Cool MOS™ Power Transistor

COOLMOS Power Semiconductors

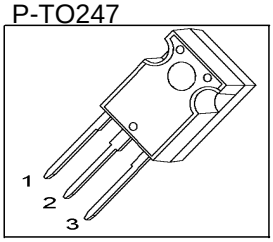
Feature

- New revolutionary high voltage technology
- Worldwide best $R_{DS(on)}$ in TO 220
- Ultra low gate charge
- Periodic avalanche rated
- Extreme d*v*/d*t* rated
- Ultra low effective capacitances
- Improved noise immunity

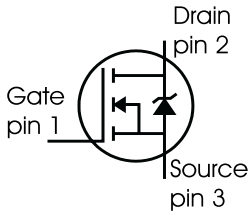
Product Summary

V_{DS} @ T_{jmax}	650	V
$R_{DS(on)}$	0.07	Ω
I_D	47	A

P-TO247



Type	Package	Ordering Code	Marking
SPW47N60C3	P-TO247	-	47N60C3



Maximum Ratings, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current	I_D		A
T_C = 25 °C		47	
T_C = 100 °C		30	
Pulsed drain current, t_p limited by T_{jmax}	$I_{D\ puls}$	141	
Avalanche energy, single pulse	E_{AS}	1800	mJ
I_D=10A, V_{DD}=50V			
Avalanche energy, repetitive t_{AR} limited by T_{jmax} [1)]	E_{AR}	1	
I_D=20A, V_{DD}=50V			
Avalanche current, repetitive t_{AR} limited by T_{jmax}	I_{AR}	20	A
Reverse diode d*v*/d*t*	d*v*/d*t*	6	V/ns
I_S=47A, V_{DS} < V_{DD}, d*i*/d*t*=100A/µs, T_{jmax}=150°C			
Gate source voltage static	V_{GS}	±20	V
Gate source voltage dynamic	V_{GS}	±30	
Power dissipation, T_C = 25°C	P_{tot}	415	W
Operating and storage temperature	T_j , T_{stg}	-55... +150	°C

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - case	R_{thJC}	-	-	0.3	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	62	
Linear derating factor		-	-	3.33	W/K
Soldering temperature, 1.6 mm (0.063 in.) from case for 10s	T_{sold}	-	-	260	°C

Electrical Characteristics, at T_j = 25 °C, unless otherwise specified

Static Characteristics					
Drain-source breakdown voltage V_{GS}=0V, I_D=0.25mA	$V_{(BR)DSS}$	600	-	-	V
Drain-source avalanche breakdown voltage V_{GS}=0V, I_D=20A	$V_{(BR)DS}$	-	700	-	
Gate threshold voltage, V_{GS} = V_{DS} I_D=2.7mA	$V_{GS(th)}$	2.1	3	3.9	
Zero gate voltage drain current	I_{DSS}				µA
V_{DS} = 600 V, V_{GS} = 0 V, T_j = 25 °C		-	0.5	25	
V_{DS} = 600 V, V_{GS} = 0 V, T_j = 150 °C		-	-	250	
Gate-source leakage current V_{GS}=20V, V_{DS}=0V	I_{GSS}	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$				Ω
V_{GS}=10V, I_D=47A, T_j=25°C		-	0.06	0.07	
V_{GS}=10V, I_D=30A, T_j=150°C		-	0.17	0.2	
Gate input resistance f = 1 MHz, open drain	R_G	-	0.62	-	

[1]Repetitve avalanche causes additional power losses that can be calculated as $P_{AV}=E_{AR}*f$.

Electrical Characteristics , at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Characteristics						
Transconductance	g_{fs}	$V_{DS}\geq 2*I_D*R_{DS(on)max}$, I_D=30A	-	tbd	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	8800	-	pF
Output capacitance	C_{oss}		-	3150	-	
Reverse transfer capacitance	C_{rss}		-	36	-	
Effective output capacitance, [1] energy related	$C_{o(er)}$	V_{GS}=0V, V_{DS}=0V to 480V	-	233	-	pF
Effective output capacitance, [2] time related	$C_{o(tr)}$		-	470	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=380V, V_{GS}=0/13V, I_D=47A, R_G=1.8Ω, T_j=125	-	tbd	-	ns
Rise time	t_r		-	tbd	-	
Turn-off delay time	$t_{d(off)}$		-	tbd	tbd	
Fall time	t_f		-	tbd	tbd	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=350V, I_D=47A	-	tbd	-	nC
Gate to drain charge	Q_{gd}		-	tbd	-	
Gate charge total	Q_g	V_{DD}=350V, I_D=47A, V_{GS}=0 to 10V	-	tbd	tbd	
Gate plateau voltage	$V_{(plateau)}$	V_{DD}=350V, I_D=47A	-	5.5	-	V

[1] $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

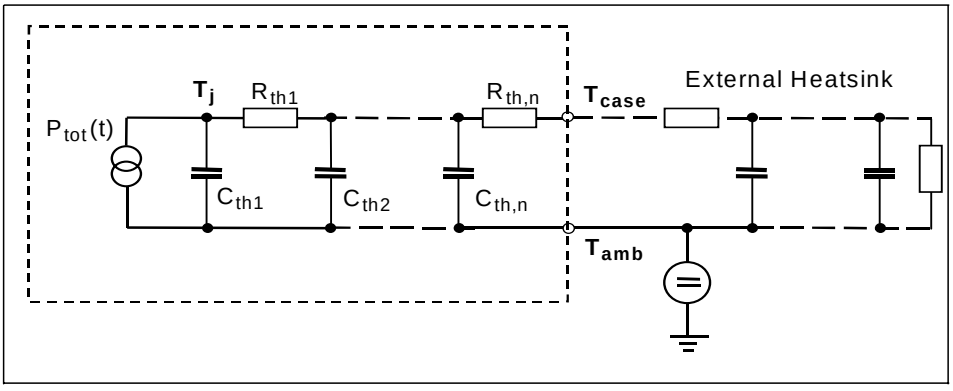
[2] $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

Electrical Characteristics, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Characteristics						
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	47	A
Inverse diode direct current, pulsed	I_{SM}		-	-	141	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=I_S	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=350V, I_F=I_S, di_F/dt=100A/µs	-	tbd	-	ns
Reverse recovery charge	Q_{rr}		-	tbd	-	µC
Peak reverse recovery current	I_{rrm}		-	tbd	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt		-	tbd	-	A/µs

Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
	typ.			typ.	
Thermal resistance			Thermal capacitance		
R_{th1}	0.002693	K/W	C_{th1}	0.001219	Ws/K
R_{th2}	0.006035		C_{th2}	0.004012	
R_{th3}	0.011		C_{th3}	0.006485	
R_{th4}	0.025		C_{th4}	0.013	
R_{th5}	0.047		C_{th5}	0.051	
R_{th6}	0.025		C_{th6}	0.613	



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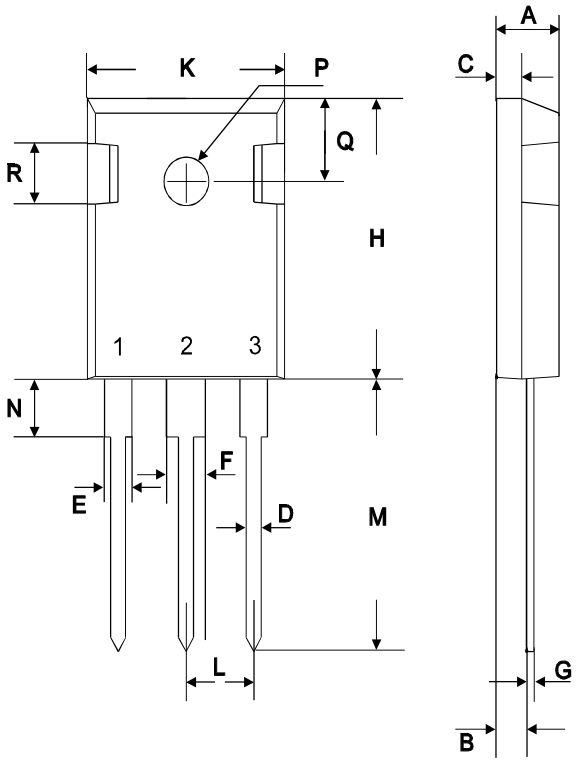

symbol	dimensions			
	[mm]		[inch]	
	min	max	min	max
A	4.78	5.28	0.1882	0.2079
B	2.29	2.51	0.0902	0.0988
C	1.78	2.29	0.0701	0.0902
D	1.09	1.32	0.0429	0.0520
E	1.73	2.06	0.0681	0.0811
F	2.67	3.18	0.1051	0.1252
G	0.76 max		0.0299 max	
H	20.80	21.16	0.8189	0.8331
K	15.65	16.15	0.6161	0.6358
L	5.21	5.72	0.2051	0.2252
M	19.81	20.68	0.7799	0.8142
N	3.560	4.930	0.1402	0.1941
∅P	3.61		0.1421	
Q	6.12	6.22	0.2409	0.2449

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