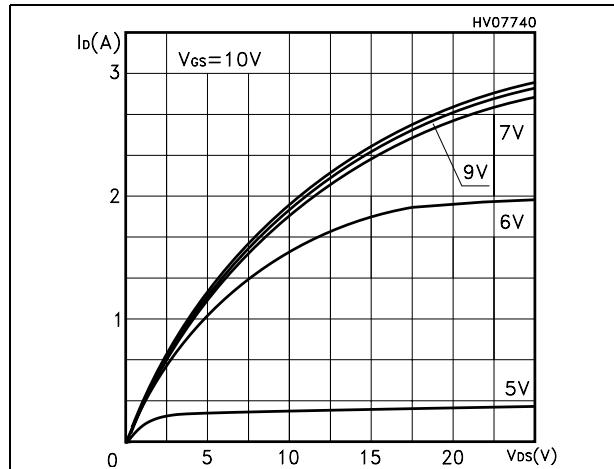


Figure 6. Transconductance

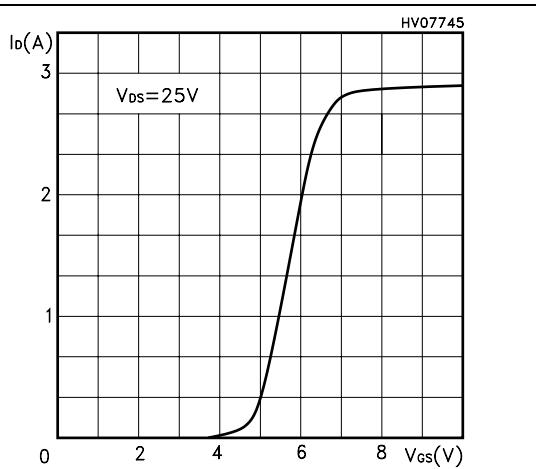


Figure 7. Static drain-source on resistance

