

650V 10mΩ SiC MOSFET

Features:

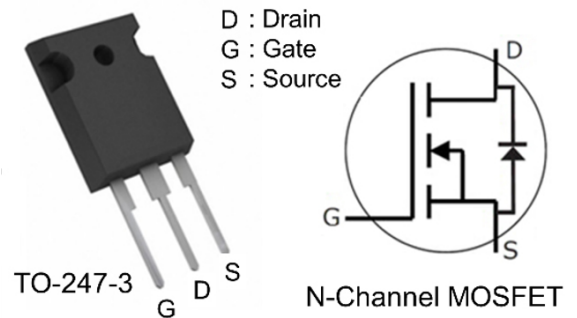
- High blocking voltage with low $R_{DS(on)}$
- High frequency operation with low capacitance
- Simple to drive with -4V/+18V gate
- Build-in 5Ω internal gate resistor
- Robust body diode with low Q_{rr}
- 100% avalanche tested

Benefits:

- Superior robustness and system reliability
- Higher system efficiency
- Easier paralleling without thermal runaway
- Capable of high temperature application
- Faster and more efficient switching

Applications:

- Solar inverters
- SMPS
- Energy storage systems
- High performance DC-DC converters
- UPS
- Motor drivers



Key Performance and Package Parameters

Type	V _{DS}	R _{DS(ON)}	I _D @25°C	I _D @100°C	Marking	Package
PC010S065ANC	650V	10mΩ	192A	136A	PC010S065ANC	TO247-3

Absolute Maximum Ratings(T_C=25°C unless otherwise specified)

Parameter	Symbols	Conditions	Value	Unit
Drain - source voltage	V _{DS(max)}	V _{GS} =0V, I _D =100μA	650	V
Gate - source voltage	V _{GS(max)}	AC (f>1Hz, duty cycle<1%, pulse width<200ns)	-9 / +23	V
Gate – source voltage	V _{GS(op)}	Recommend operation	-4 / +18	V
Continuous drain current (limited by T _{J,max})	I _D	V _{GS} =18V, T _C =25°C V _{GS} =18V, T _C =100°C	192 136	A
Pulsed drain current	I _{D(pulse)}	T _C =25°C	501	A
Total power dissipation	P _D	T _C =25°C	625	W
Operating junction temperature	T _J		-55 to 175	°C
Storage temperature	T _{STG}		-55 to 175	°C
Soldering temperature	T _L		260	°C
Avalanche capability, single pulse*	I _{AV}	V _{DD} =100V, V _{GS} =10V, L=1mH	77	A
Avalanche capability, single pulse**	E _{AV}	V _{DD} =100V, V _{GS} =10V, L=1mH	2964	mJ

*100% tested in 60% rating

**100% tested in 36% rating

Electrical Characteristics at Tc= 25°C (unless otherwise specified)

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=100\mu A$	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=30mA$	2.6	3.1	4.2	V
		$V_{DS}=V_{GS}, I_D=30mA, T_J=150^\circ C$	-	2.4	-	
		$V_{DS}=V_{GS}, I_D=30mA, T_J=175^\circ C$	-	2.3	-	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$	0	0.5	60	μA
		$V_{DS}=650V, V_{GS}=0V, T_J=175^\circ C$	0	5	200	
Gate-source leakage current	I_{GSS}	$V_{GS}=18V, V_{DS}=0V$	0	5	100	nA
Gate-source leakage current	I_{GSS}	$V_{GS}=-4V, V_{DS}=0V$	-100	-5	0	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=18V, I_D=90A$	-	10	14	mΩ
		$V_{GS}=18V, I_D=90A, T_J=175^\circ C$	-	12	-	
Transconductance	gfs	$V_{DS}=20V, I_D=90A$	-	78	-	S
		$V_{DS}=20V, I_D=90A, T_J=175^\circ C$	-	69	-	
Input capacitance	C_{iss}	$V_{DS}=400V, V_{GS}=0V$ $f=100kHz, V_{AC}=25mV$	-	5345	-	pF
Output capacitance	C_{oss}		-	434	-	pF
Reverse transfer capacitance	C_{rss}		-	38	-	pF
Coss stored energy	E_{oss}		-	44	-	μJ
Turn-on switching energy	E_{on}	$V_{DS}=400V, V_{GS}=-4V/18V$ $I_D=90A, R_{G(ext)}=2\Omega, R_{G(int)}=5\Omega,$ $L=200\mu H$	-	1995	-	μJ
Turn-off switching energy	E_{off}		-	610	-	μJ
Turn-on delay time	$t_{d(on)}$	$V_{DS}=400V, V_{GS}=-4V/18V$ $I_D=90A, R_{G(ext)}=2\Omega, R_{G(int)}=5\Omega,$ $L=200\mu H$	-	449	-	ns
Rise time	t_r		-	100	-	ns
Turn-off delaytime	$t_{d(off)}$		-	237	-	ns
Fall time	t_f		-	48	-	ns
Total gate charge	Q_g	$V_{DS}=400V, V_{GS}=-4V/18V$ $I_D=90A$	-	255	-	nC
Gate-source charge	Q_{gs}		-	75	-	nC
Gate-drain charge	Q_{gd}		-	80	-	nC
Internal gate input resistance	$R_{g(int)}$	$f=1MHz, I_D=0A$	-	5	-	Ω

***Turn-off with -4V gate bias is highly recommended

Reverse Diode Characteristics at Tc= 25°C (unless otherwise specified)

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Diode Forward Voltage	V_{SD}	$V_{GS}=-4V, I_{SD}=50A, T_J=25^\circ C$	-	4.2	-	V
Diode Forward Voltage	V_{SD}	$V_{GS}=-4V, I_{SD}=50A, T_J=175^\circ C$	-	3.7	-	V
Continuous diode forward current	I_S	$V_{GS}=-4V, T_J=25^\circ C$	-	124	-	A
Reverse recovery time	t_{rr}	$V_{GS}=-4V, I_{SD}=90A,$ $V_R=400V, L=200\mu H$ $L=200\mu H, di/dt=1939A/us$	-	36	-	ns
Reverse recovery charge	Q_{rr}		-	589	-	nC
Peak reverse recovery current	I_{rrm}		-	32	-	A

Thermal Characteristics

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Thermal resistance	$R_{th(j-c)}$	Junction to case	-	0.18	0.24	°C/W

Typical Characteristics

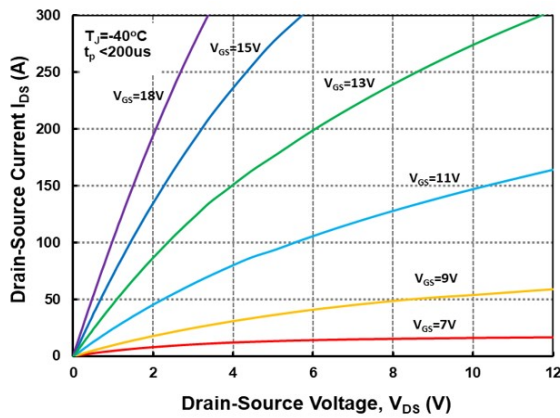


Figure 1: Output Characteristics, $T_J = -40^\circ\text{C}$

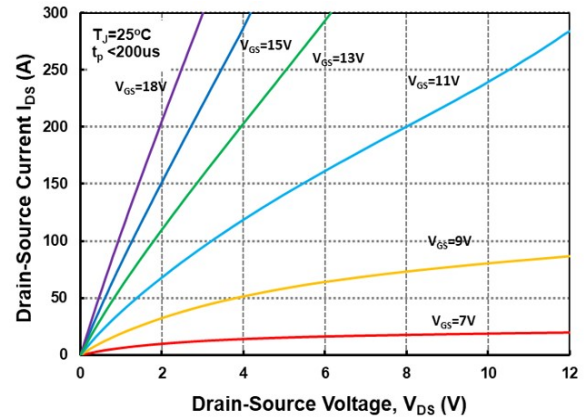


Figure 2: Output Characteristics, $T_J = 25^\circ\text{C}$

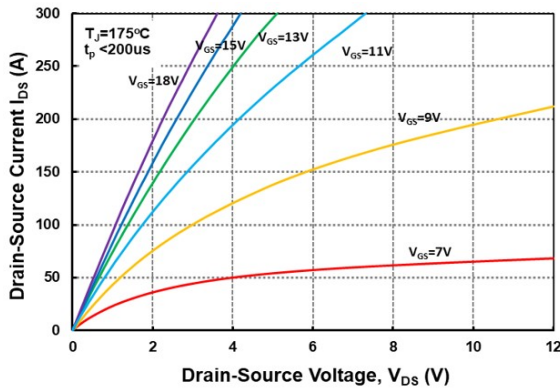


Figure 3: Output Characteristics, $T_J = 175^\circ\text{C}$

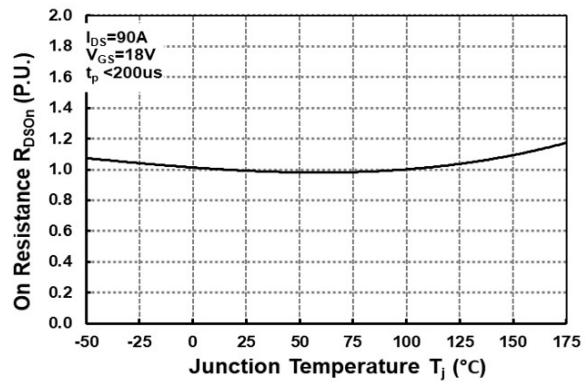


Figure 4: Normalized On-Resistance vs. Temperature

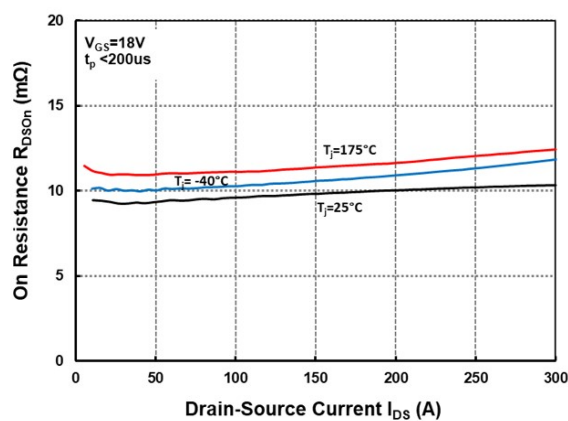


Figure 5: On-Resistance vs. Drain Current for Various Temperatures

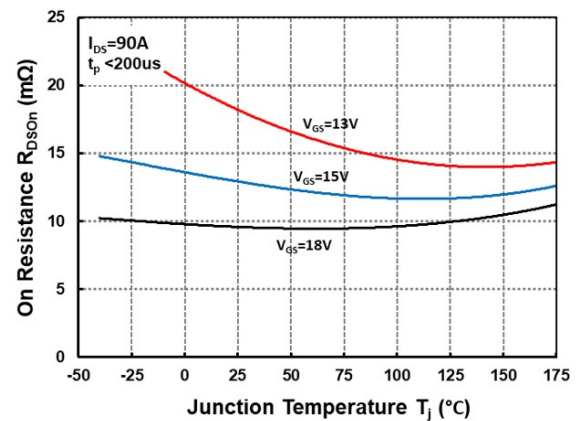


Figure 6: On-Resistance vs. Temperature for Various Gate Voltage

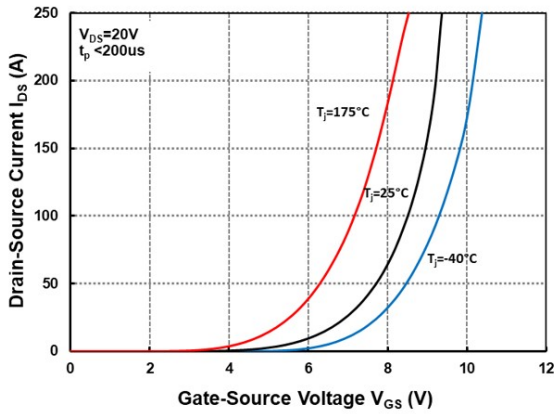


Figure 7. Transfer Characteristic for Various Junction Temperatures

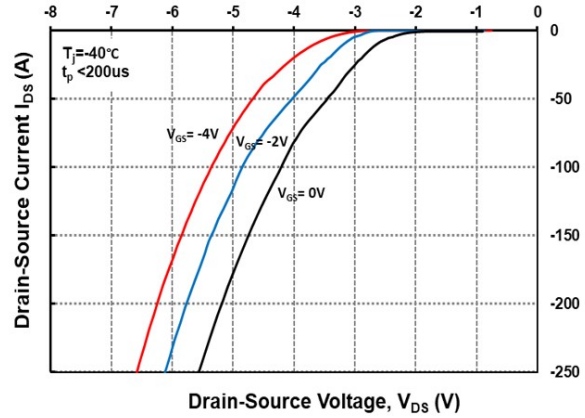


Figure 8. Body Diode Characteristics @ -40°C

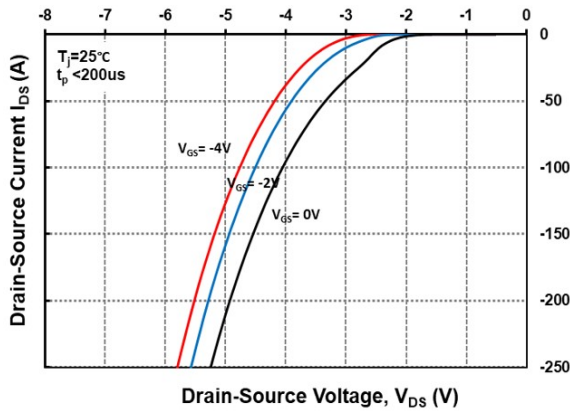


Figure 9. Body Diode Characteristics @ 25°C

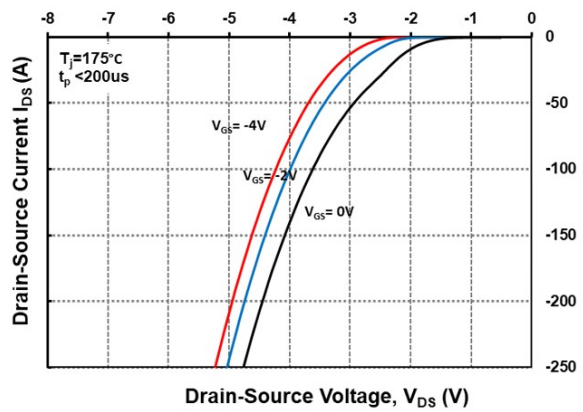


Figure 10. Body Diode Characteristics @ 175°C

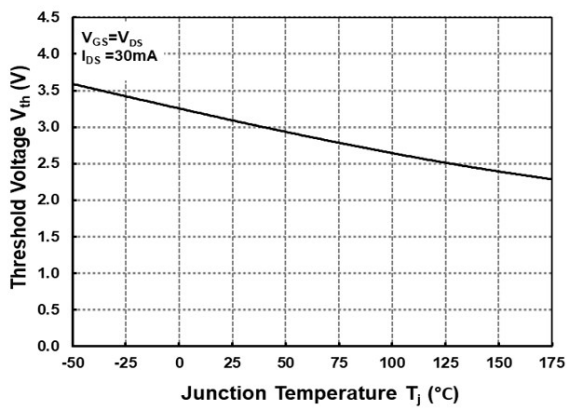


Figure 11. Threshold Voltage vs. Temperature

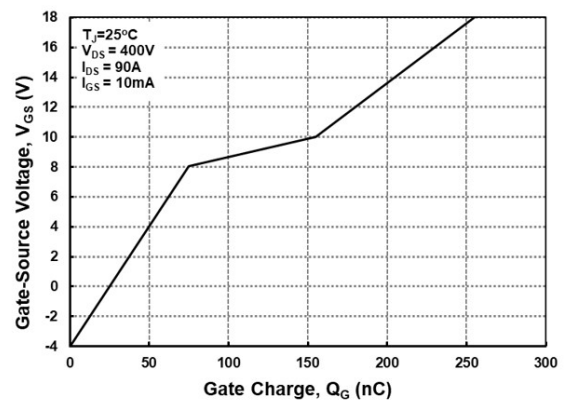


Figure 12. Gate Charge Characteristics

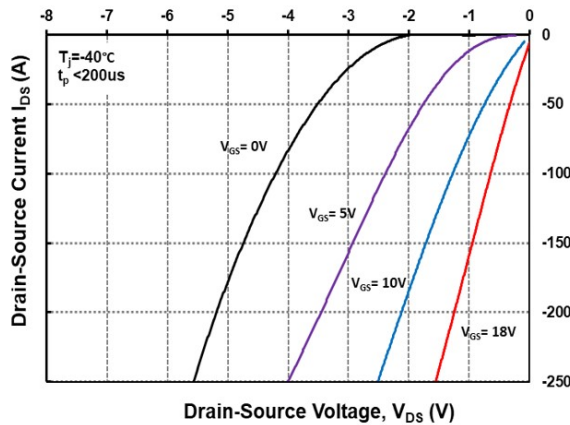


Figure 13. 3rd Quadrant Characteristics @ -40°C

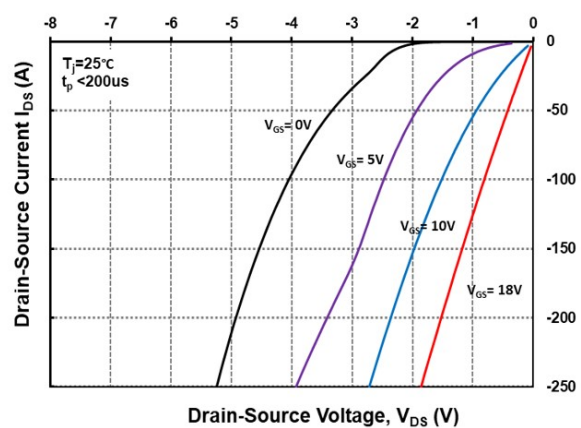


Figure 14. 3rd Quadrant Characteristics @ 25°C

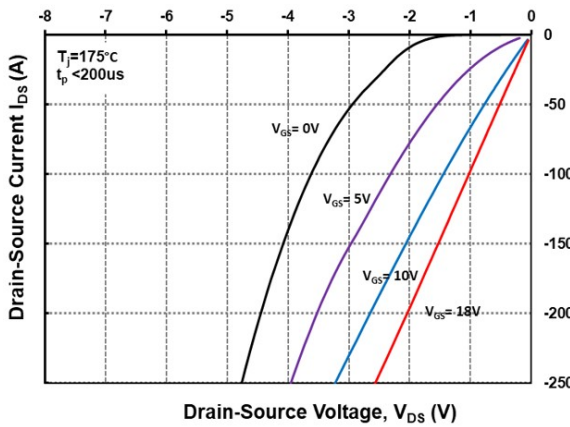


Figure 15. 3rd Quadrant Characteristics @ 175°C

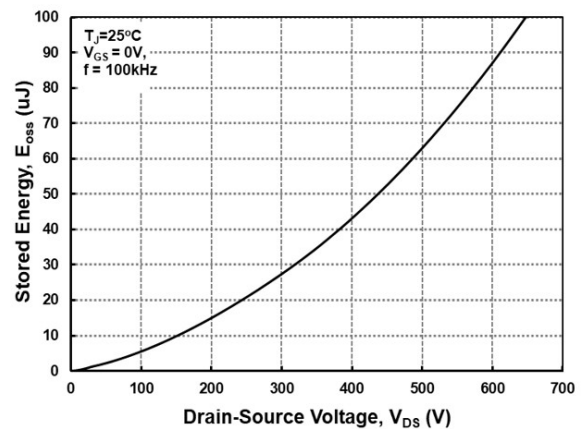


Figure 16. Output Capacitor Stored Energy

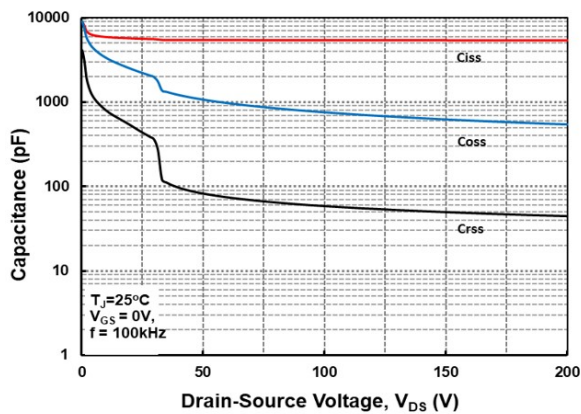


Figure 17. Capacitances vs. Drain-Source Voltage (0-200V)

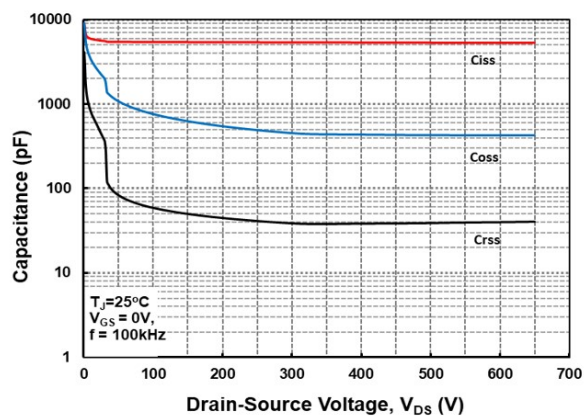


Figure 18. Capacitances vs. Drain-Source Voltage (0-650V)

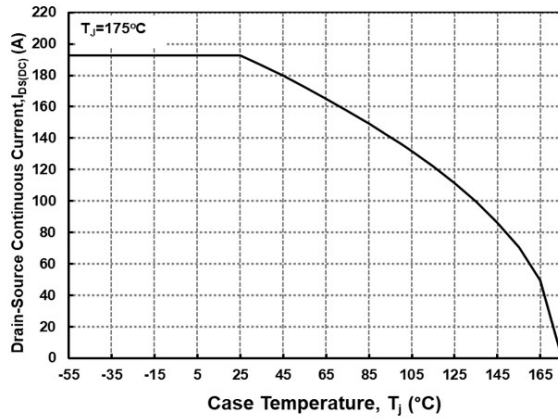


Figure 19. Continuous Drain Current Derating vs. Case Temperature

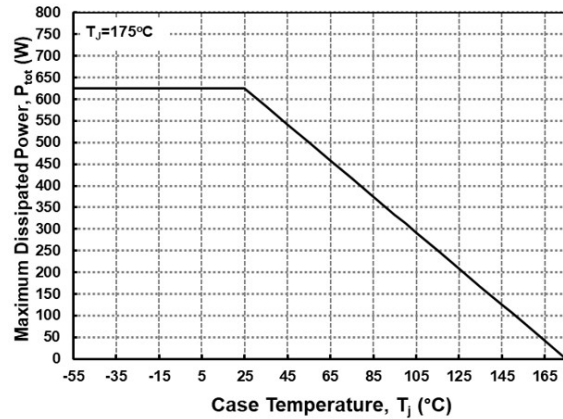


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

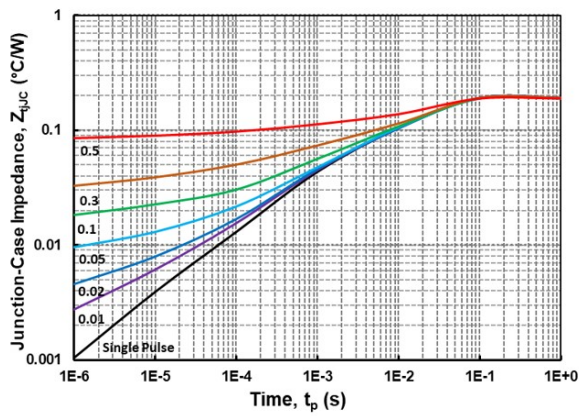


Figure 21. Transient Thermal Impedance (Junction - Case)

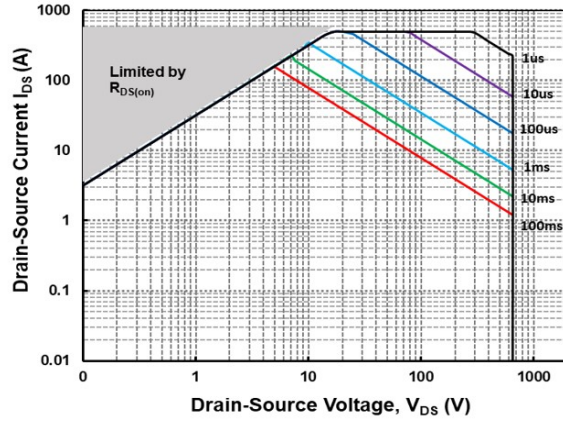


Figure 22. Safe Operating Area

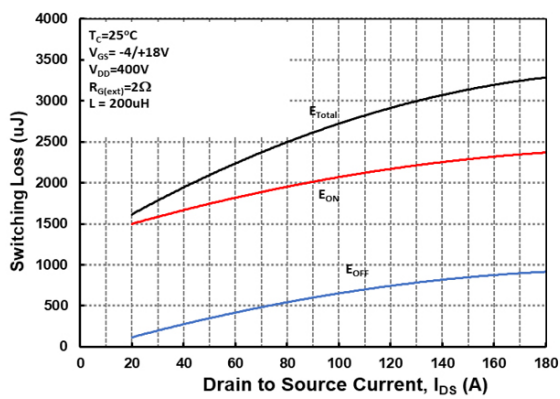


Figure 23. Clamped Inductive Switching Energy vs Drain Current (V_{DD} = 400V)

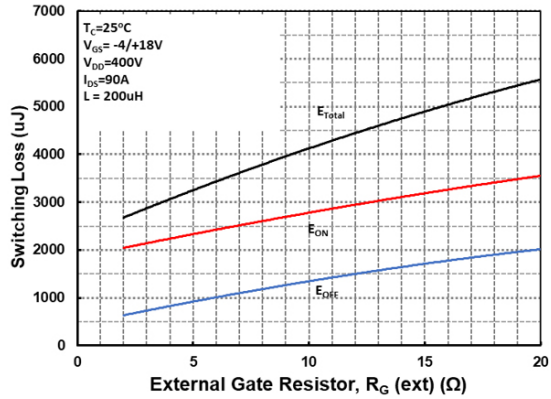


Figure 24. Clamped Inductive Switching Energy vs External Gate Resistor R_{G(ext)}

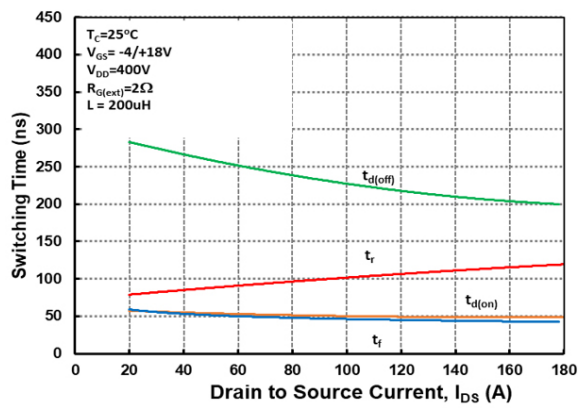


Figure 25. Switching Times vs Drain Current (V_{DD}=400V)

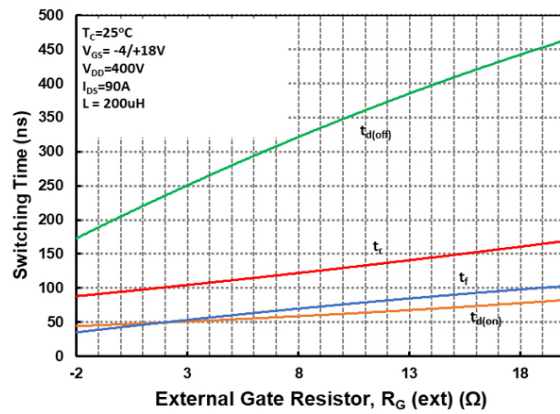
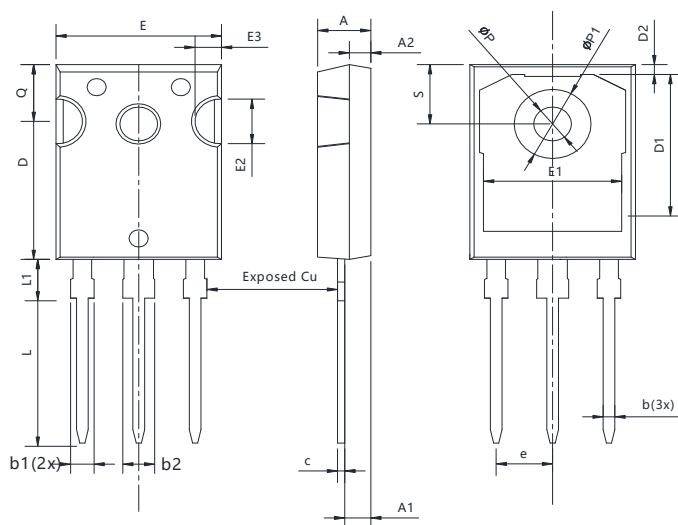


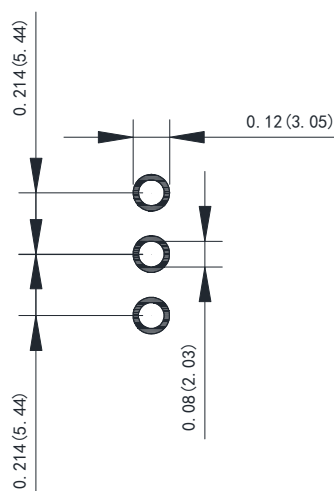
Figure 26. Switching Times vs External Gate Resistor R_G(ext)

Package Dimensions

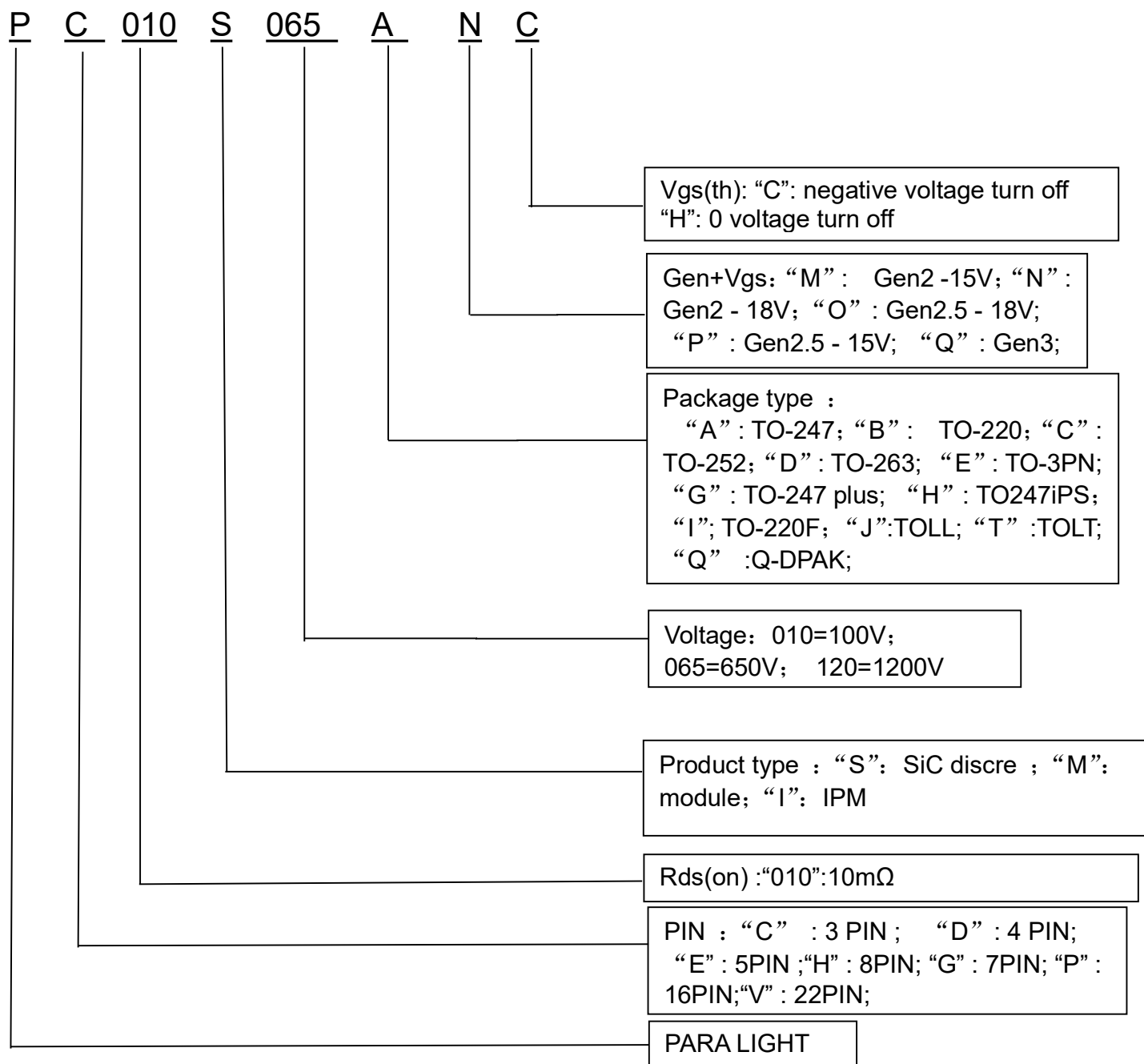


Common dimensions(mm)							
Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
A	4.82	5.02	5.22	E1	13.01	13.26	13.51
A1	2.21	2.41	2.61	E2	4.71	4.91	5.11
A2	1.8	2.0	2.2	E3	2.26	2.46	2.66
b	0.95	1.2	1.45	e	5.44BSC		
b1	1.95	2.2	2.45	L	19.82	20.07	20.32
b2	2.95	3.2	3.45	L1	3.94	4.19	4.44
c	0.35	0.6	0.85	P	3.41	3.61	3.81
D	20.75	20.95	21.15	P1	6.94	7.19	7.44
D1	16.3	16.55	16.8	Q	5.59	5.79	5.99
D2	0.99	1.19	1.39	S	5.97	6.17	6.37
E	15.74	15.94	16.14				

Recommended Solder Pad Layout



PART NO. SYSTEM :



Revision history

Document revision history

Date	Version	Changes
2026.04.27	A / 0	First release.