

30V N-Channel Power MOSFET

30V, 50A, 9mΩ

FEATURES

- Fast switching
- Halogen Free
- G-S ESD Protection Diode Embedded

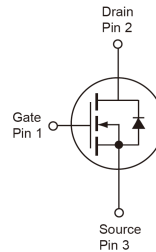
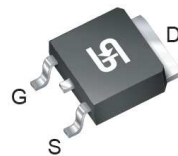
APPLICATION

- MB / VGA / Vcore
- POL Applications
- SMPS 2nd SR

KEY PERFORMANCE PARAMETERS		
PARAMETER	VALUE	UNIT
V_{DS}	30	V
$R_{DS(on)}$ (max)	$V_{GS} = 10V$	9
	$V_{GS} = 4.5V$	14
Q_g	7.5	nC



TO-252 (DPAK)



Notes: Moisture sensitivity level: level 3. Per J-STD-020

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	$T_C = 25^\circ\text{C}$	50
		$T_C = 100^\circ\text{C}$	32
Pulsed Drain Current ^(Note 1)	I_{DM}	200	A
Total Power Dissipation	P_D	$T_C = 25^\circ\text{C}$	40
		Derate above $T_C = 25^\circ\text{C}$	0.32
Single Pulsed Avalanche Energy ^(Note 2)	E_{AS}	45	mJ
Single Pulsed Avalanche Current ^(Note 2)	I_{AS}	30	A
Operating Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	- 55 to +150	$^\circ\text{C}$

THERMAL PERFORMANCE			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction to Case Thermal Resistance	$R_{\theta JC}$	3.1	$^{\circ}\text{C/W}$
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	62	$^{\circ}\text{C/W}$

Notes: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistances. The case thermal reference is defined at the solder mounting surface of the drain pins. $R_{\theta JA}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design. $R_{\theta JA}$ shown below for single device operation on FR-4 PCB in still air.

ELECTRICAL SPECIFICATIONS ($T_J = 25^{\circ}\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static (Note3)						
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$	BV_{DSS}	30	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	$V_{GS(TH)}$	1.2	1.6	2.5	V
Gate Body Leakage	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	I_{GSS}	--	--	± 10	μA
Zero Gate Voltage Drain Current	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V}$	I_{DSS}	--	--	1	μA
	$V_{DS} = 24\text{V}, T_J = 125^{\circ}\text{C}$		--	--	10	
Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 8\text{A}$	g_{fs}	--	9.5	--	S
Drain-Source On-State Resistance	$V_{GS} = 10\text{V}, I_D = 16\text{A}$	$R_{DS(ON)}$	--	7.5	9	m Ω
	$V_{GS} = 4.5\text{V}, I_D = 8\text{A}$		--	9.6	14	
Dynamic (Note4)						
Total Gate Charge	$V_{DS} = 15\text{V}, I_D = 20\text{A}, V_{GS} = 4.5\text{V}$	Q_g	--	7.7	--	nC
Gate-Source Charge		Q_{gs}	--	1.9	--	
Gate-Drain Charge		Q_{gd}	--	2.8	--	
Input Capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	C_{iss}	--	680	--	pF
Output Capacitance		C_{oss}	--	150	--	
Reverse Transfer Capacitance		C_{rss}	--	70	--	
Gate Resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	R_g	--	2.7	--	Ω
Switching (Note5)						
Turn-On Delay Time	$V_{DD}=15\text{V}, V_{GS}=10\text{V}, R_G=3.3\Omega, I_D=-15\text{A}$	$t_{d(on)}$	--	4.8	--	ns
Turn-On Rise Time		t_r	--	12.5	--	
Turn-Off Delay Time		$t_{d(off)}$	--	27.6	--	
Turn-Off Fall Time		t_f	--	8.2	--	
Source-Drain Diode (Note3)						
Forward Voltage	$V_{GS} = 0\text{V}, I_S = 1\text{A}$	V_{SD}	--	--	1	V
Continuous Drain-Source Diode	$V_G=V_D=0\text{V}$	I_S	--	--	50	A
Pulse Drain-Source Diode	Force Current	I_{SM}	--	--	200	A

Notes:

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}=25\text{V}, V_{GS}=10\text{V}, L=0.1\text{mH}, I_{AS}=30\text{A}, R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$.
3. Pulse test: $PW \leq 300\mu\text{s}$, duty cycle $\leq 2\%$
4. For DESIGN AID ONLY, not subject to production testing.
5. Switching time is essentially independent of operating temperature

ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TSM090N03ECP ROG	TO-252	2,500pcs / 13" Reel

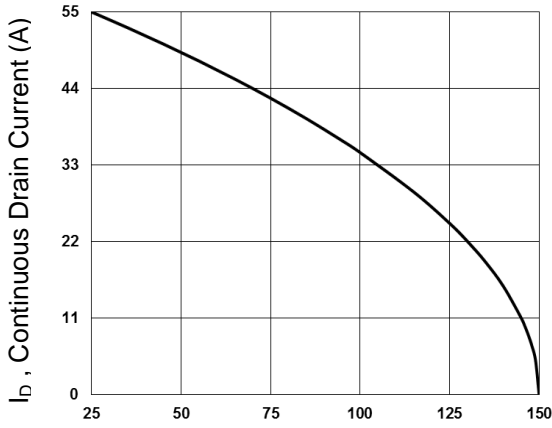
Note:

1. Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
2. Halogen-free according to IEC 61249-2-21 definition

CHARACTERISTICS CURVES

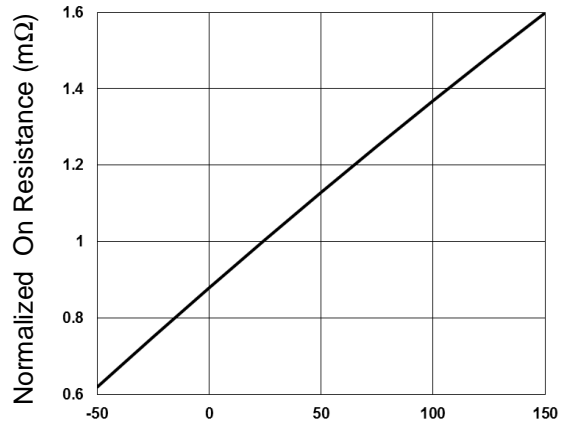
($T_C = 25^\circ\text{C}$ unless otherwise noted)

Continuous Drain Current vs. T_C



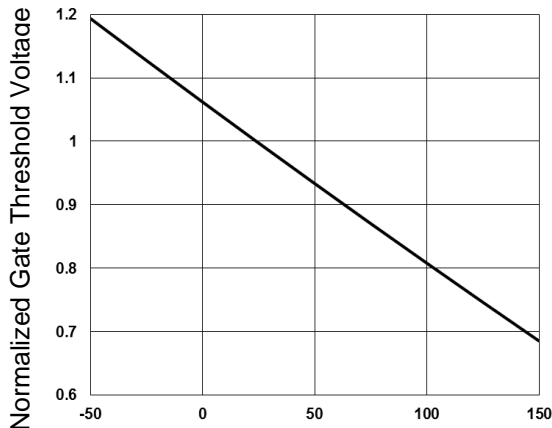
T_C , Case Temperature ($^\circ\text{C}$)

Normalized $R_{DS(on)}$ vs. T_J



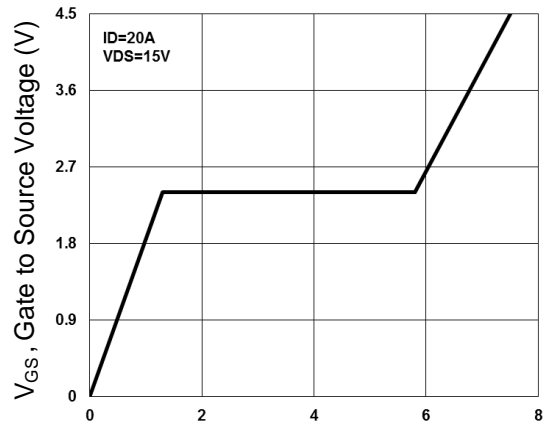
T_J , Junction Temperature ($^\circ\text{C}$)

Normalized V_{th} vs. T_J



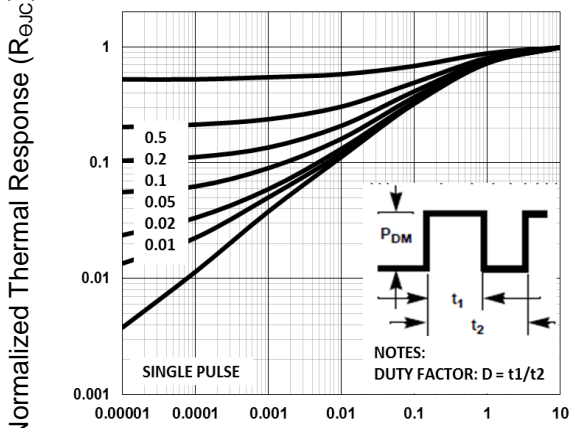
T_J , Junction Temperature ($^\circ\text{C}$)

Gate Charge Waveform



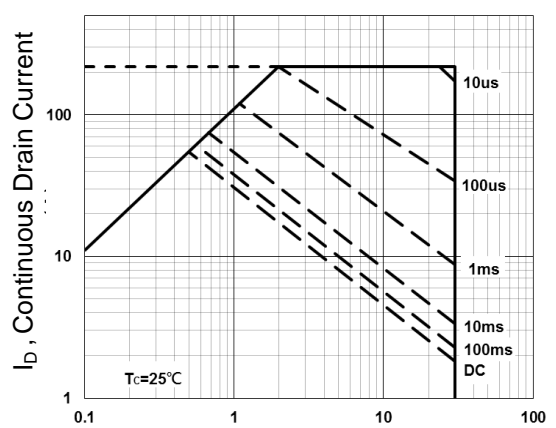
Q_g , Gate Charge (nC)

Normalized Transient Impedance



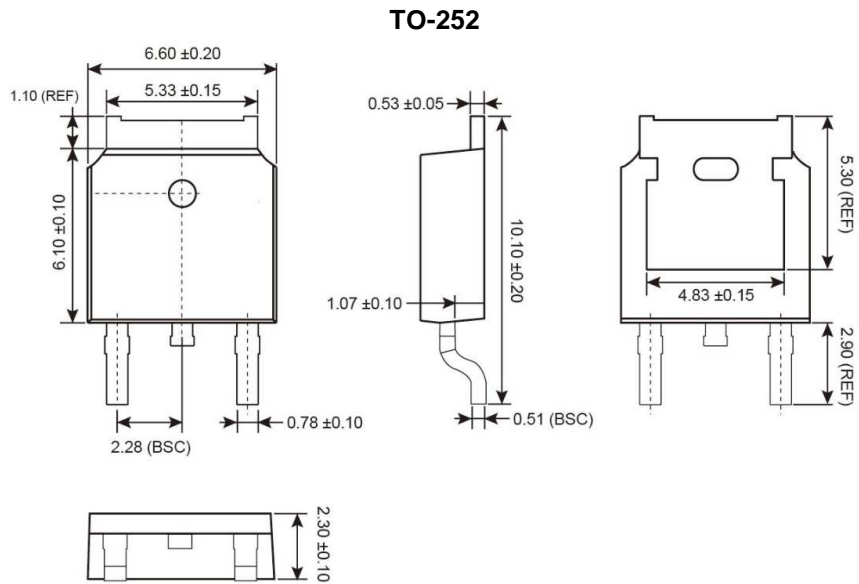
Square Wave Pulse Duration

Maximum Safe Operation Area

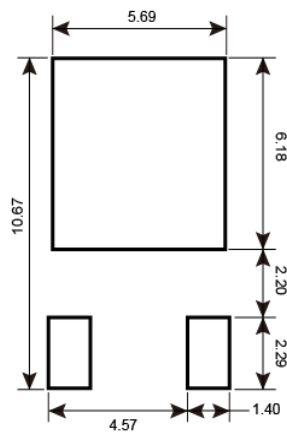


V_{DS} , Drain to Source Voltage

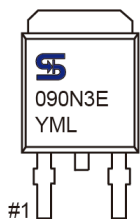
PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)



SUGGESTED PAD LAYOUT (Unit: Millimeters)



MARKING DIAGRAM



- Y** = Year Code
- M** = Month Code for Halogen Free Product
- 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

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