

SiC Module PAIB12050AM

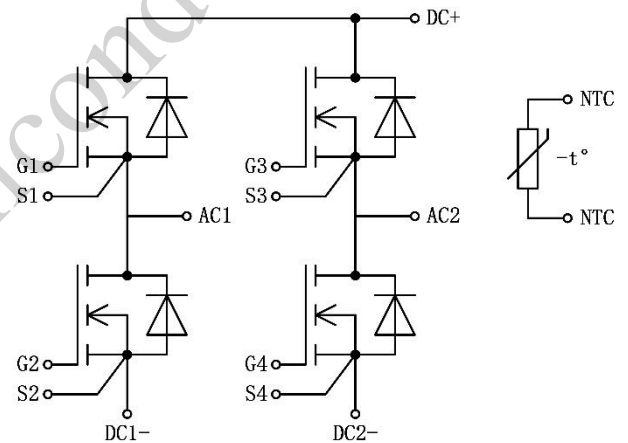
Features

- High blocking voltage
- Low on-state resistance
- Low stray inductance
- Low switching loss
- Low thermal resistance



Applications

- High-frequency switching application
- DC/DC converter
- Motor drives
- Solar inverter
- Electric vehicle
- UPS systems



Standards Benefits

- Improve system efficiency
- Improve power density
- Reduce cooling requirement
- Reduce system cost

Order Information

Part Number	Package	Marking
PAIB12050AM	EASY 1B	PAIB12050AM

Contents

Features	1
Applications.....	1
Standards Benefits.....	1
Order Information.....	1
Contents	2
1. Maximum Ratings.....	3
2. Electrical Characteristics.....	3
3. Reverse Diode Characteristics	6
4. NTC Thermistor Characteristics.....	7
5. Typical Performance	8
6. Package Outlines	12

PNJunction Semiconductor

1. Maximum Ratings

At $T_J = 25^\circ\text{C}$, unless specified otherwise

Parameter	Symbol	Value	Unit	Test Conditions
Drain - Source Voltage	V_{DSmax}	1200	V	$V_{GS}=0V$ $I_D = 100\mu A$
Gate - Source Voltage (Dynamic)	V_{GSmax}	-8 / +21	V	AC (f > 1Hz)
Gate - Source Voltage(static) turn-on gate voltage turn-off gate voltage	$V_{GS,on}$ $V_{GS,off}$	+15 / +18 -3	V	Static
Continuous Drain Current	I_D	80	A	$V_{GS} = 15V$ $T_C = 25^\circ\text{C}$ $T_J = 150^\circ\text{C}$
		50		$V_{GS} = 15V$ $T_C = 100^\circ\text{C}$ $T_J = 150^\circ\text{C}$
Operating Junction Temperature	T_J	-40 To +150	$^\circ\text{C}$	

2. Electrical Characteristics

At $T_J = 25^\circ\text{C}$, unless specified otherwise (Per Position)

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	1200	/	/	V	$V_{GS}=0V$ $I_D = 100\mu A$
Gate Threshold Voltage	$V_{GS(th)}$	1.6	2.5	/	V	$V_{DS} = V_{GS}$ $I_D = 20mA$ $T_J = 25^\circ\text{C}$
		/	1.8	/		$V_{DS} = V_{GS}$ $I_D = 20mA$ $T_J = 150^\circ\text{C}$

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Reverse Bias Drain Current	I_{DSS}	/	5	150	μA	$V_{GS}= 0V$ $V_{DS}= 1200V$
Gate-Source Leakage Current	I_{GSS}	/	20	250	nA	$V_{GS}= 15V$ $V_{DS}= 0V$
Drain-Source On-State Resistance	$R_{DS(on)}$	/	20	25	m Ω	$V_{GS}= 15V$ $I_D= 50A$ $T_J= 25^{\circ}C$
		/	25	/		$V_{GS}= 15V$ $I_D= 50A$ $T_J= 150^{\circ}C$
		/	16	20		$V_{GS}= 18V$ $I_D= 50A$ $T_J= 25^{\circ}C$
Transconductance	g_{fs}	/	27	/	S	$V_{DS}= 20V$ $I_{DS}= 50A$ $T_J= 25^{\circ}C$
		/	38	/		$V_{DS}= 20V$ $I_{DS}= 50A$ $T_J= 150^{\circ}C$
Turn-on Energy	E_{on}	/	492	/	μJ	$V_{DS}= 800V$ $I_{DS}= 50A$ $V_{GS}= -3V/15V$ $R_G= 1.0\Omega$ $L= 100\mu H$
Turn-off Energy	E_{off}	/	187	/		
Turn-On Delay Time	$T_{d(on)}$	/	44.5	/	ns	
Rise Time	T_r	/	8.6	/		
Turn-Off Delay Time	$T_{d(off)}$	/	45.1	/		
Fall Time	T_f	/	12.2	/		

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Internal Gate Resistance	$R_{G(int)}$	/	0.5	/	Ω	$f = 1\text{MHz}$ $V_{AC} = 25\text{mV}$
Input Capacitance	C_{iss}	/	7.5	/	nF	$V_{GS} = 0\text{V}$ $V_{DS} = 800\text{V}$ $f = 500\text{kHz}$ $V_{AC} = 25\text{mV}$
Output Capacitance	C_{oss}	/	0.3	/	nF	
Reverse Transfer Capacitance	C_{rss}	/	25	/	pF	
Thermal Resistance from Junction to Case	$R_{\theta JC}$	/	0.54	/	$^{\circ}\text{C/W}$	

3. Reverse Diode Characteristics

At $T_J = 25^\circ\text{C}$, unless specified otherwise (Per Position)

Parameter	Symbol	Value		Unit	Test Conditions
		Typ.	Max.		
Diode Forward Voltage	V_{SD}	6.2	/	V	$V_{GS} = -3\text{V}$ $I_{SD} = 50\text{A}$ $T_J = 25^\circ\text{C}$
		5.6	/	V	$V_{GS} = -3\text{V}$ $I_{SD} = 50\text{A}$ $T_J = 150^\circ\text{C}$
Reverse Recover Time	t_{rr}	28.2	/	ns	$V_{GS} = -3/18\text{V}$ $I_{SD} = 50\text{A}$
Reverse Recovery Charge	Q_{rr}	1379	/	μC	$V_{DS} = 800\text{V}$ $d_{if}/d_t =$ $4900\text{A}/\mu\text{s}$
Peak Reverse Recovery Current	I_{rrm}	77.4	/	A	$R_G = 1.0\Omega$ $T_J = 25^\circ\text{C}$
Reverse Recovery Energy	E_{RR}	780	/	μJ	$V_{DS} = 800\text{V}$ $I_{SD} = 50\text{A}$ $V_{GS} = -3\text{V}/18\text{V}$ $R_G = 1.0\Omega$ $L = 100\mu\text{H}$

4. NTC Thermistor Characteristics

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Rated Resistance	R_{NTC}	/	5	/	k Ω	$T_{NTC} = 25^{\circ}\text{C}$
Resistance Tolerance	$\Delta R/R$	-5	/	5	%	$T_{NTC} = 25^{\circ}\text{C}$
B-value	$B_{25/50}$	/	3380	/	K	$T_2 = 50^{\circ}\text{C}$
B-value	$B_{25/85}$	/	3435	/	K	$T_2 = 80^{\circ}\text{C}$
B-value	$B_{25/100}$	/	3485	/	K	$T_2 = 100^{\circ}\text{C}$
Power Dissipation	P_{NTC}	/	/	10	mW	$T_{NTC} = 25^{\circ}\text{C}$

5. Typical Performance

At $T_J = 25^\circ\text{C}$, unless specified otherwise (Per Position)

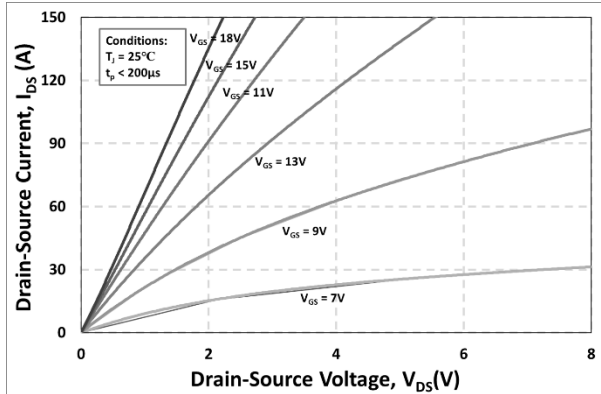


Figure 1. Output Characteristics $T_J = 25^\circ\text{C}$

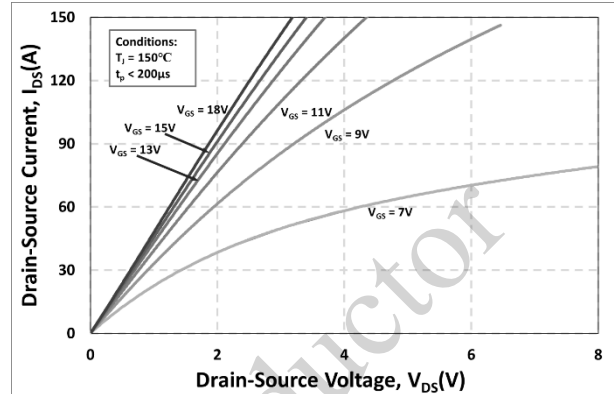


Figure 2. Output Characteristics $T_J = 150^\circ\text{C}$

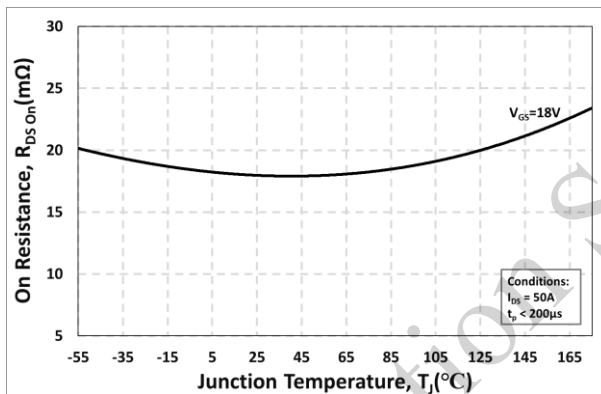


Figure 3. Normalized On-Resistance vs. Temperature

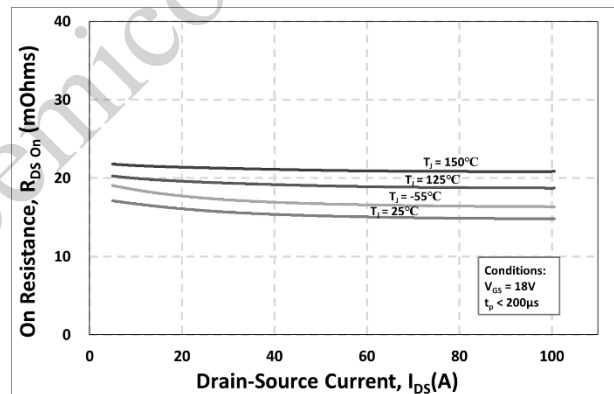


Figure 4. On-Resistance vs. Drain Current Various Temperatures

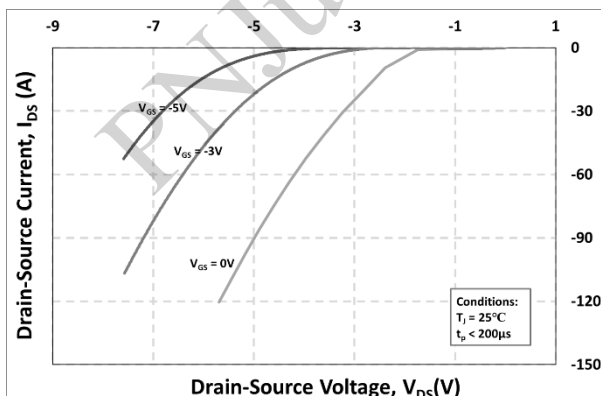


Figure 5. Body Diode Characteristic at 25°C

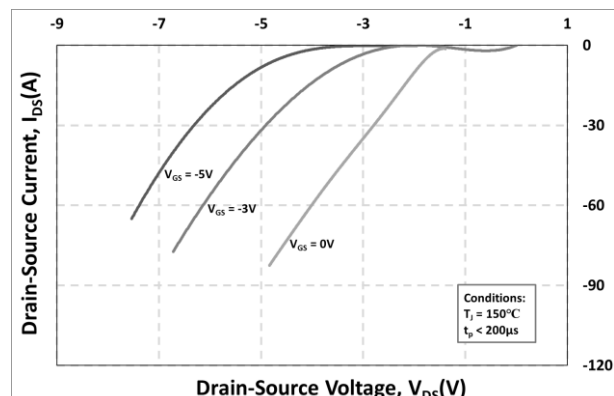


Figure 6. Body Diode Characteristic at 150°C

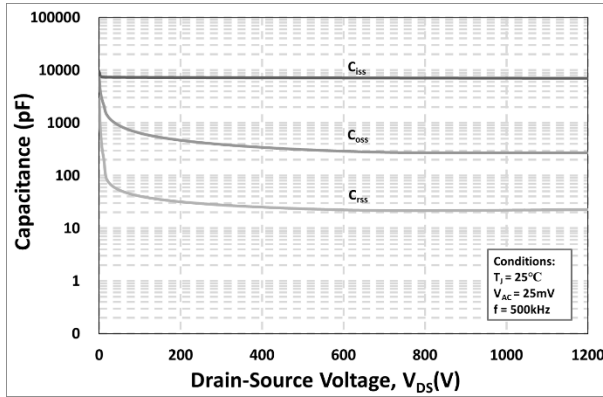


Figure 7. Capacitances vs. Drain-Source Voltage (0 - 1200V)

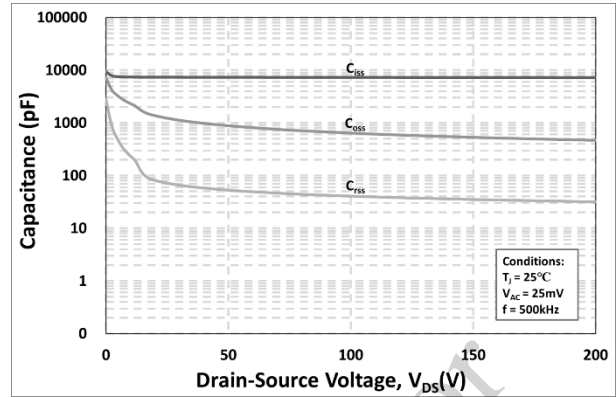


Figure 8. Capacitances vs. Drain-Source Voltage (0 - 200V)

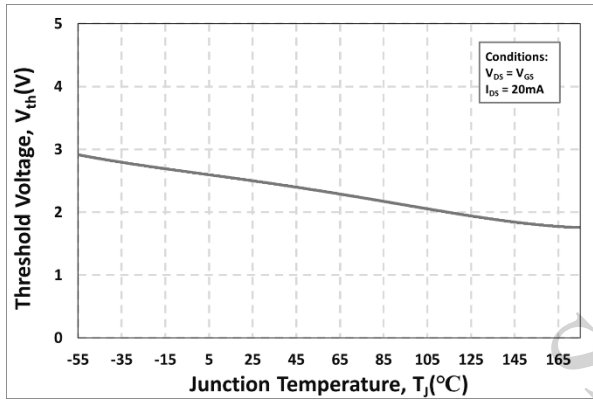


Figure 9. Threshold Voltage vs. Junction Temperature

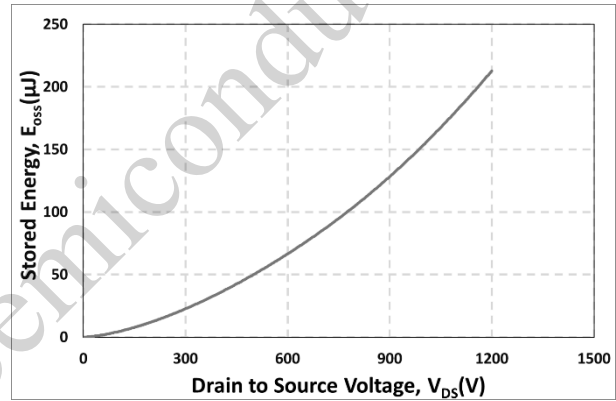


Figure 10. Output Capacitor Stored Energy

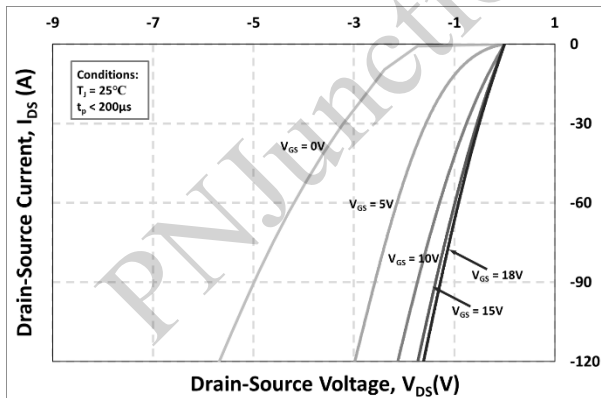


Figure 11. 3rd Quadrant Characteristic at 25°C

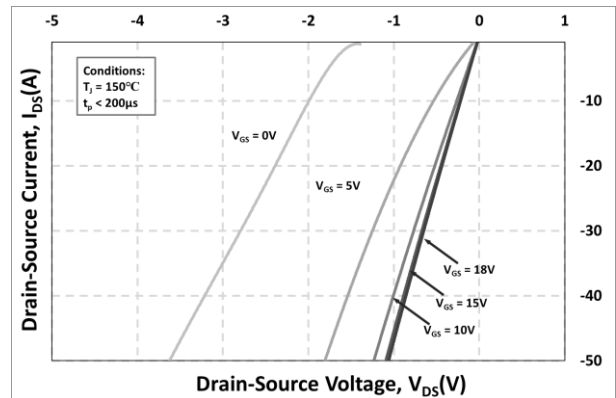


Figure 12. 3rd Quadrant Characteristic at 150°C

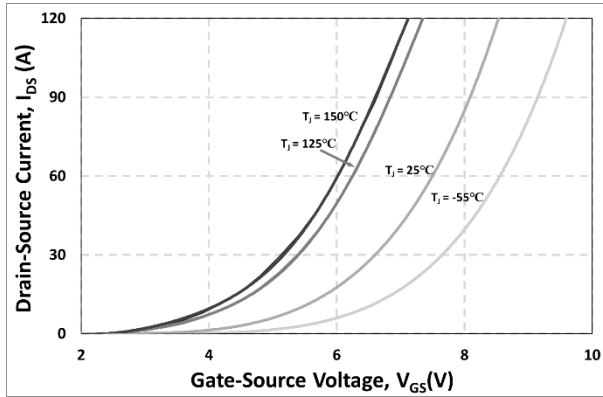


Figure 13. Transfer Characteristic for Various Junction Temperatures

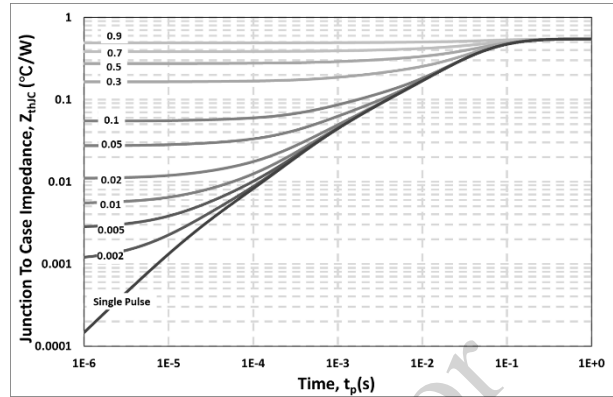


Figure 14. Transient Thermal Impedance (Junction - Case)

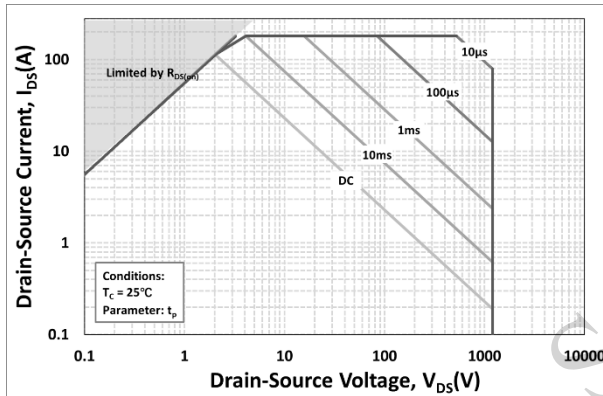


Figure 15. Forward Bias Safe Operating Area (FBSOA)

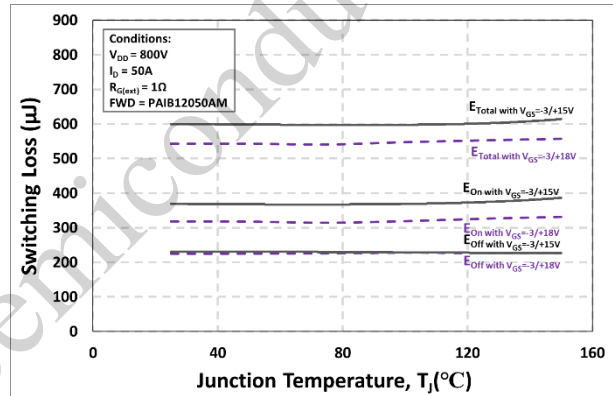


Figure 16. Clamped Inductive Switching Energy vs. Temperature

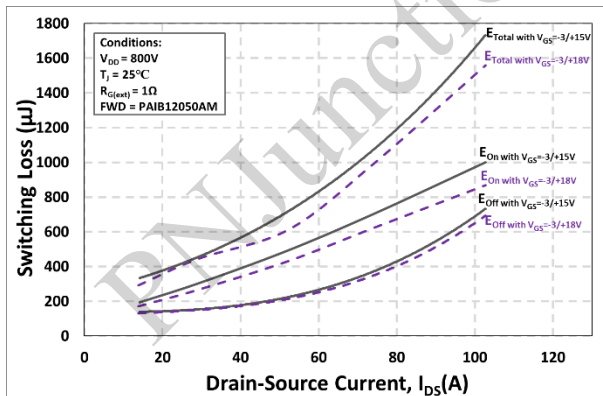


Figure 17. Switching Loss vs. Drain-Source Current ($V_{DS} = 800\text{ V}$)

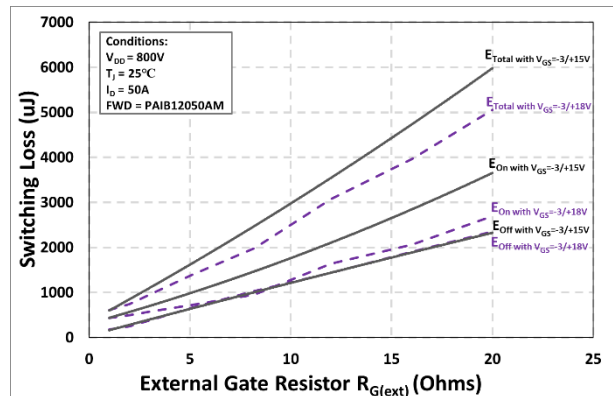


Figure 18. Switching Loss vs. External Gate Resistance

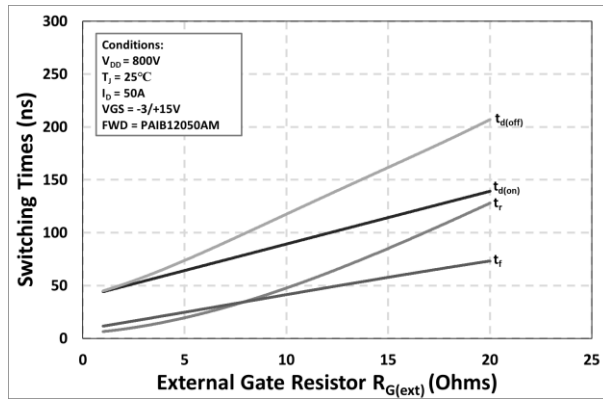
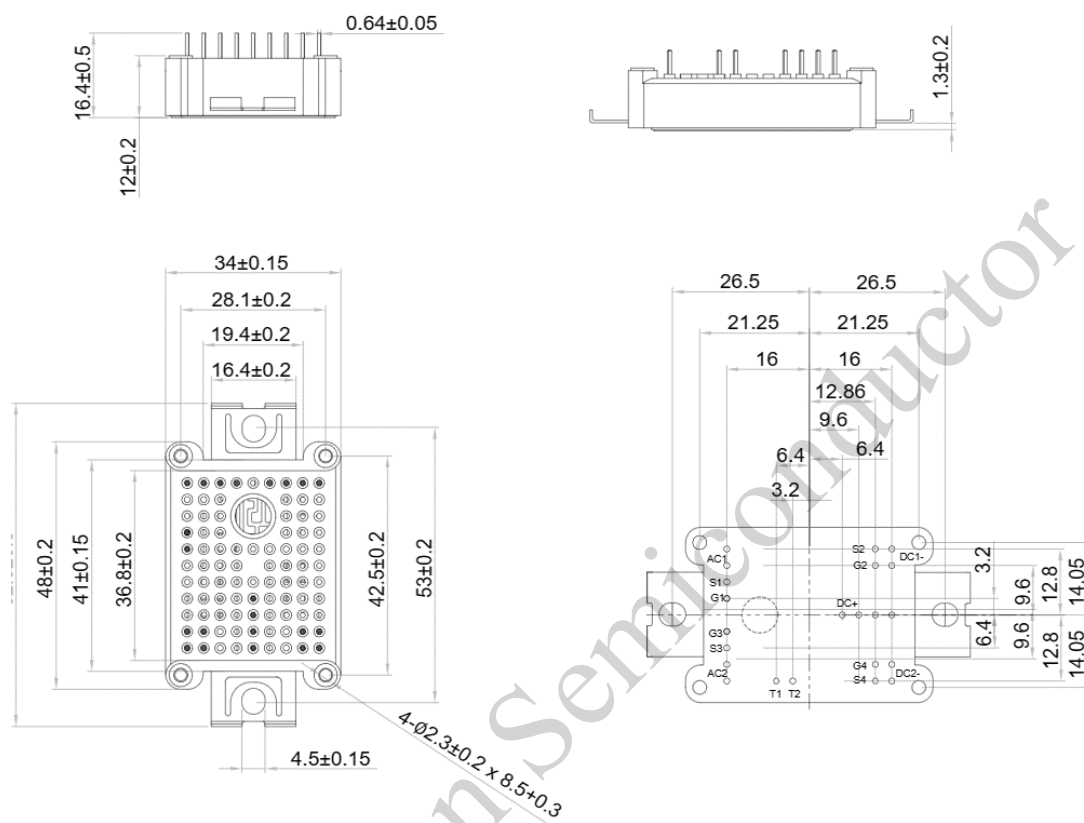


Figure 19. Switching Times vs. External Gate Resistance

PNJunction Semiconductor

6. Package Outlines



Drawing and Dimensions

Important Notice

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, PN Junction hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

PN Junction reserves the right to make changes at any time to any products or information herein, without notice. "Typical" parameters which may be provided in PN Junction data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typical" must be validated for each customer application by customer's technical experts.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of PN Junction in customer's applications. The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest PN Junction office (www.pnjsemi.com).

Warnings

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest PN Junction office.

Except as otherwise explicitly approved by PN Junction in a written document signed by authorized representatives of PN Junction, PN Junction's products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.