

# P-Channel Enhancement Mode MOSFET

## 1. Product Information

### 1.1 Features

- ☒ **Advanced trench cell design**
- ☒ **Low Thermal Resistance**

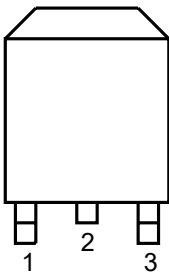
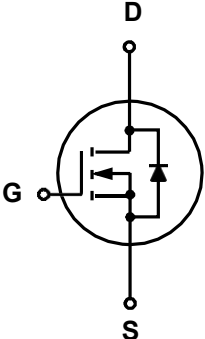
### 1.2 Applications

- ☒ **Motor driver**
- ☒ **DC - DC Converter**

### 1.3 Quick reference

- ☒  **$BV \geq -100\text{ V}$**
- ☒  **$R_{DS(ON)} \leq 200\text{ m}\Omega @ V_{GS} = -10\text{ V}$**
- ☒  **$P_{tot} \leq 35\text{ W}$**
- ☒  **$R_{DS(ON)} \leq 230\text{ m}\Omega @ V_{GS} = -4.5$**
- ☒  **$I_D \leq -20\text{ A}$**

## 2. Pin Description

Pin	Description	Simplified Outline	Symbol
1	Gate(G)	 <p style="text-align: center;">Top View TO-252-3L</p>	
2	Drain(D)		
3	Source(S)		

## 3. Limiting Values

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	Drain-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	-	-100	V
$V_{GS}$	Gate-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	-	$\pm 20$	V
$I_D^*$	Drain Current	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	-20	A
$I_{DM}^{*,**,***}$	Pulsed Drain Current	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	-43	A
$P_{tot}^*$	Total Power Dissipation	$T_C = 25\text{ }^{\circ}\text{C}$	-	35	W
$T_{stg}$	Storage Temperature		- 55	150	$^{\circ}\text{C}$
$T_J$	Junction Temperature		-	150	$^{\circ}\text{C}$
$I_S$	Diode Forward Current	$T_C = 25\text{ }^{\circ}\text{C}$	-	-43	A
$R_{\theta JC}^*$	Thermal Resistance- Junction to Case		-	3.5	$^{\circ}\text{C} / \text{W}$
$R_{\theta JA}^*$	Thermal Resistance- Junction to Ambient		-	62.5	$^{\circ}\text{C} / \text{W}$

Notes:

\* Surface Mounted on 1 in<sup>2</sup> pad area,  $t \leq 10\text{ sec}$

\*\* Pulse width  $\leq 10\text{ }\mu\text{s}$ , duty cycle  $\leq 1\%$

\*\*\* Limited by bonding wire

## 4. Marking Information

Product Name	Marking
SN20P10K	<div>SN20P10K</div> <div>YWWXXX</div> <div>YWW: Date Code</div>

## 5. Ordering Code

Product Name	Package	Reel Size	Tape width	Quantity	Note
SN20P10K	TO252			2500	

Note: NHCX defines “Green” as lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900 ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500 ppm by weight; Follow IEC 61249-2-21 and IPC / JEDEC J-STD-020C)

## 6. Electrical Characteristics (T<sub>C</sub> = 25 °C Unless Otherwise Noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static Characteristics						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>DS</sub> = -250 μA	-100	-	-	V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = -250 μA	-1.0	-	-2.0	V
I <sub>DSS</sub>	Drain Leakage Current	V <sub>DS</sub> = -80 V, V <sub>GS</sub> = 0 V	-	-	-1	μA
I <sub>GSS</sub>	Gate Leakage Current	V <sub>GS</sub> = ± 20 V, V <sub>DS</sub> = 0 V	-	-	± 100	nA
R <sub>DS<sub>(ON)</sub></sub> <sup>a</sup>	Channel On-State Resistance	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -3 A	-	170	200	mΩ
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -2 A	-	180	230	
Diode Characteristics						
V <sub>SD</sub> <sup>a</sup>	Diode Forward Voltage	I <sub>SD</sub> = -3 A, V <sub>GS</sub> = 0 V	-	-	-1.3	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = -3 A, dI <sub>SD</sub> / dt = 100 A / μs	-	24.7	-	Ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	28.4	-	nC
Dynamic Characteristics <sup>b</sup>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -50 V Frequency = 1 MHz	-	1503	-	pF
C <sub>oss</sub>	Output Capacitance		-	38	-	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	34	-	
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DS</sub> = - 50 V, V <sub>GEN</sub> = - 10 V, R <sub>G</sub> = 4.5 Ω, R <sub>L</sub> = 16.6 Ω, I <sub>DS</sub> = - 3 A	-	9.9	-	nS
t <sub>r</sub>	Turn-on Rise Time		-	29.2	-	
t <sub>d(off)</sub>	Turn-off Delay Time		-	276	-	
t <sub>f</sub>	Turn-off Fall Time		-	84.5	-	
Gate Charge Characteristics <sup>b</sup>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> = - 10 V, V <sub>DS</sub> = - 50 V, I <sub>DS</sub> = - 3 A	-	23	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	6.5	-	
Q <sub>gd</sub>	Gate-Drain Charge		-	3	-	

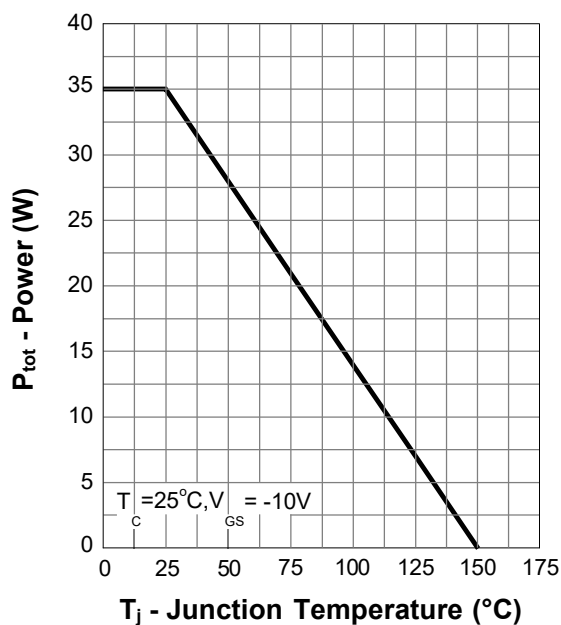
Notes:

a : Pulse test ; pulse width ≤ 300 μs, duty cycle ≤ 2 %

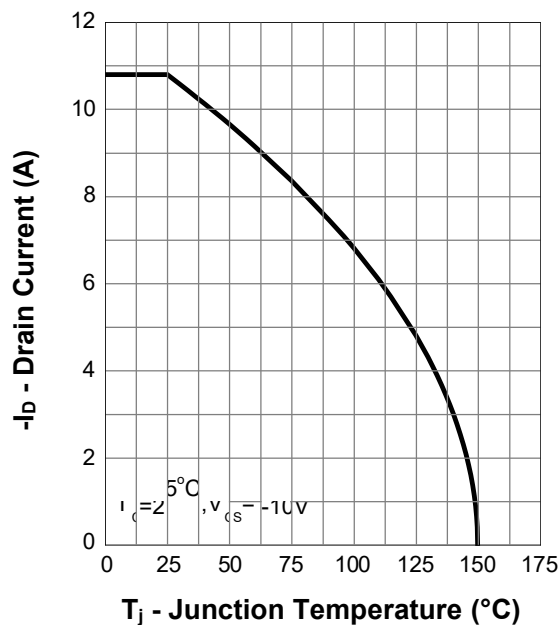
b : Guaranteed by design, not subject to production testing

## 7. Typical Characteristics

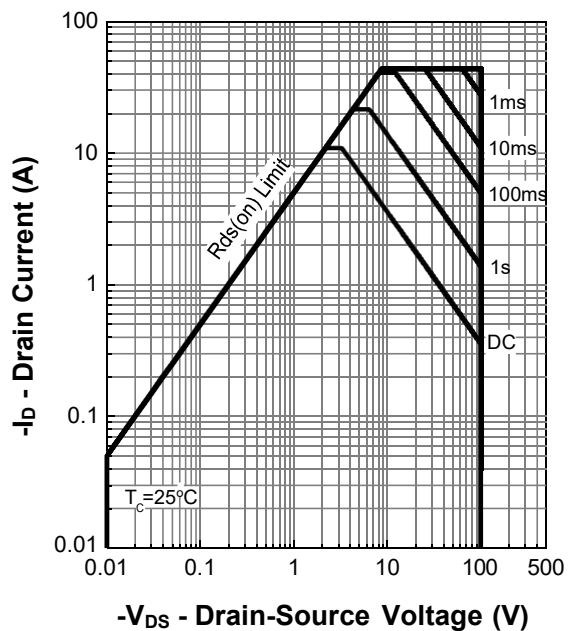
**Power Capability**



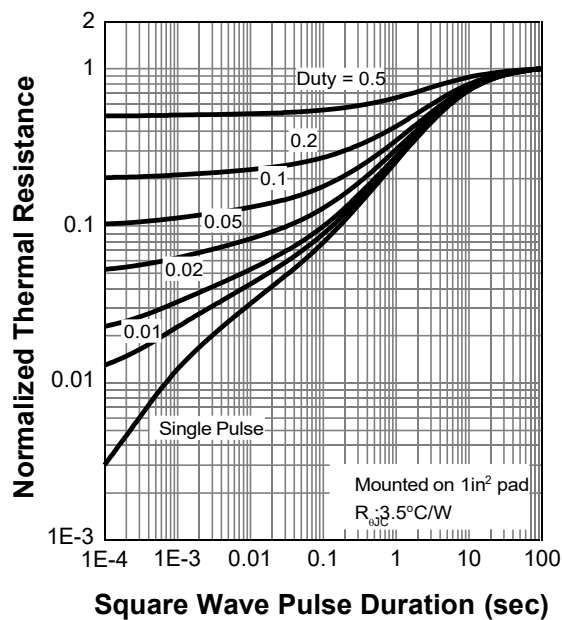
**Current Capability**



**Safe Operation Area**

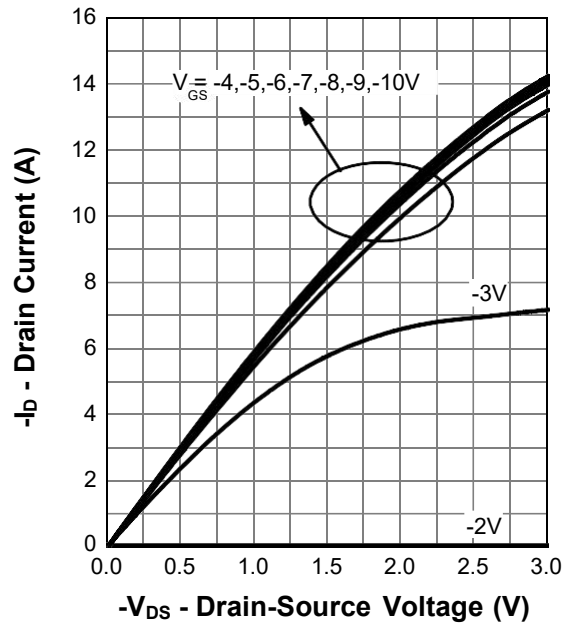


**Transient Thermal Impedance**

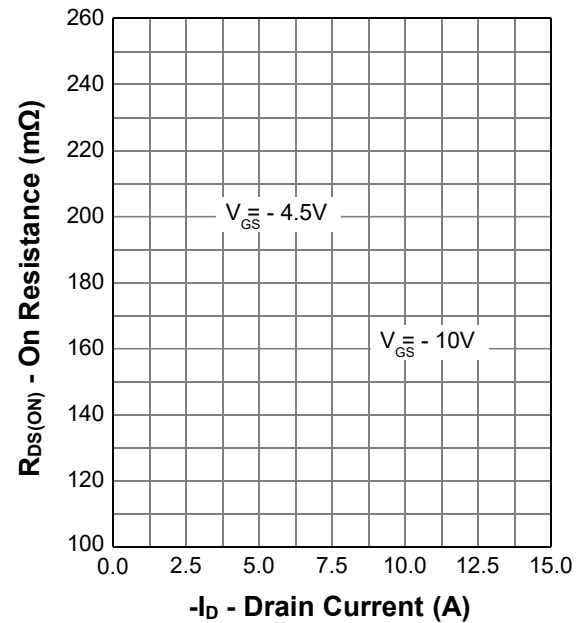


## 7. Typical Characteristics (cont.)

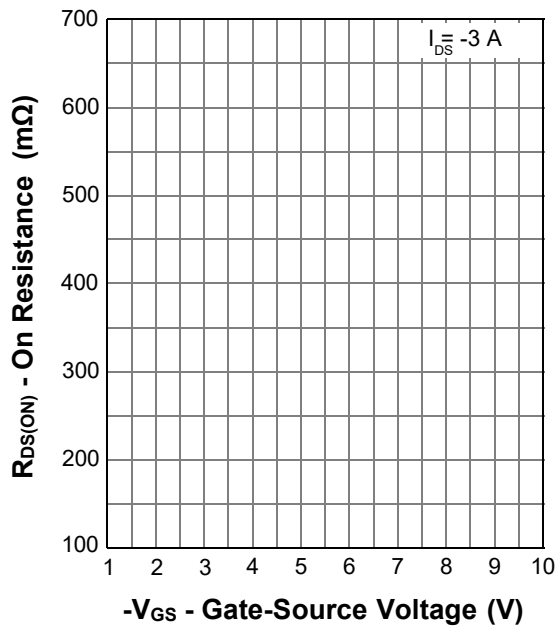
**Output Characteristics**



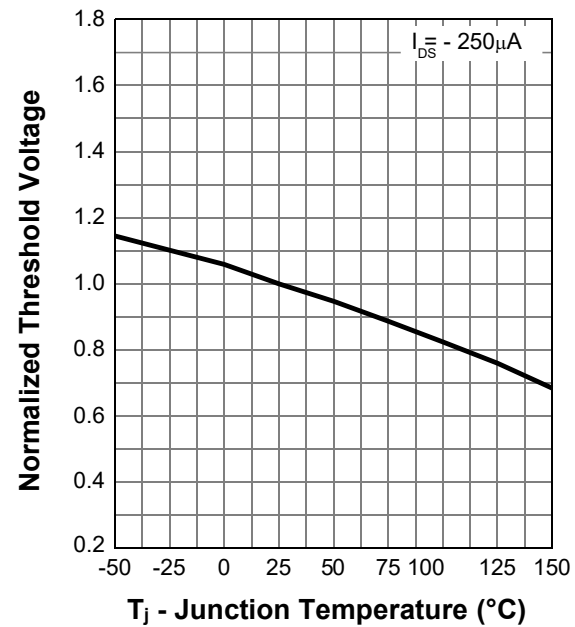
**Drain-Source On Resistance**



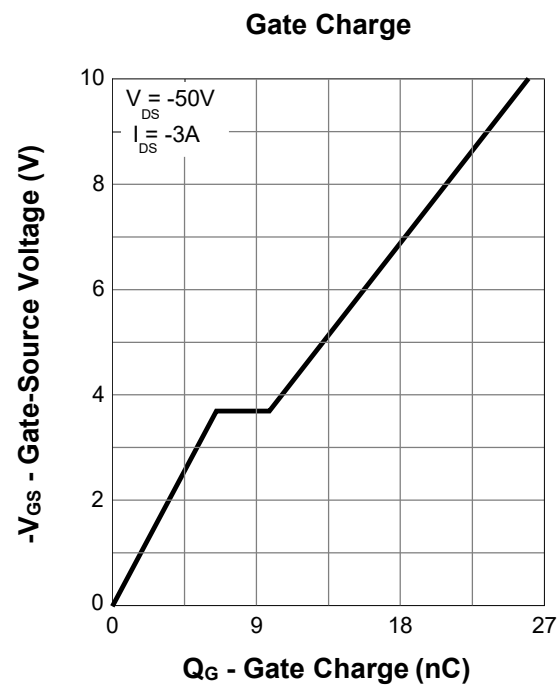
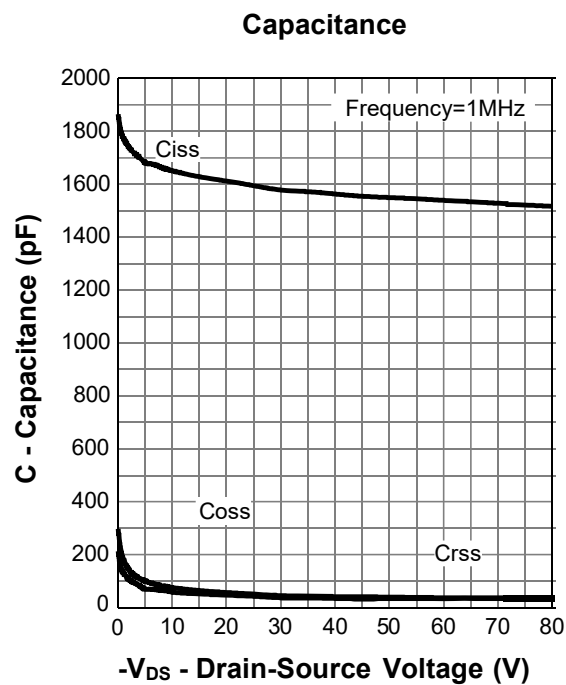
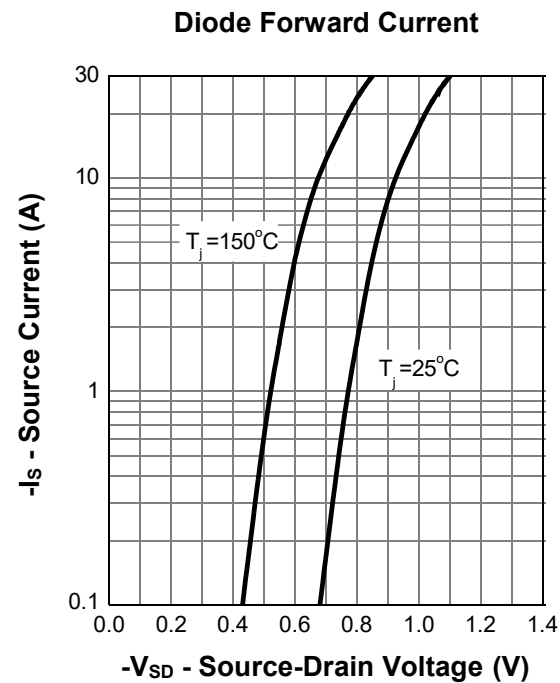
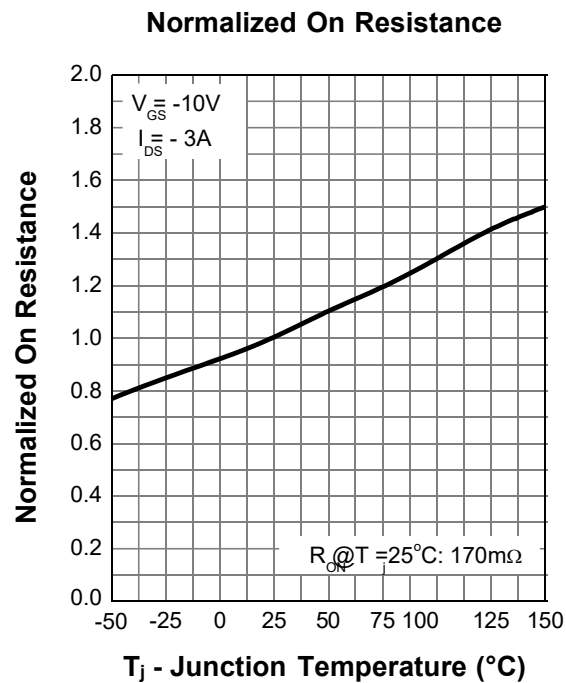
**Transfer Characteristics**



**Normalized Threshold Voltage**

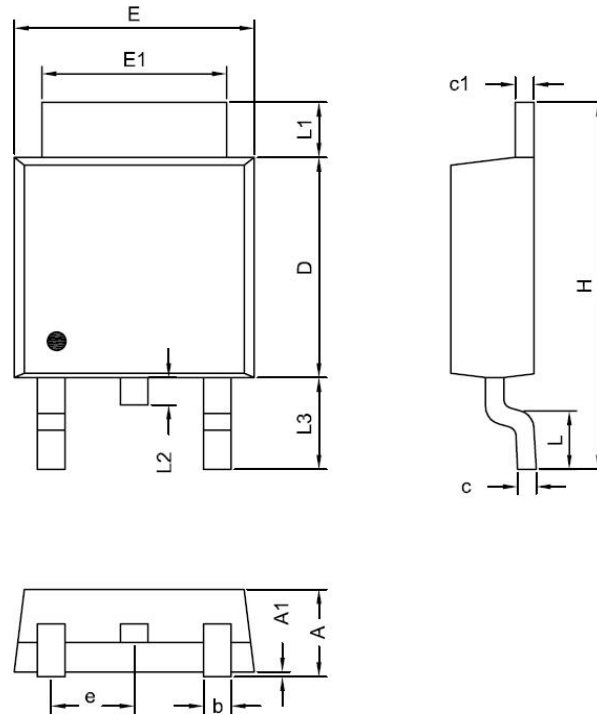


## 7. Typical Characteristics (cont.)



## 8.Package Dimensions

TO252-3L



Symbol	Dimensions In Millimeters	
	MIN.	MAX.
A	2.19	2.38
A1	0.02	0.13
D	5.30	6.40
E	6.35	6.80
E1	5.20	5.50
c	0.40	0.60
c1	0.40	0.60
b	0.55	0.85
e	2.30 BCS	
L	1.00	1.80
L1	0.70	1.80
L2	0.70 BCS	
L3	2.40	2.80
H	9.20	10.40