

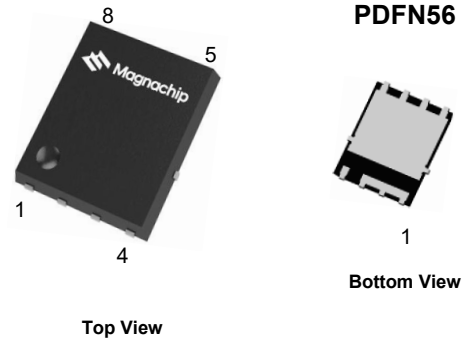


# MDU040N010PSVRH

Single N-channel Trench MOSFET 40V 1.0m $\Omega$

## FEATURES

- Trench power MOSFET technology
- Single N-channel trench, normal gate level
- Enhanced avalanche ruggedness
- 100% Avalanche tested
- Maximum 175°C junction temperature

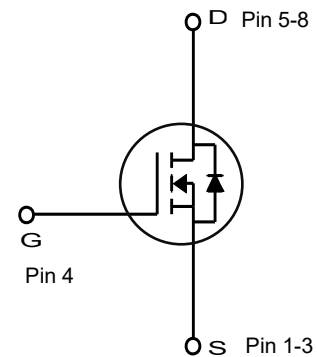


## PRODUCT VALIDATION

- Qualified according to JEDEC Standard

## KEY PERFORMANCE PARAMETERS

$V_{DS}$	40	V
$R_{DS(on), typ.}$	0.0008	$\Omega$
$I_D$	297	A
$Q_g$	73	nC
Junction temperature <sub>, max</sub>	175	$^{\circ}C$



## ORDERING INFORMATION

Type / Ordering Code	Package	Marking	Packing	RoHS Status
MDU040N010PSVRH	PDFN56	040N010P	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	$V_{DS}$	40	V
Gate-source Voltage	$V_{GS}$	$\pm 20$	
Drain current	$I_D$	$T_c=25^\circ\text{C}$	297
		$T_c=100^\circ\text{C}$	210
<sup>1)</sup> Pulsed drain current	$I_{DM}$	$T_c=25^\circ\text{C}, t_p \leq 100 \mu\text{s}$	1188
Total power dissipation	$P_{tot}$	$T_c=25^\circ\text{C}$	150
		$T_c=100^\circ\text{C}$	75
<sup>2)</sup> Avalanche energy, single pulse	$E_{AS}$		421
Operating and storage temperature	$T_j, T_{stg}$		- 55 ~ 175

**THERMAL CHARACTERISTICS**

Parameter	Symbol	Rating	Unit
Thermal resistance, junction - case	$R_{\theta JC}$	1	$^\circ\text{C}/\text{W}$
<sup>3)</sup> Thermal resistance, junction - ambient	$R_{\theta JA}$	50	

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	40	-	-	V	V <sub>GS</sub> =0 V, I <sub>D</sub> =250 μA
Gate threshold voltage	V <sub>GS(th)</sub>	2.25	-	3.75		V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =431 μA
Zero gate voltage drain current	I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> =40 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>	-	0.80	1.00	mΩ	V <sub>GS</sub> =10 V, I <sub>D</sub> =50 A
		-	0.90	1.40		V <sub>GS</sub> =8 V, I <sub>D</sub> =50 A
<sup>4)</sup> Gate resistance	R <sub>g</sub>	-	1.1	-	Ω	f=1 MHz
<sup>4)</sup> Transconductance	g <sub>fs</sub>	-	115	-	S	V <sub>DS</sub> =10 V, I <sub>D</sub> =50 A

**<sup>4)</sup> DYNAMIC CHARACTERISTICS**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Input capacitance	C <sub>iss</sub>	-	5503	-	pF	V <sub>GS</sub> =0 V, V <sub>DS</sub> =20 V, f=1 MHz
Output capacitance	C <sub>oss</sub>	-	1492	-		
Reverse transfer capacitance	C <sub>rss</sub>	-	58	-		
Turn-on delay time	t <sub>d(on)</sub>	-	28	-	ns	V <sub>DD</sub> =20 V, V <sub>GS</sub> =10 V, I <sub>D</sub> =50 A, R <sub>G,ext</sub> =1.6 Ω
Rise time	t <sub>r</sub>	-	8	-		
Turn-off delay time	t <sub>d(off)</sub>	-	50	-		
Fall time	t <sub>f</sub>	-	13	-		

**<sup>4)</sup> GATE CHARGE CHARACTERISTICS**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Gate to source charge	Q <sub>gs</sub>	-	20	-	nC	V <sub>DD</sub> =20 V, I <sub>D</sub> =50 A, V <sub>GS</sub> =0 to 10 V
Gate charge at threshold	Q <sub>gs(th)</sub>	-	13	-		
Gate to drain charge	Q <sub>gd</sub>	-	13	-		
Switching charge	Q <sub>sw</sub>	-	20	-		
Gate charge total	Q <sub>g</sub>	-	73	-		
Gate plateau voltage	V <sub>plateau</sub>	-	4.6	-	V	

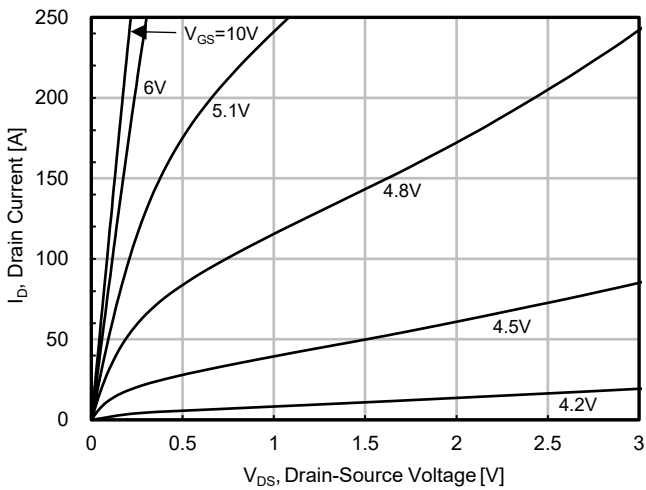
**SOURCE-DRAIN DIODE**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
<sup>4)</sup> Diode continuous forward current	I <sub>S</sub>	-	-	190	A	-
<sup>4)</sup> Diode pulse current	I <sub>S,pulse</sub>	-	-	1165	A	pulsed; t <sub>p</sub> ≤ 100 μs
Diode forward voltage	V <sub>SD</sub>	-	0.8	1.1	V	V <sub>GS</sub> =0 V, I <sub>F</sub> =50 A
<sup>4)</sup> Reverse recovery time	t <sub>rr</sub>	-	53	-	ns	I <sub>F</sub> =50 A, di <sub>F</sub> /dt=100 A/μs
<sup>4)</sup> Reverse recovery charge	Q <sub>rr</sub>	-	56	-	nC	

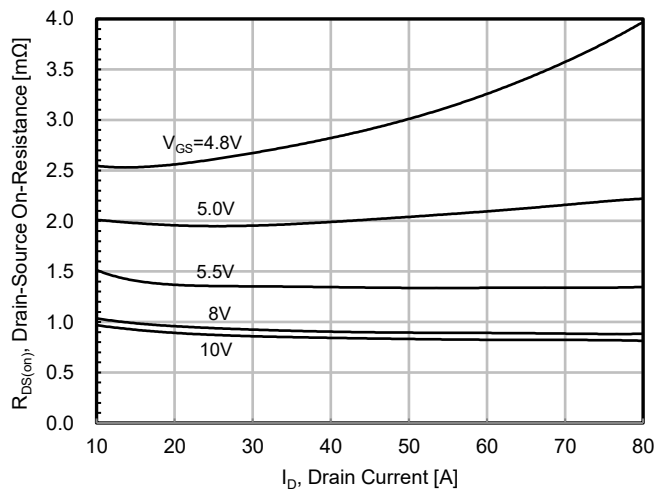
**Notes**

- Pulse width limited by T<sub>Jmax</sub>
- Starting T<sub>J</sub>=25°C, L=1mH, I<sub>AS</sub>=29A, V<sub>DD</sub>=36V, V<sub>GS</sub>=10V
- Surface mounted FR-4 board by JEDEC (jesd51-7)
- The parameter is not subject to production testing - guaranteed by design.

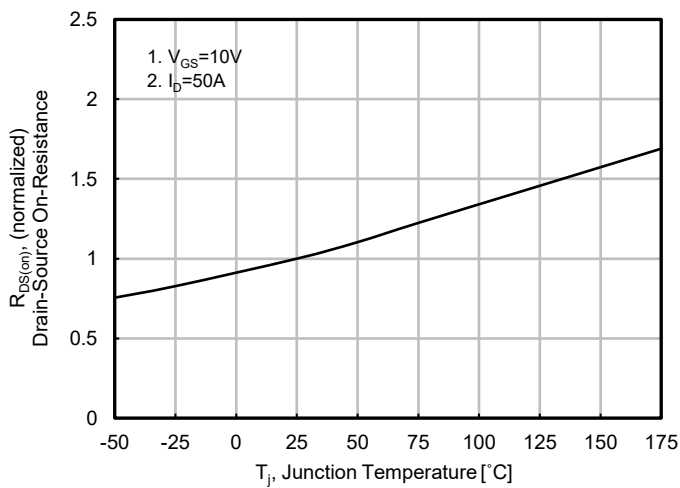
**ELECTRICAL CHARACTERISTICS DIAGRAMS (25 °C, unless otherwise noted)**



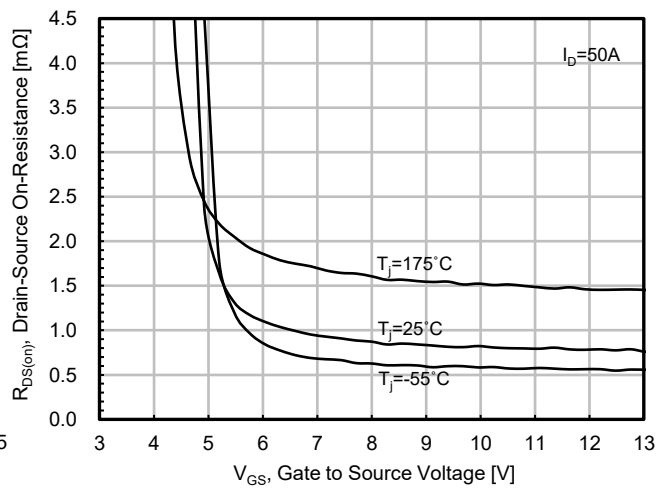
**Fig. 1. Typ. Output Characteristics**



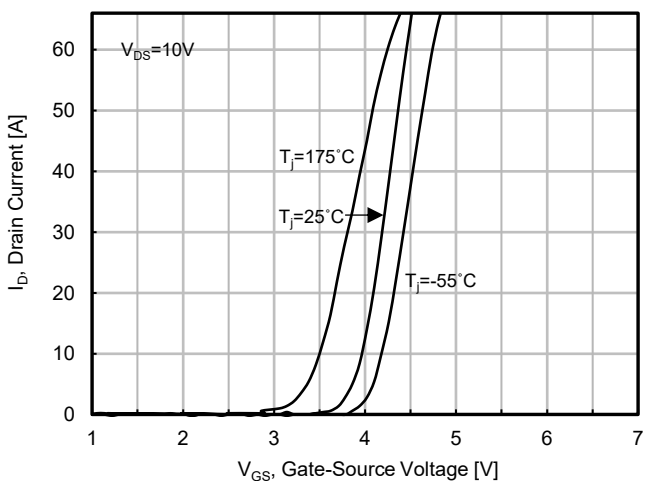
**Fig. 2. Typ. Drain to Source On-Resistance**



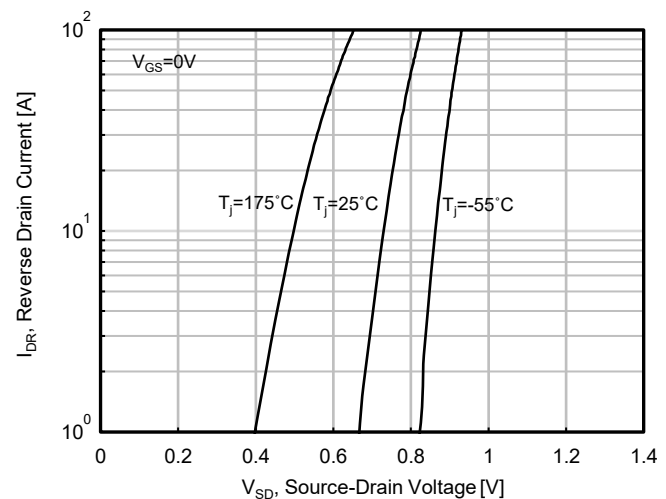
**Fig. 3. On-Resistance vs. Junction Temperature**



**Fig. 4. On-Resistance vs. Gate to Source Voltage**

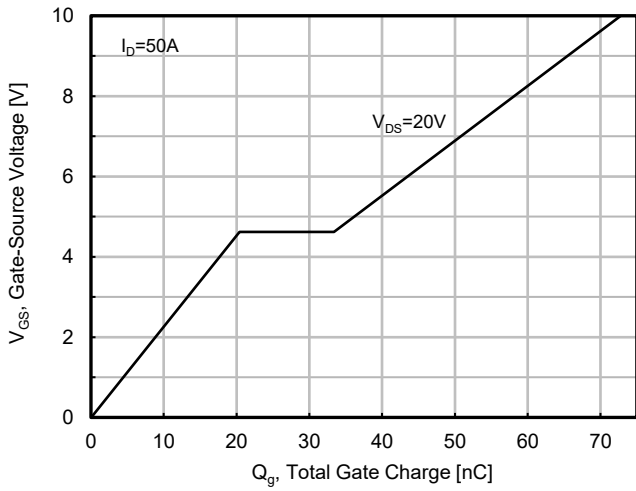


**Fig. 5. Typ. Transfer Characteristics**

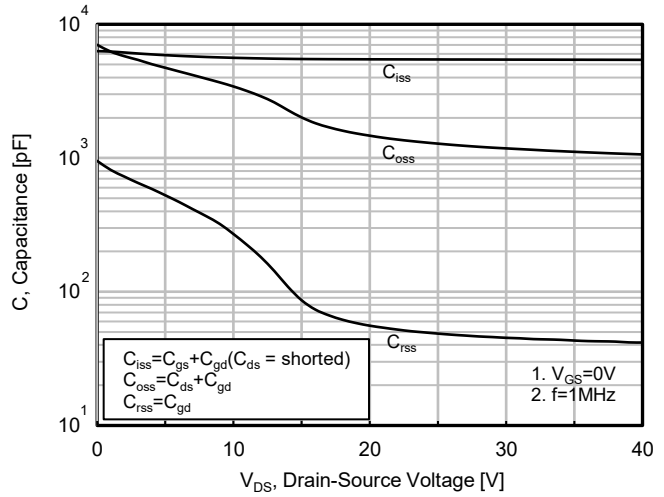


**Fig. 6. Forward Characteristics of Reverse Diode**

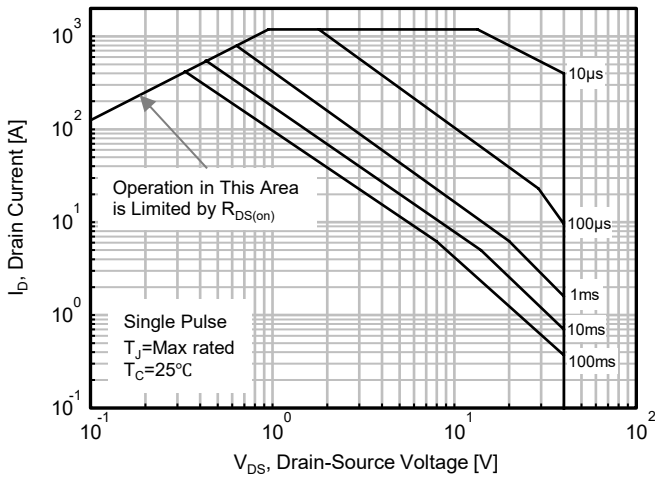
**ELECTRICAL CHARACTERISTICS DIAGRAMS (25 °C, unless otherwise noted)**



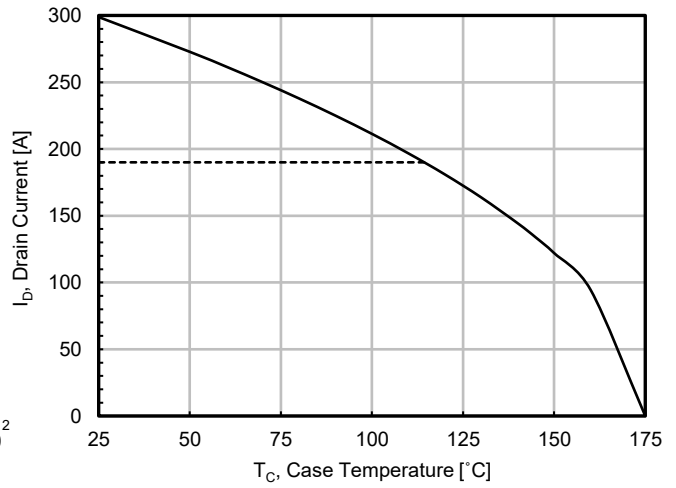
**Fig. 7. Typ. Gate Charge**



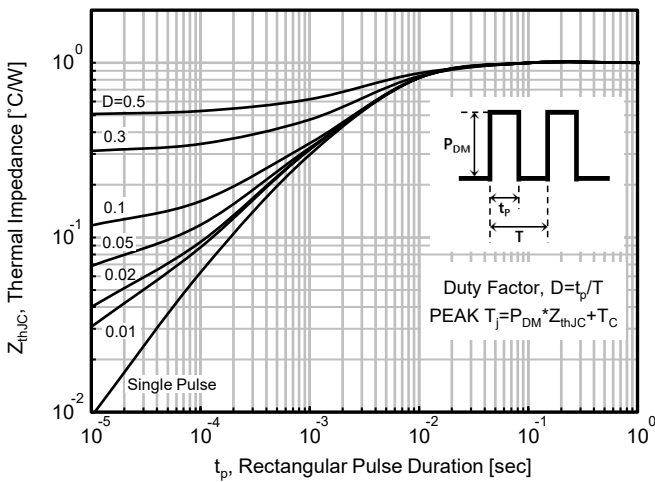
**Fig. 8. Typ. Capacitances**



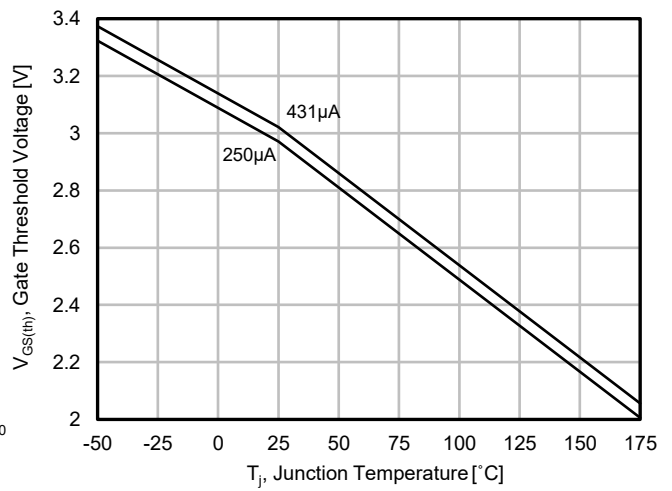
**Fig. 9. Safe Operating Area**



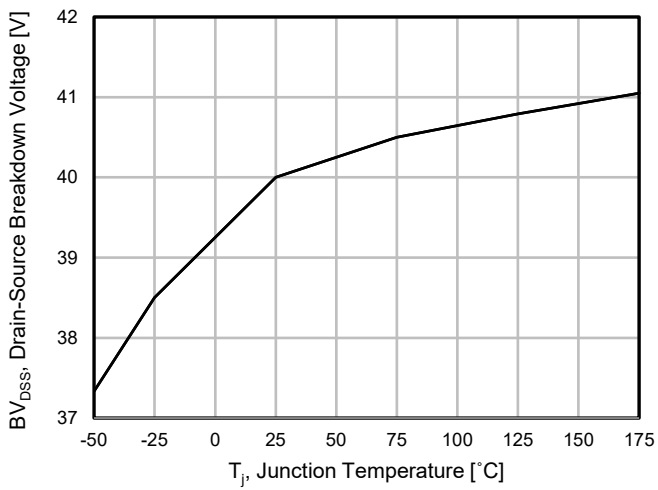
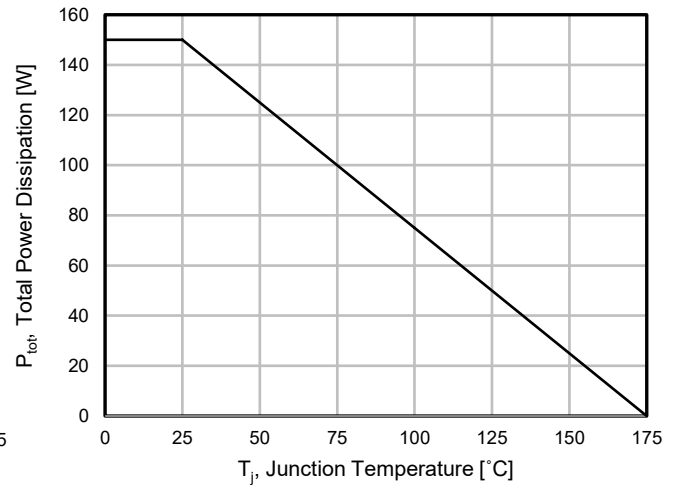
**Fig. 10. Drain Current vs. Temperature**



**Fig. 11. Transient Thermal Impedance**

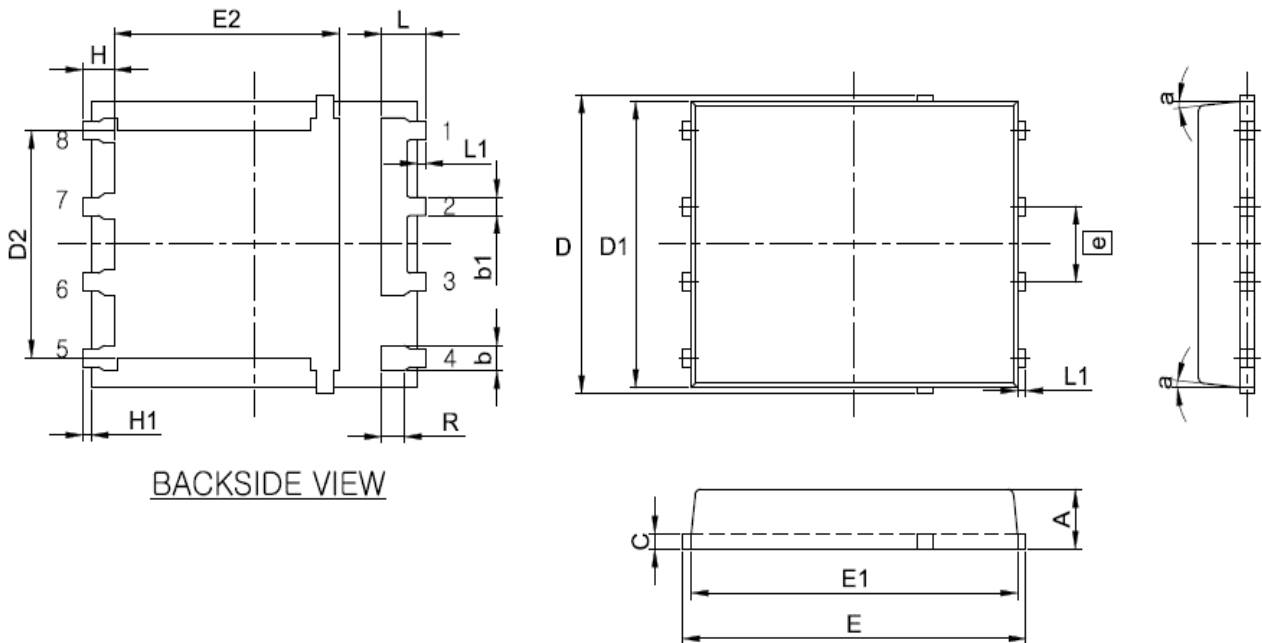


**Fig. 12. V\_GS(th) Variation with Temperature**

**ELECTRICAL CHARACTERISTICS DIAGRAMS (25 °C, unless otherwise noted)****Fig. 13.  $BV_{DSS}$  Variation with Temperature****Fig. 14. Power Dissipation**

# Package Outlines

PDFN56




Symbol	Dimension (mm)		
	Min	Nom	Max
A	0.90	-	1.10
b	0.33	-	0.49
b1	0.26	-	1.36
C	0.20	0.25	0.34
D	4.50	5.15	5.30
D1	4.50	5.00	5.10
D2	3.65	-	3.95
E	5.90	6.15	6.30
E1	5.85	6.00	6.10
E2	3.46	-	3.86
e	1.27 BSC		
H	0.50	-	0.71
H1	0.03	-	0.13
L	0.74	-	0.84
L1	0.03	-	0.13
R	0.48	-	0.58
a	0°	-	12°

## Notes

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

**DISCLAIMER :**

The Products are not designed for use in hostile environments, including, without limitation, aircraft, nuclear power generation, medical appliances, and devices or systems in which malfunction of any Product can reasonably be expected to result in a personal injury. Seller's customers using or selling Seller's products for use in such applications do so at their own risk and agree to fully defend and indemnify Seller.

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