

TSM230N06CP

60V N-Channel Power MOSFET



Pin Definition:

1. Gate
2. Drain
3. Source

Key Parameter Performance

Parameter	Value	Unit
V_{DS}	60	V
$R_{DS(on)}$ (max)	$V_{GS} = 10V$	23
	$V_{GS} = 4.5V$	28
Q_g	28	nC

Features

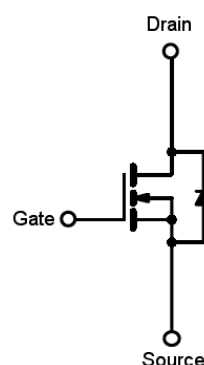
- 100% avalanche tested
- Fast Switching

Ordering Information

Ordering code	Package	Packing
TSM230N06CP ROG	TO-252	2.5kpcs / 13" Reel

Note: Halogen-free according to IEC 61249-2-21 definition

Block Diagram



N-Channel MOSFET

Absolute Maximum Ratings ($T_c = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^(Note 1)	I_D	$T_c = 25^\circ C$	50*
		$T_c = 100^\circ C$	32*
Pulsed Drain Current ^(Note 2)	I_{DM}	200	A
Single Pulse Avalanche Energy ^(Note 3)	E_{AS}	42	mJ
Power Dissipation @ $T_c = 25^\circ C$	P_D	53	W
Operating Junction Temperature	T_J	150	$^\circ C$
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ C$

Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	$R_{\theta JC}$	2	$^\circ C/W$
Thermal Resistance - Junction to Ambient	$R_{\theta JA}$	62	

Electrical Specifications ($T_C = 25^\circ\text{C}$ unless otherwise noted)

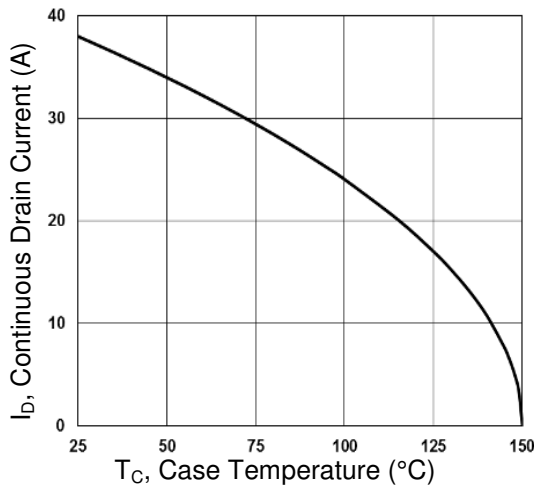
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	BV_{DSS}	60	--	--	V
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 20A$	$R_{DS(ON)}$	--	20	23	m Ω
	$V_{GS} = 4.5V, I_D = 12A$		--	23	28	
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	1.2	1.8	2.5	V
Zero Gate Voltage Drain Current	$V_{DS} = 60V, V_{GS} = 0V$	I_{DSS}	--	--	1	μA
	$V_{DS} = 48V, T_J = 125^\circ\text{C}$		--	--	10	
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Forward Transconductance ^(Note 4)	$V_{DS} = 10V, I_D = 10A$	g_{fs}	--	9	--	S
Dynamic						
Total Gate Charge ^(Note 4,5)	$V_{DS} = 30V, I_D = 15A,$ $V_{GS} = 10V$	Q_g	--	28	--	nC
Gate-Source Charge ^(Note 4,5)		Q_{gs}	--	3.5	--	
Gate-Drain Charge ^(Note 4,5)		Q_{gd}	--	6.5	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$	C_{iss}	--	1680	--	pF
Output Capacitance		C_{oss}	--	115	--	
Reverse Transfer Capacitance		C_{rss}	--	85	--	
Switching						
Turn-On Delay Time ^(Note 4,5)	$V_{DD} = 30V, I_D = 1A,$ $V_{GS} = 10V, R_G = 6\Omega$	$t_{d(on)}$	--	7.2	--	ns
Turn-On Rise Time ^(Note 4,5)		t_r	--	38	--	
Turn-Off Delay Time ^(Note 4,5)		$t_{d(off)}$	--	34	--	
Turn-Off Fall Time ^(Note 4,5)		t_f	--	8.2	--	
Source-Drain Diode Ratings and Characteristic						
Maximum Continuous Drain-Source Diode Forward Current	Integral reverse diode in the MOSFET	I_S	--	--	50	A
Maximum Pulse Drain-Source Diode Forward Current		I_{SM}	--	--	200	A
Diode-Source Forward Voltage	$V_{GS} = 0V, I_S = 1A$	V_{SD}	--	--	1	V
Reverse Recovery Time ^(Note 4)	$V_{GS} = 0V, I_S = 1A$ $dI_F/dt = 100A/\mu s$	t_{rr}	--	19.6	--	ns
Reverse Recovery Charge ^(Note4)		Q_{rr}	--	14.2	--	nC

Note:

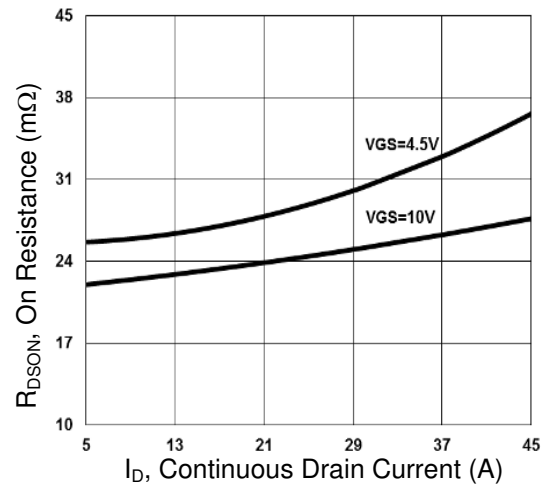
- Limited by maximum junction temperature
- Pulse width limited by safe operating area
- $L = 0.1\text{mH}, I_{AS} = 29A, V_{DD} = 25V, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
- Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- Switching time is essentially independent of operating temperature.

Electrical Characteristics Curve

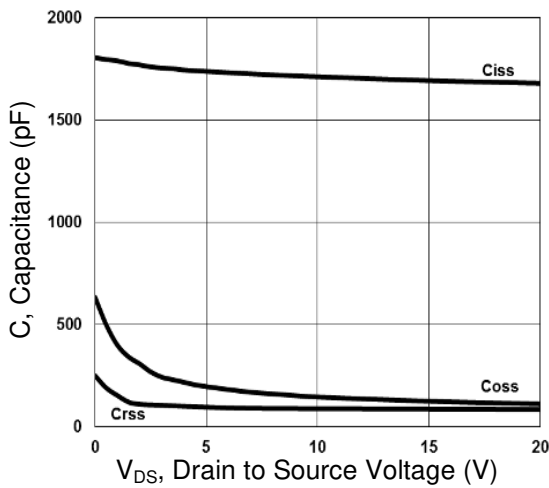
Continuous Drain Current vs. T_C



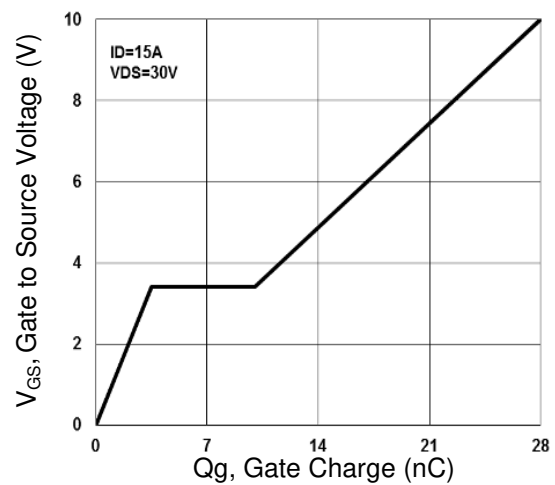
$R_{DS(on)}$ vs. Continuous Drain Current



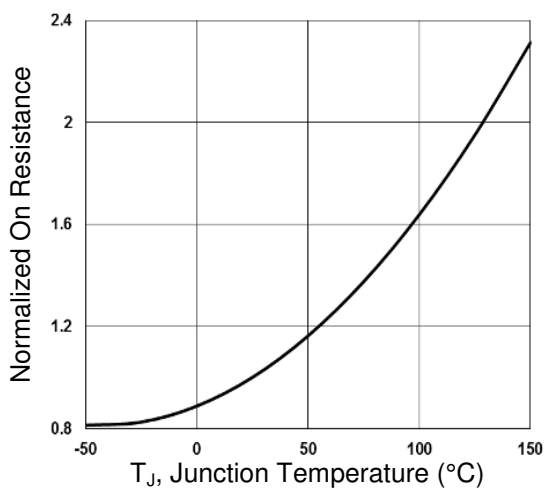
Capacitance



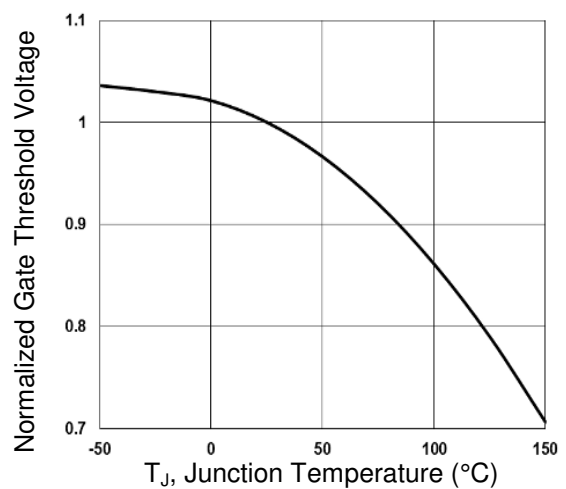
Gate Charge



On-Resistance vs. Junction Temperature

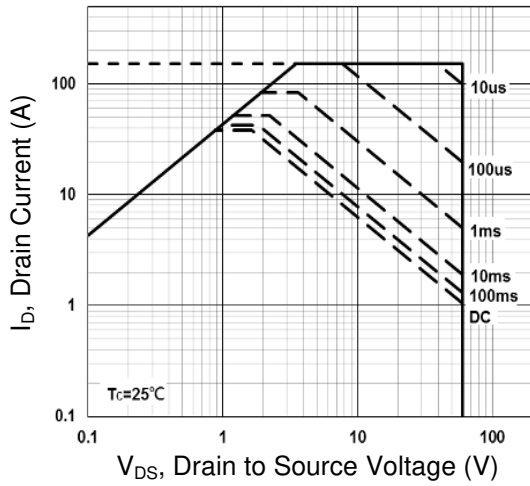


Threshold Voltage vs. Junction Temperature

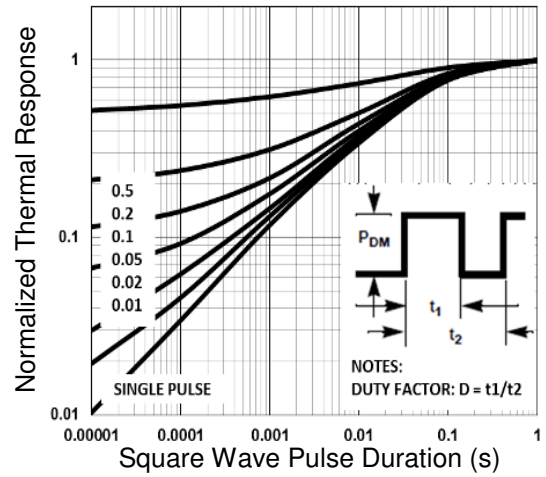


Electrical Characteristics Curve

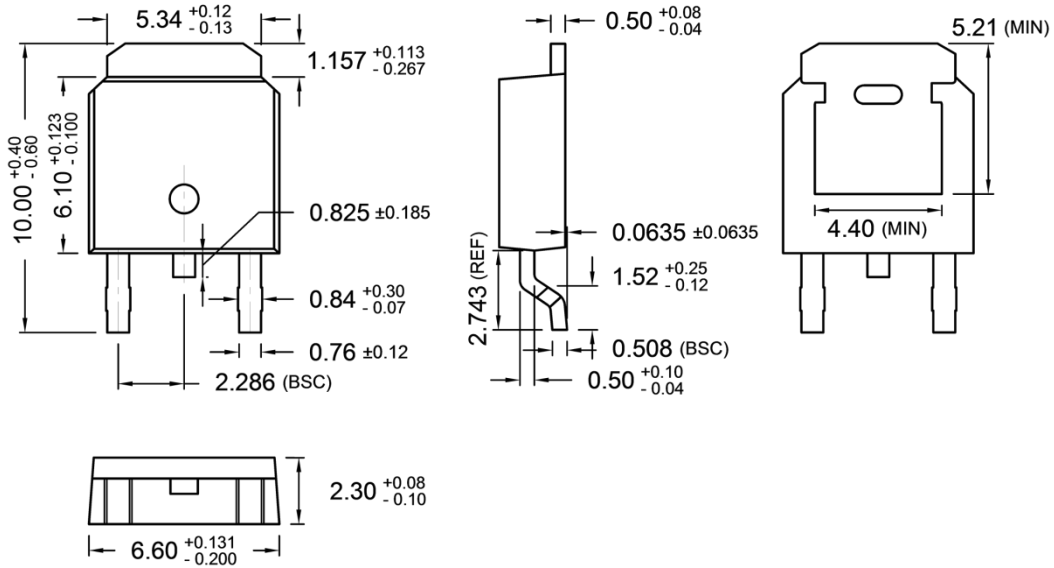
Maximum Safe Operating Area



Normalized Thermal Transient Impedance

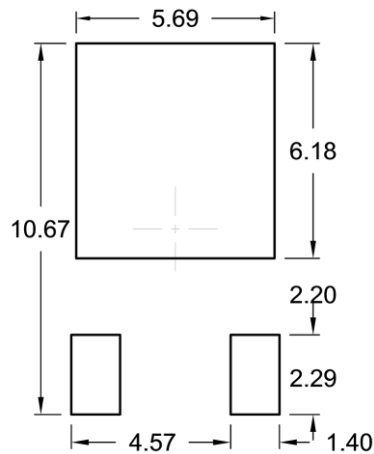


TO-252 Mechanical Drawing

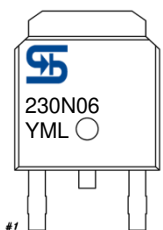


Unit: Millimeters

SUGGESTED PAD LAYOUT (Unit: Millimeters)



Marking Diagram



- Y** = Year Code
- M** = Month Code
- O** =Jan **P** =Feb **Q** =Mar **R** =Apr
- S** =May **T** =Jun **U** =Jul **V** =Aug
- W** =Sep **X** =Oct **Y** =Nov **Z** =Dec
- L** = Lot Code (1~9, A~Z)

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