

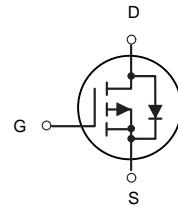


Description

The HN0400PZKE1AY uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



TO-252-2L



General Features

$V_{DS} = -40V$ $I_D = -25A$

$R_{DS(ON)} < 44 m\Omega$ @ $V_{GS}=10V$

Application

Battery protection

P-Channel MOSFET

Load switch

Uninterruptible power supply

Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
HN0400PZKE1AY	TO-252-2L	HXY MOSFET	2500

Absolute Maximum Ratings ($T_c=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-40	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D @ T_c=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	-25	A
$I_D @ T_c=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	-12	A
Idm	Pulsed Drain Current ²	-40	A
$P_D @ T_c=25^\circ C$	Total Power Dissipation ⁴	8	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction-ambient ¹	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	18.8	$^\circ C/W$



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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristics						
$V_{(\text{BR})\text{DSS}}$	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$, $I_D = -250\mu\text{A}$	-40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}} = -40\text{V}$, $V_{\text{GS}}=0\text{V}$	-	-	-1	μA
I_{GSS}	Gate to Body Leakage Current	$V_{\text{DS}}=0\text{V}$, $V_{\text{GS}}= \pm 20\text{V}$	-	-	± 100	nA
On Characteristics						
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$V_{\text{DS}}=V_{\text{GS}}$, $I_D = -250\mu\text{A}$	-1.0	-1.6	-2.5	V
$R_{\text{DS}(\text{on})}$ note3	Static Drain-Source on-Resistance	$V_{\text{GS}}= -10\text{V}$, $I_D = -8\text{A}$	-	31	44	$\text{m}\Omega$
		$V_{\text{GS}}= -4.5\text{V}$, $I_D = -5\text{A}$	-	44	60	
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{\text{DS}}= -20\text{V}$, $V_{\text{GS}}=0\text{V}$, $f=1.0\text{MHz}$	-	1034	-	pF
C_{oss}	Output Capacitance		-	107	-	pF
C_{rss}	Reverse Transfer Capacitance		-	79.5	-	pF
Q_g	Total Gate Charge	$V_{\text{DS}}= -20\text{V}$, $I_D = -5\text{A}$, $V_{\text{GS}}= -10\text{V}$	-	20	-	nC
Q_{gs}	Gate-Source Charge		-	3.5	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	4.2	-	nC
Switching Characteristics						
$t_{\text{d}(\text{on})}$	Turn-on Delay Time	$V_{\text{DD}}= -20\text{V}$, $I_D = -5\text{A}$, $V_{\text{GS}}= -10\text{V}$, $R_{\text{GEN}}=2.5\Omega$	-	8	-	ns
t_r	Turn-on Rise Time		-	15	-	ns
$t_{\text{d}(\text{off})}$	Turn-off Delay Time		-	23	-	ns
t_f	Turn-off Fall Time		-	9	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_{S}	Maximum Continuous Drain to Source Diode Forward Current	-	-	-23	-	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	-40	-	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{\text{GS}}=0\text{V}$, $I_{\text{S}} = -10\text{A}$	-	-0.8	-1.2	V
trr	Reverse Recovery Time	$V_{\text{GS}} = 0\text{V}$, $I_{\text{S}} = -5\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$	-	29	-	ns
Q_{rr}	Reverse Recovery Charge		-	20	-	nC

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition: $T_J = 25^\circ\text{C}$, $V_{\text{DD}} = -20\text{V}$, $V_{\text{G}} = -10\text{V}$, $L = 0.5\text{mH}$, $R_{\text{G}} = 25\Omega$, $I_{\text{AS}} = -10.5\text{A}$

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



Typical Performance Characteristics

Figure 1: Output Characteristics

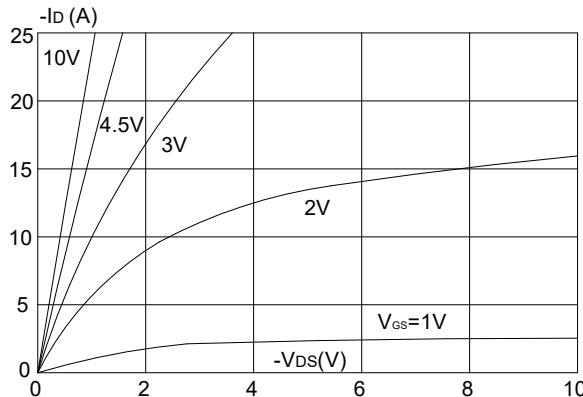


Figure 3: On-resistance vs. Drain Current

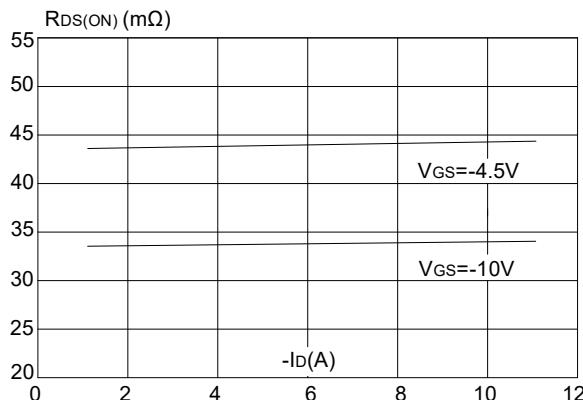


Figure 5: Gate Charge Characteristics

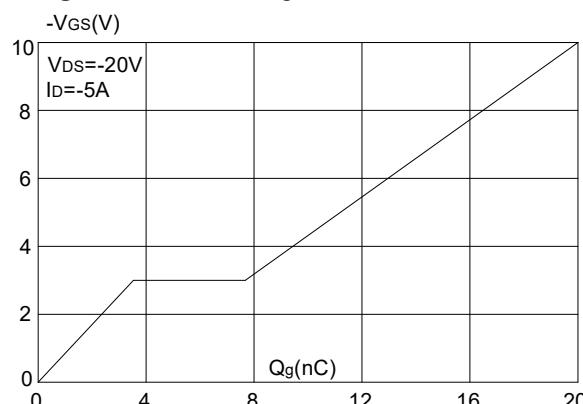


Figure 2: Typical Transfer Characteristics

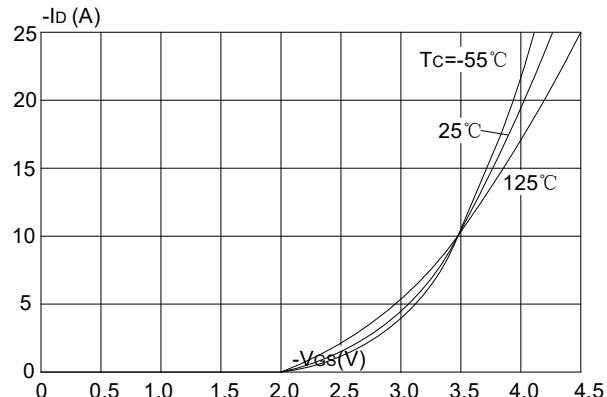


Figure 4: Body Diode Characteristics

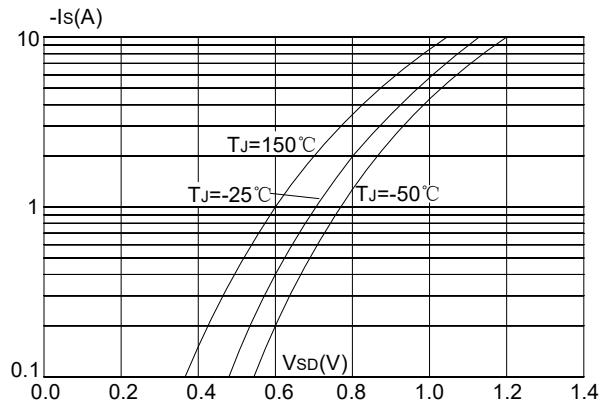


Figure 6: Capacitance Characteristics

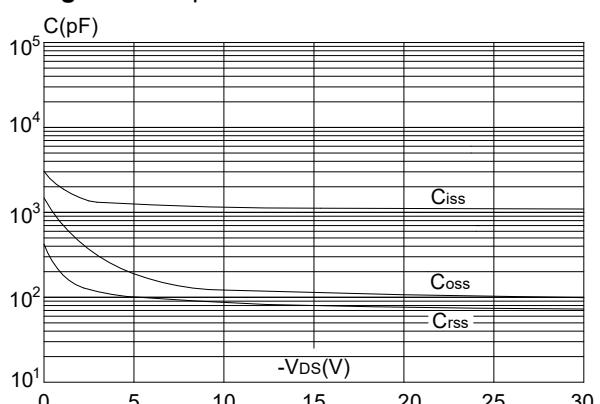




Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

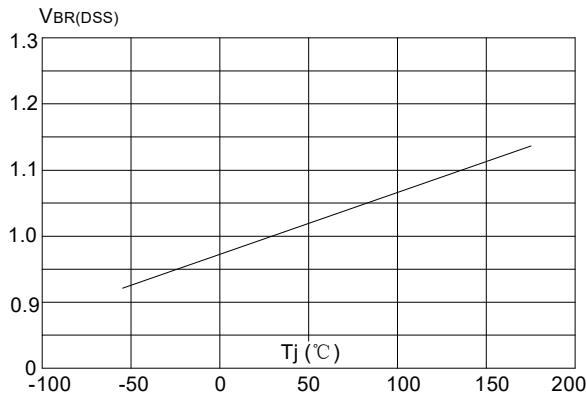


Figure 9: Maximum Safe Operating Area

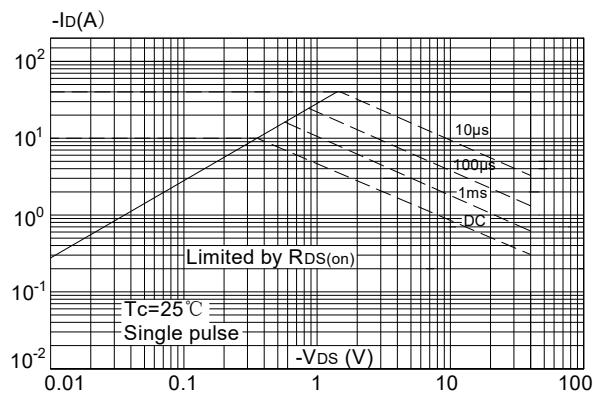


Figure 11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

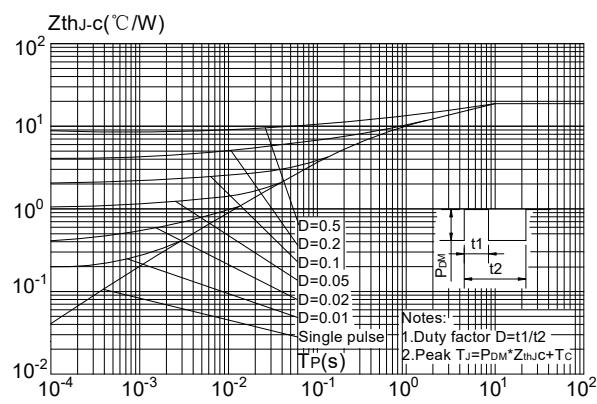


Figure 8: Normalized on Resistance vs. Junction Temperature

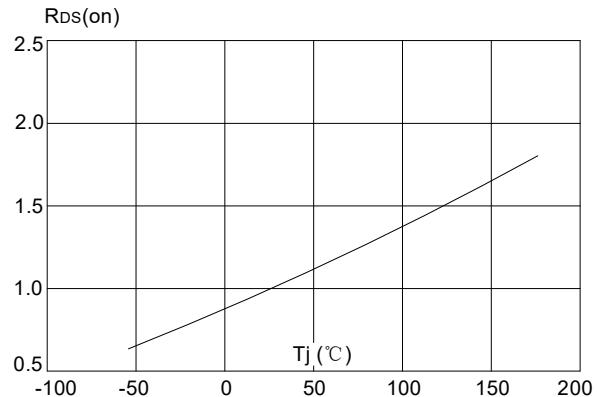
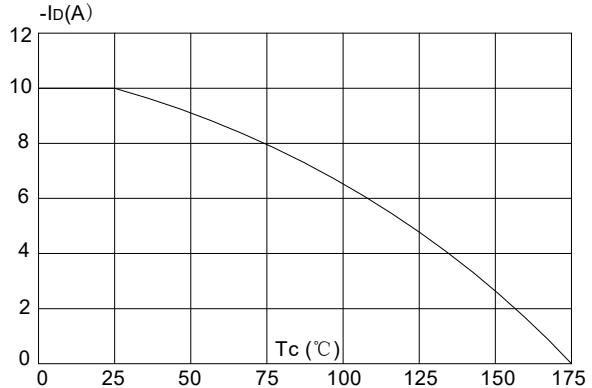


Figure 10: Maximum Continuous Drain Current vs. Case Temperature





Test Circuit

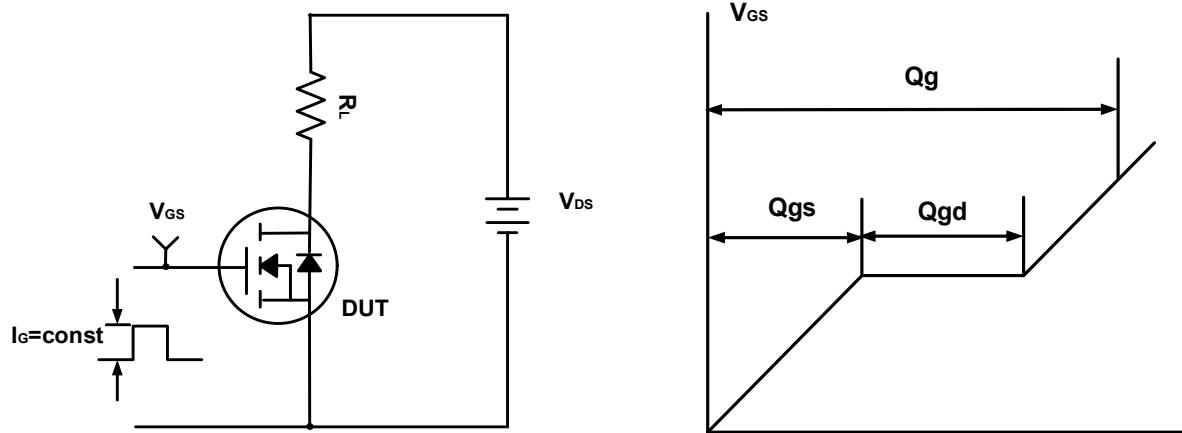


Figure A. Gate Charge Test Circuit & Waveforms

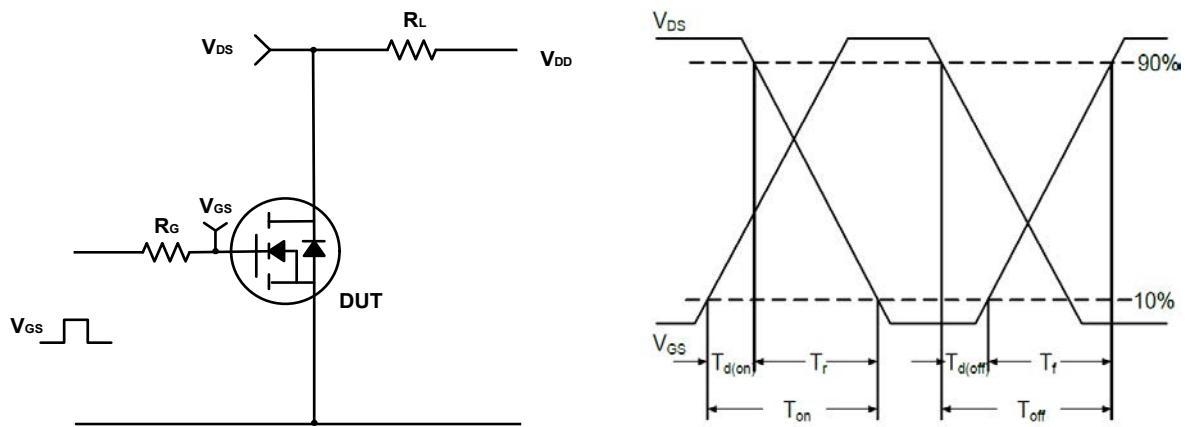


Figure B. Switching Test Circuit & Waveforms

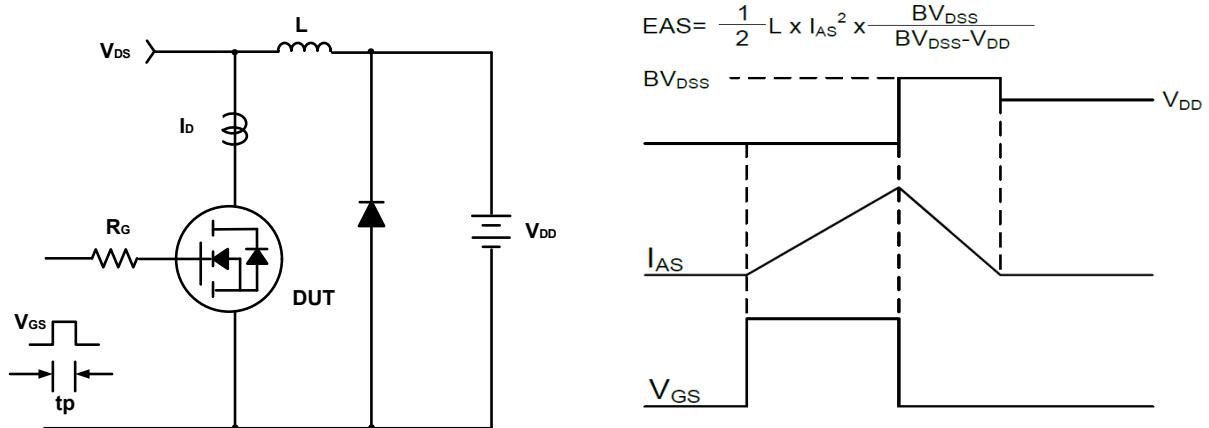
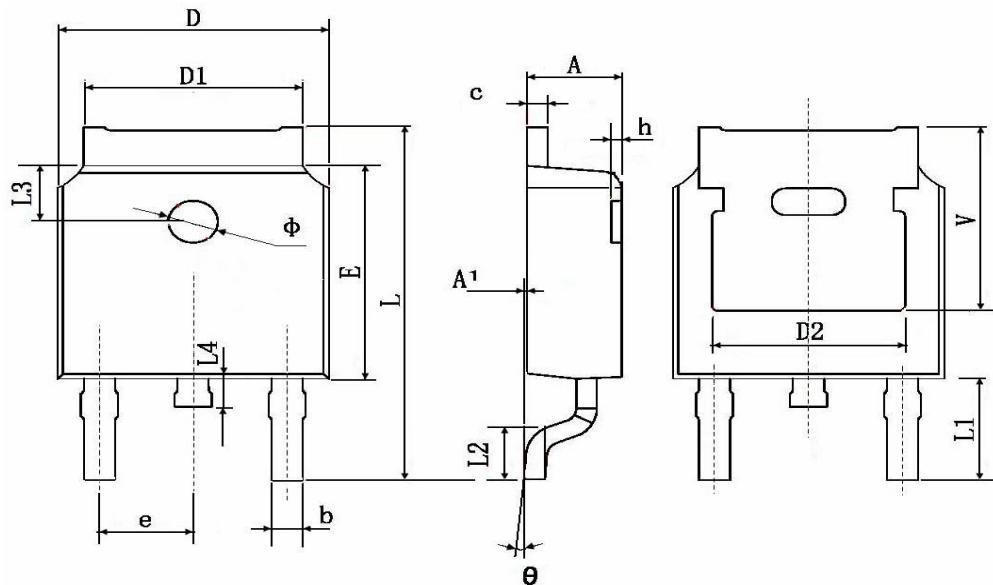


Figure C. Unclamped Inductive Switching Circuit & Waveforms



TO-252-2L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	



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