



# MDY20N113PTRH

Single N-channel Trench MOSFET 200V 11.3mΩ 100A

## FEATURES

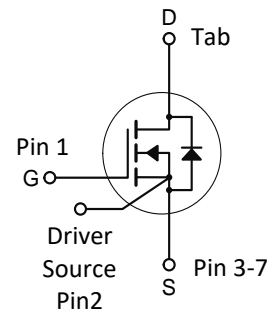
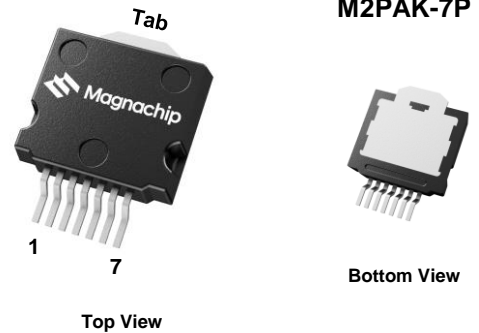
- MV MOSFET GEN3T technology
- N-channel, normal level
- Enhanced avalanche ruggedness
- 100% UIS and Rg tested
- Maximum 175°C junction temperature

## APPLICATIONS

- DC/DC and AC/DC converters
- Brushed and BLDC Motor drive systems
- Battery powered systems

## KEY PERFORMANCE PARAMETERS

$V_{DS}$	200	V
$R_{DS(on), typ.}$	0.0103	$\Omega$
$I_D$	100	A
$Q_G$	83	nC
Junction temperature, $_{max}$	175	$^{\circ}C$



## ORDERING INFORMATION

Type / Ordering Code	Package	Marking	Packing	RoHS Status
MDY20N113PTRH	M2PAK-7P	MDY20N113	Tape & Reel	Halogen Free

<http://www.magnachip.com/>

**ABSOLUTE MAXIMUM RATINGS**, at  $T_C = 25^\circ\text{C}$ , unless otherwise specified

PARAMETER		SYMBOL	RATING	UNIT
Drain-source Voltage		$V_{DS}$	200	V
Gate-source Voltage		$V_{GS}$	$\pm 20$	V
Drain current	$T_C=25^\circ\text{C}$	$I_D$	100	A
	$T_C=100^\circ\text{C}$		71	A
<sup>1)</sup> Pulsed drain current	$T_C=25^\circ\text{C}$	$I_{DM}$	400	A
Total power dissipation	$T_C=25^\circ\text{C}$	$P_{tot}$	326	W
	$T_C=100^\circ\text{C}$		163	W
<sup>2)</sup> Avalanche energy, single pulse		$E_{AS}$	365	mJ
Operating and storage temperature		$T_j, T_{stg}$	- 55 ~ 175	$^\circ\text{C}$

**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	RATING	UNIT
Thermal resistance, junction - case	$R_{\theta JC}$	0.46	$^\circ\text{C/W}$
<sup>3)</sup> Thermal resistance, junction - ambient	$R_{\theta JA}$	30	$^\circ\text{C/W}$

**Notes**

- Pulse width limited by  $T_{jmax}$
- Starting  $T_J=25^\circ\text{C}$ ,  $L=1\text{mH}$ ,  $I_{AS}=27\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $V_{GS}=10\text{V}$
- Surface mounted FR-4 board by JEDEC (jesd51-7)

ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C)

## Static

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	200	-	-	V	V <sub>GS</sub> =0 V, I <sub>D</sub> =250 μA
Gate threshold voltage	V <sub>GS(th)</sub>	3.00	3.75	4.50	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 μA
Zero gate voltage drain current	I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> =200 V, V <sub>GS</sub> =0 V
Gate-source leakage current	I <sub>GSS</sub>	-	-	± 100	nA	V <sub>GS</sub> =±20 V, V <sub>DS</sub> =0 V
Drain-source on-state resistance	R <sub>DS(on)</sub>	-	10.3	11.3	mΩ	V <sub>GS</sub> =10 V, I <sub>D</sub> =50 A
Gate resistance	R <sub>G</sub>	-	2.5	-	Ω	f=1MHz
Transconductance	g <sub>fs</sub>	-	85	-	S	V <sub>DS</sub> =10 V, I <sub>D</sub> =50 A

## Dynamic

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Input capacitance	C <sub>iss</sub>	-	6869	-	pF	V <sub>GS</sub> =0 V, V <sub>DS</sub> =100 V, f=1 MHz
Output capacitance	C <sub>oss</sub>	-	402	-	pF	V <sub>GS</sub> =0 V, V <sub>DS</sub> =100 V, f=1 MHz
Reverse transfer capacitance	C <sub>rss</sub>	-	8	-	pF	V <sub>GS</sub> =0 V, V <sub>DS</sub> =100 V, f=1 MHz
Turn-on delay time	t <sub>d(on)</sub>	-	37	-	ns	V <sub>DD</sub> =100 V, V <sub>GS</sub> =10 V, I <sub>D</sub> =50 A, R <sub>G,ext</sub> =3Ω
Rise time	t <sub>r</sub>	-	12	-	ns	V <sub>DD</sub> =100 V, V <sub>GS</sub> =10 V, I <sub>D</sub> =50 A, R <sub>G,ext</sub> =3Ω
Turn-off delay time	t <sub>d(off)</sub>	-	62	-	ns	V <sub>DD</sub> =100 V, V <sub>GS</sub> =10 V, I <sub>D</sub> =50 A, R <sub>G,ext</sub> =3Ω
Fall time	t <sub>f</sub>	-	8	-	ns	V <sub>DD</sub> =100 V, V <sub>GS</sub> =10 V, I <sub>D</sub> =50 A, R <sub>G,ext</sub> =3Ω

## Gate Charge Characteristics

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Gate to source charge	Q <sub>gs</sub>	-	39	-	nC	V <sub>DD</sub> =100 V, I <sub>D</sub> =50 A, V <sub>GS</sub> =0 to 10 V
Gate charge at threshold	Q <sub>gs(th)</sub>	-	22	-	nC	V <sub>DD</sub> =100 V, I <sub>D</sub> =50 A, V <sub>GS</sub> =0 to 10 V
Gate to drain charge	Q <sub>gd</sub>	-	12	-	nC	V <sub>DD</sub> =100 V, I <sub>D</sub> =50 A, V <sub>GS</sub> =0 to 10 V
Switching charge	Q <sub>sw</sub>	-	29	-	nC	V <sub>DD</sub> =100 V, I <sub>D</sub> =50 A, V <sub>GS</sub> =0 to 10 V
Gate charge total	Q <sub>g</sub>	-	83	-	nC	V <sub>DD</sub> =100 V, I <sub>D</sub> =50 A, V <sub>GS</sub> =0 to 10 V
Gate plateau voltage	V <sub>plateau</sub>	-	5.9	-	V	V <sub>DD</sub> =100 V, I <sub>D</sub> =50 A, V <sub>GS</sub> =0 to 10 V

## Source-Drain Diode Ratings and Characteristics

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Diode continuous forward current	I <sub>S</sub>	-	-	100	A	-
Diode pulse current	I <sub>S,pulse</sub>	-	-	402	A	pulsed; t <sub>p</sub> ≤ 10 μs
Diode forward voltage	V <sub>SD</sub>	-	0.9	1.2	V	V <sub>GS</sub> =0 V, I <sub>F</sub> =50 A
Reverse recovery time	t <sub>rr</sub>	-	167	-	ns	I <sub>F</sub> =50 A, d <sub>iF</sub> /dt=100 A/μs
Reverse recovery charge	Q <sub>rr</sub>	-	1010	-	nC	I <sub>F</sub> =50 A, d <sub>iF</sub> /dt=100 A/μs

Electrical Characteristics Diagrams (25 °C, unless otherwise noted)

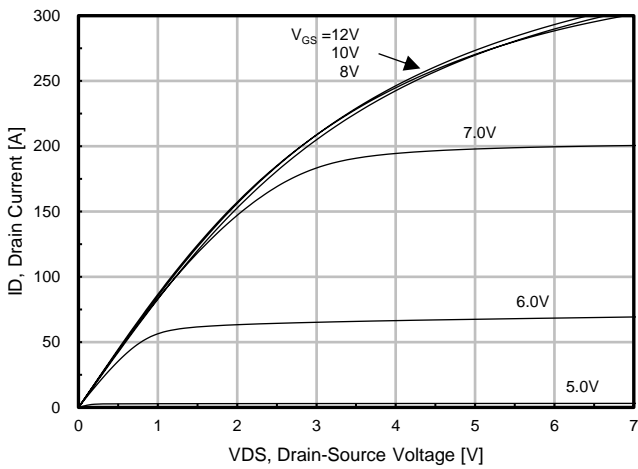


Fig. 1. Output Characteristics

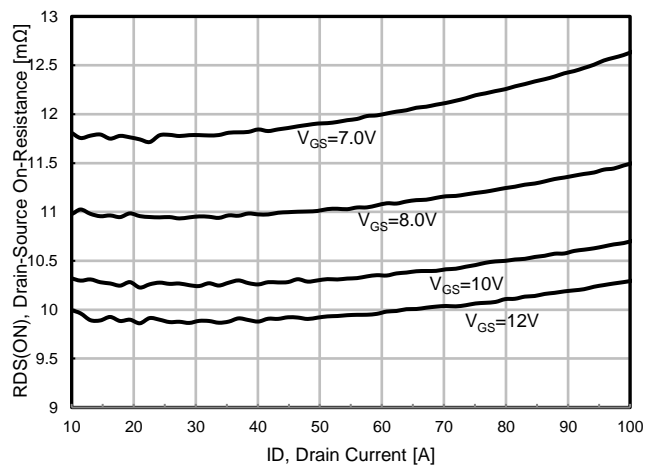


Fig. 2. Static On-Resistance Variation

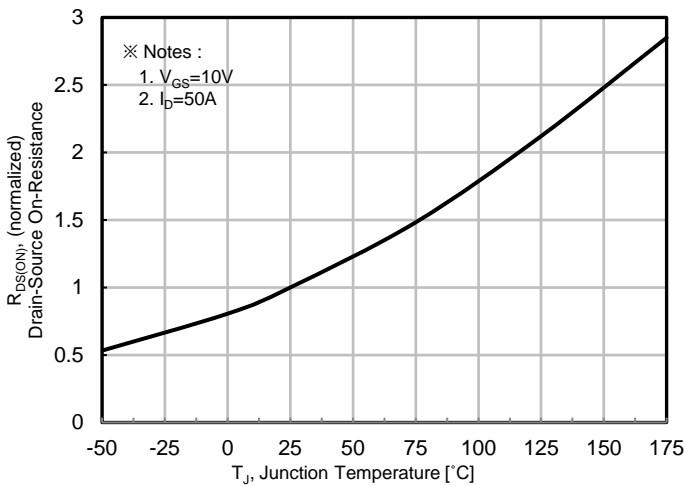


Fig. 3. On-Resistance vs. Junction Temperature

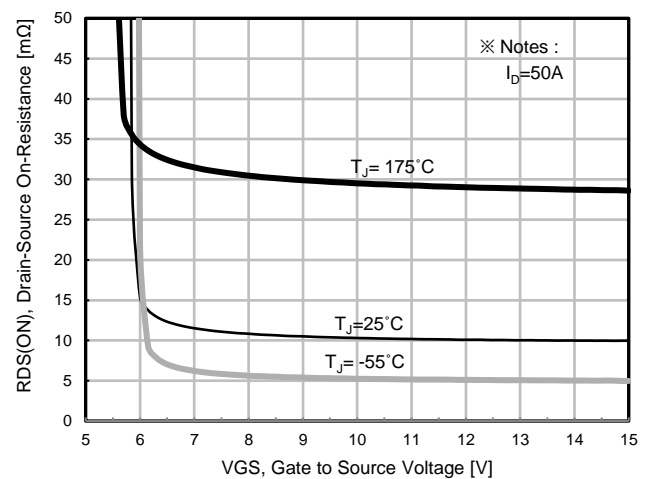


Fig. 4. On-Resistance vs. Gate to source Voltage

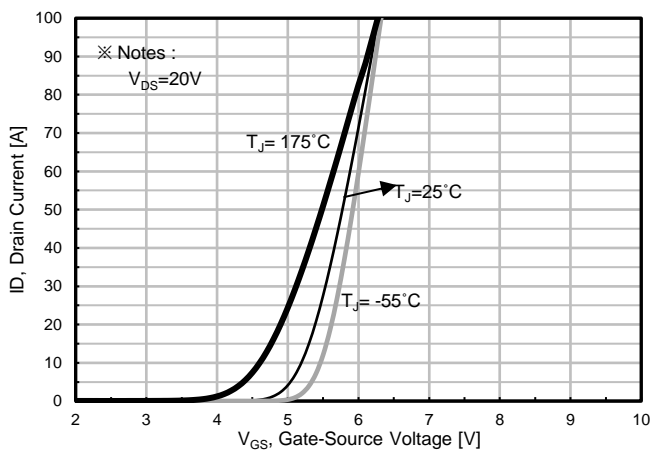


Fig. 5. Transfer Characteristics

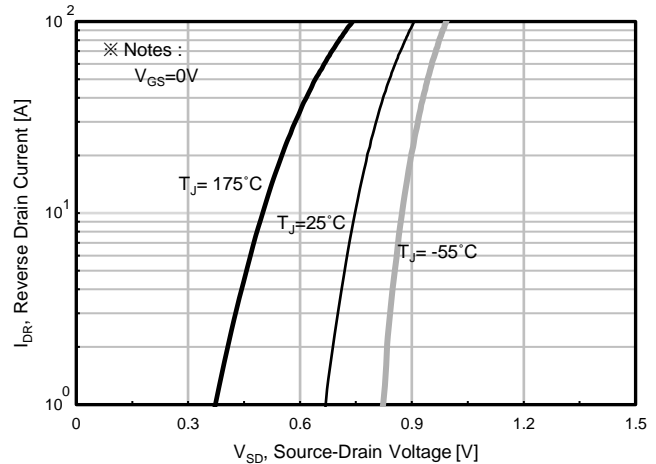


Fig. 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Electrical Characteristics Diagrams (25 °C, unless otherwise noted)

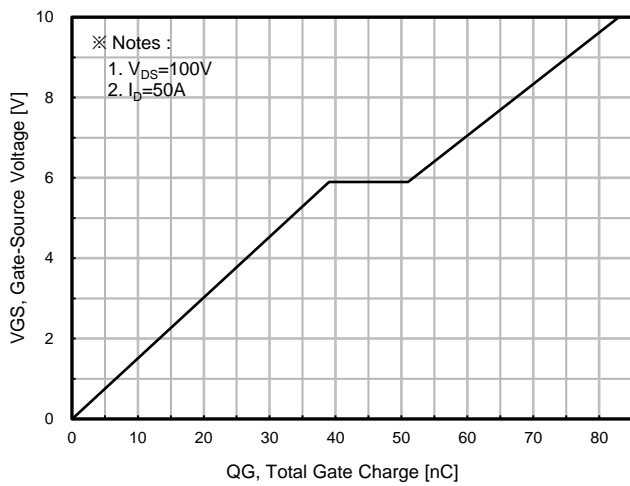


Fig. 7. Gate Charge

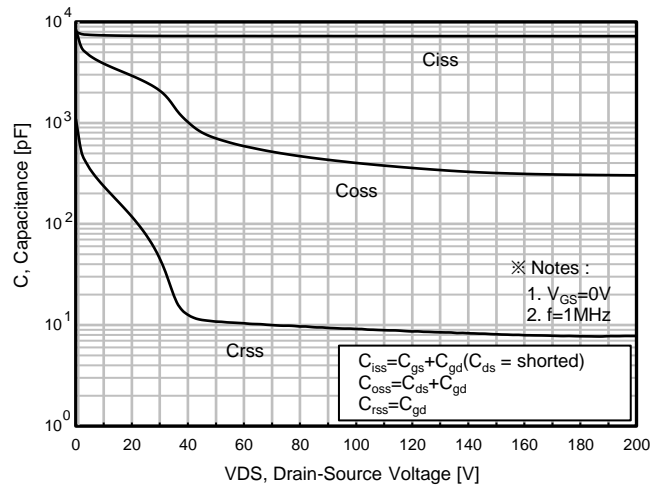


Fig. 8. Capacitance

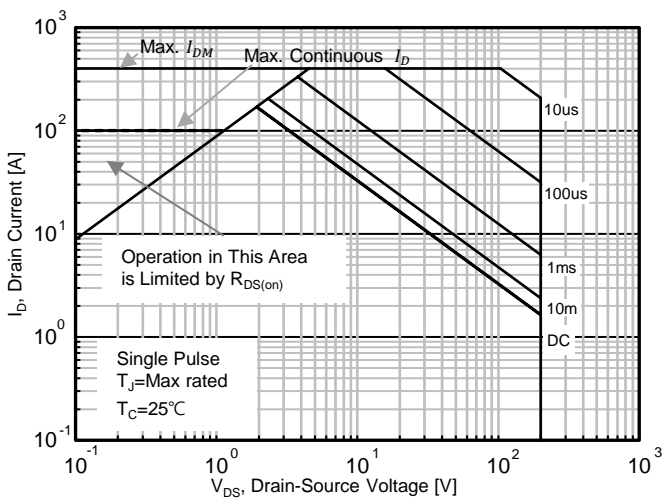


Fig. 9. Safe Operating Area, Junction-to-Ambient

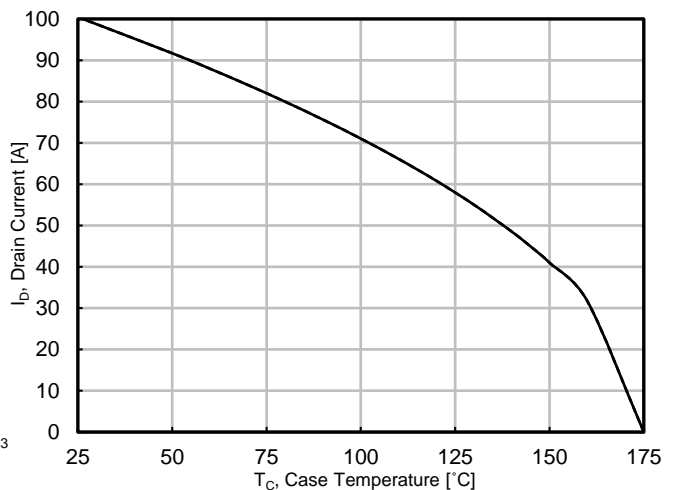


Fig. 10. Maximum Drain vs. Case Temperature

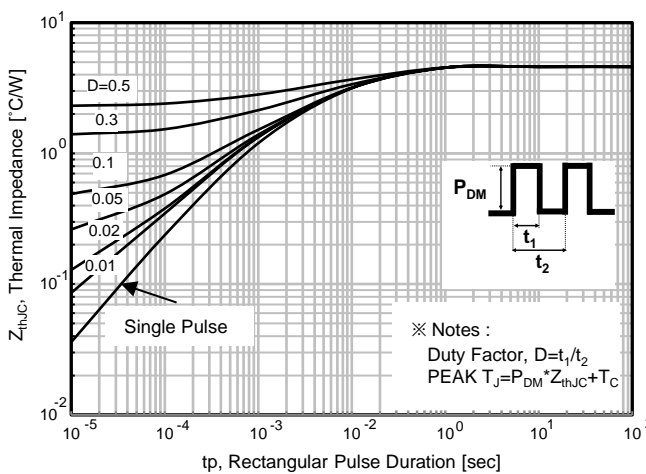


Fig. 11. Transient Thermal Impedance (Junction to Case)

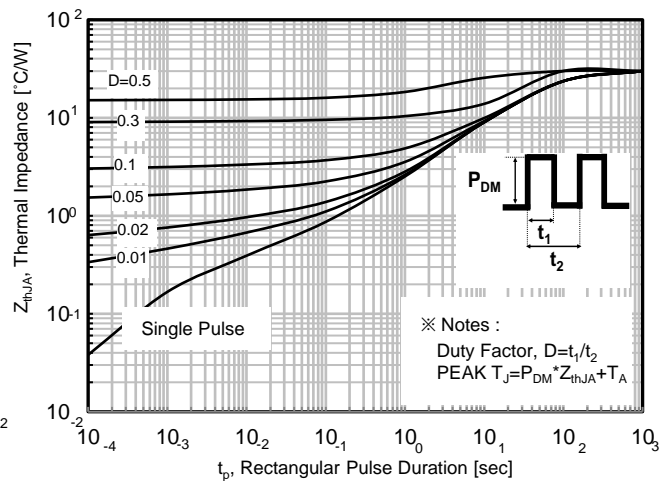


Fig. 11-1. Transient Thermal Impedance (Junction to Ambient)

## Electrical Characteristics Diagrams (25 °C, unless otherwise noted)

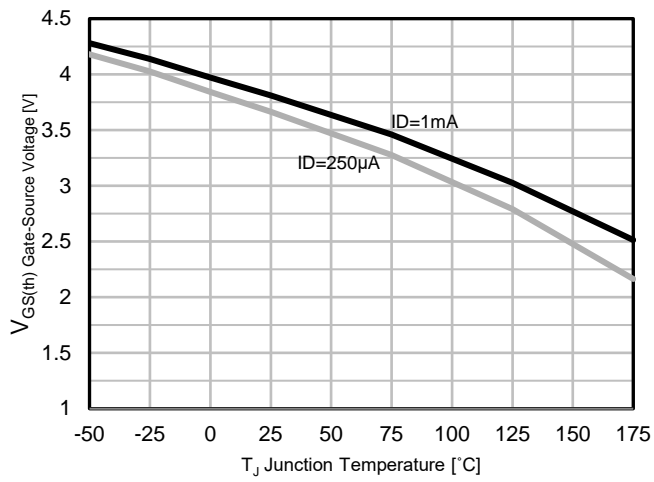


Fig.12 Gate -Source Threshold Voltage vs. Temperature

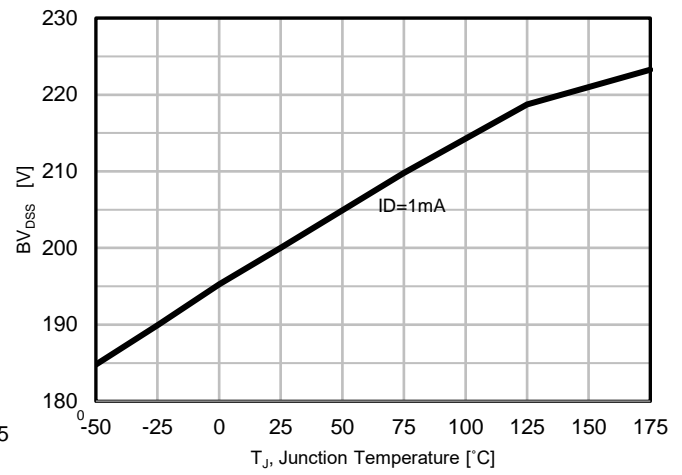
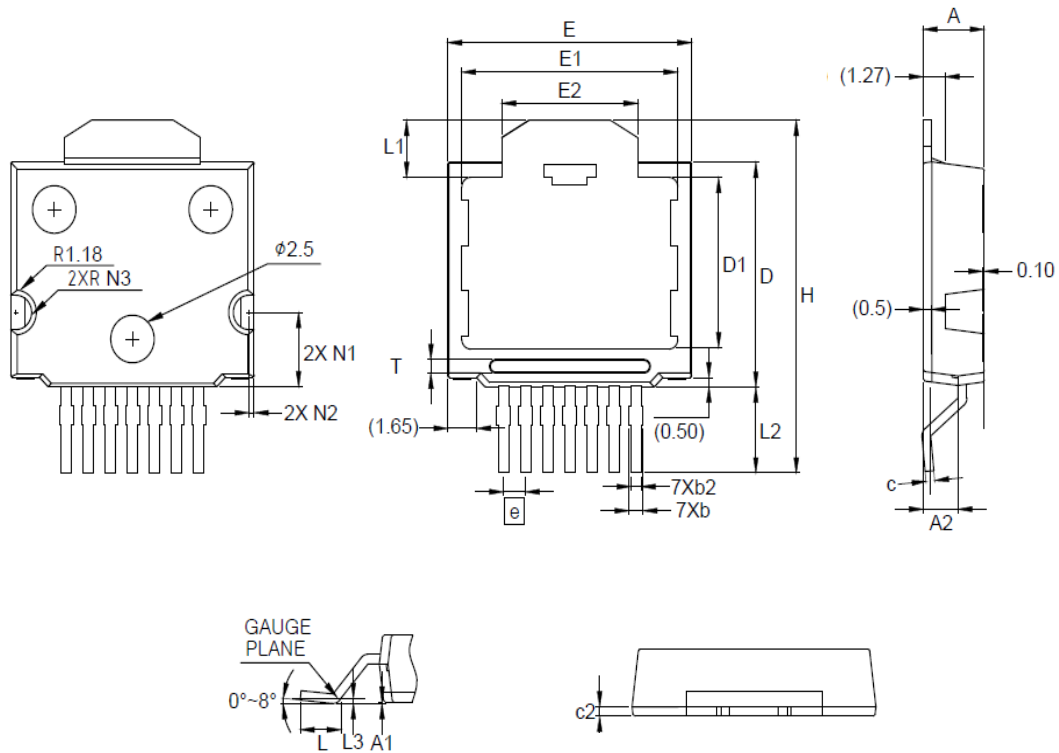


Fig.13 Drain-Source Voltage vs. Temperature

# Package Information

## M2PAK-7P




Symbol	Dimension (mm)		
	Min	Nom	Max
A	3,40	-	3,60
A1	0,00	-	0,25
A2	1,80	-	2,20
b	0,50	-	0,70
b2	0,50	-	1,00
c	0,40	-	0,60
c2	0,40	-	0,60
D	11,70	-	11,90
D1	8,90	-	9,10
E	13,90	-	14,10
E1	12,30	-	12,50
E2	7,75	-	7,85
T	0,60		0,70
e	BSC 1,27		
H	18,00	-	19,00
L	2,22	-	2,42
L1	2,90	-	3,10
L2	4,35	-	4,65
L3	BSC 0,25		
N1	3,80	-	4,00
N2	0,25	-	0,35
N3	0,80	-	1,00

Note : Package body size, length and width do not include mold flash, protrusions and gate burrs.

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