

P-Channel Power MOSFET

-20V, -4.7A, 50mΩ

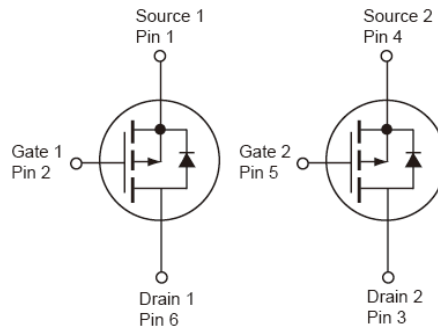
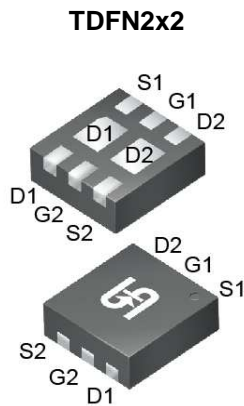
FEATURES

- Halogen-free
- Suited for 1.8V drive applications
- Low profile package

APPLICATION

- Battery Pack
- Load Switch

KEY PERFORMANCE PARAMETERS		
PARAMETER	VALUE	UNIT
V_{DS}	-20	V
$R_{DS(on)}$ (max)	$V_{GS} = -4.5V$	50
	$V_{GS} = -2.5V$	65
	$V_{GS} = -1.8V$	85
Q_g	9.6	nC



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

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ C$ unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	± 10	V
Continuous Drain Current ^(Note 1)	I_D	$T_C = 25^\circ C$	-4.7
		$T_C = 100^\circ C$	-2.82
Pulsed Drain Current ^(Note 2)	I_{DM}	-18.8	A
Total Power Dissipation @ $T_C = 25^\circ C$	P_{TOT}	0.62	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ C$

THERMAL PERFORMANCE			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	200	$^\circ C/W$

Notes: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistances. $R_{\theta JA}$ 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 ($T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static (Note 3)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250\mu A$	BV_{DSS}	-20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	$V_{GS(TH)}$	-0.3	-0.6	-0.8	V
Gate Body Leakage	$V_{GS} = \pm 10V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = -20V, V_{GS} = 0V$	I_{DSS}	--	--	-1	μA
Drain-Source On-State Resistance	$V_{GS} = -4.5V, I_D = -3A$	$R_{DS(ON)}$	--	42	50	m Ω
	$V_{GS} = -2.5V, I_D = -2A$		--	57	65	
	$V_{GS} = -1.8V, I_D = -1A$		--	75	85	
Forward Transconductance	$V_{DS} = -10V, I_D = -3A$	g_{fs}	--	7	--	S
Dynamic (Note 4)						
Total Gate Charge	$V_{DS} = -10V, I_D = -3.0A,$ $V_{GS} = -4.5V$	Q_g	--	9.6	13	nC
Gate-Source Charge		Q_{gs}	--	1.6	2	
Gate-Drain Charge		Q_{gd}	--	2	4	
Input Capacitance	$V_{DS} = -10V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$	C_{iss}	--	850	1230	pF
Output Capacitance		C_{oss}	--	70	100	
Reverse Transfer Capacitance		C_{rss}	--	55	80	
Switching (Note 5)						
Turn-On Delay Time	$V_{DD} = -10V,$ $R_{GEN} = 25\Omega,$ $I_D = -1A, V_{GS} = -4.5V,$	$t_{d(on)}$	--	6	11	ns
Turn-On Rise Time		t_r	--	21.6	41	
Turn-Off Delay Time		$t_{d(off)}$	--	51	97	
Turn-Off Fall Time		t_f	--	13.8	26	
Source-Drain Diode (Note 3)						
Continuous Source Current	$V_G = V_D = 0V,$ Force Current	I_S	--	--	-4.7	A
Pulsed Source Current		I_{SM}	--	--	-18.8	A
Forward On Voltage	$I_S = -1.0A, V_{GS} = 0V$	V_{SD}	--	--	-1.0	V

Notes:

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. Pulse test: $PW \leq 300\mu s$, 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
TSM500P02DCQ RFG	TDFN 2x2	3,000pcs / 7" Reel

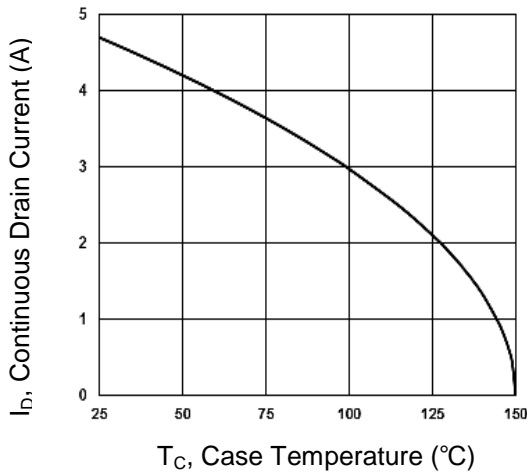
Note:

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

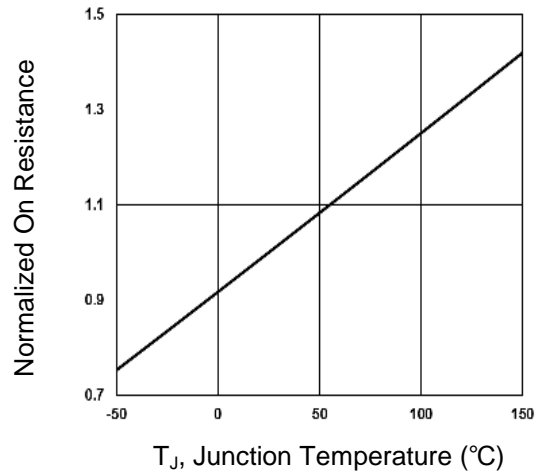
CHARACTERISTICS CURVES

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

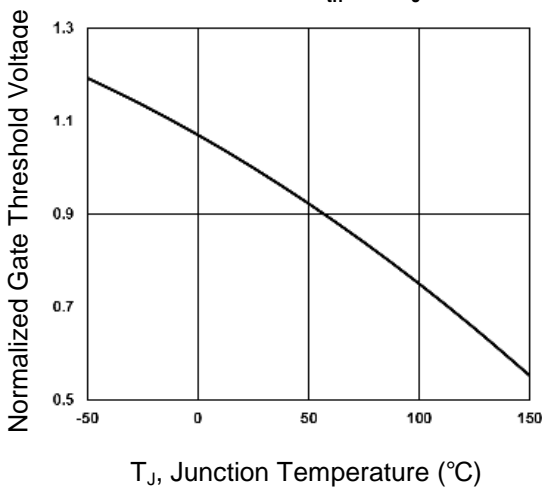
Continuous Drain Current vs. T_C



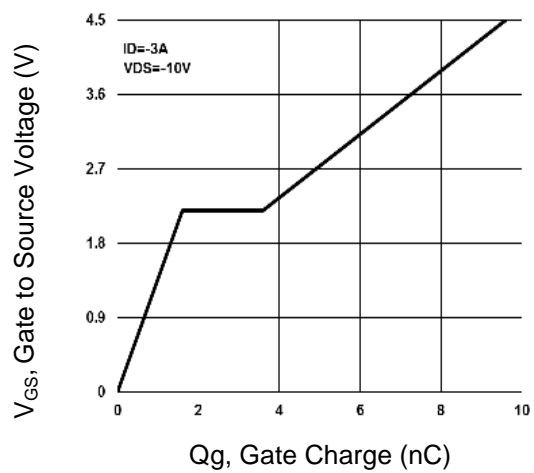
Normalized $R_{DS(on)}$ vs. T_J



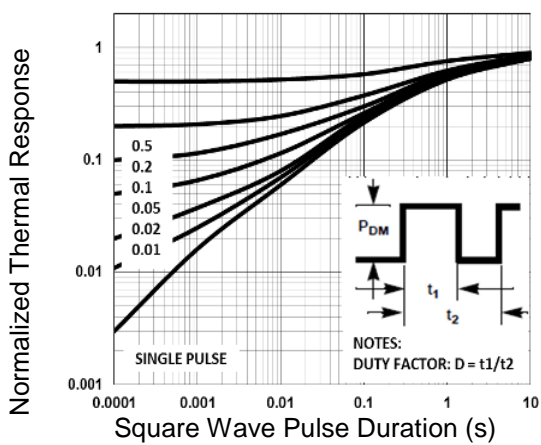
Normalized V_{th} vs. T_J



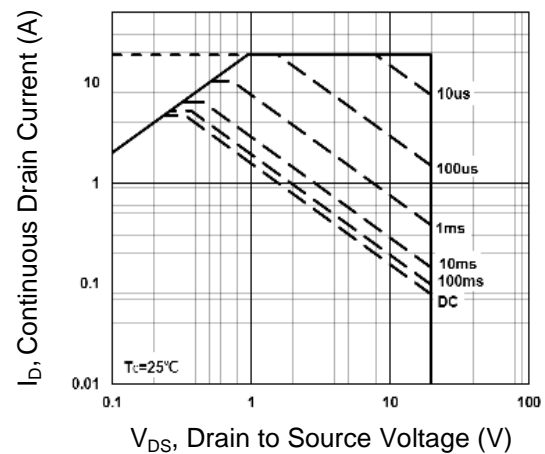
Gate Charge Waveform



Normalized Transient Impedance

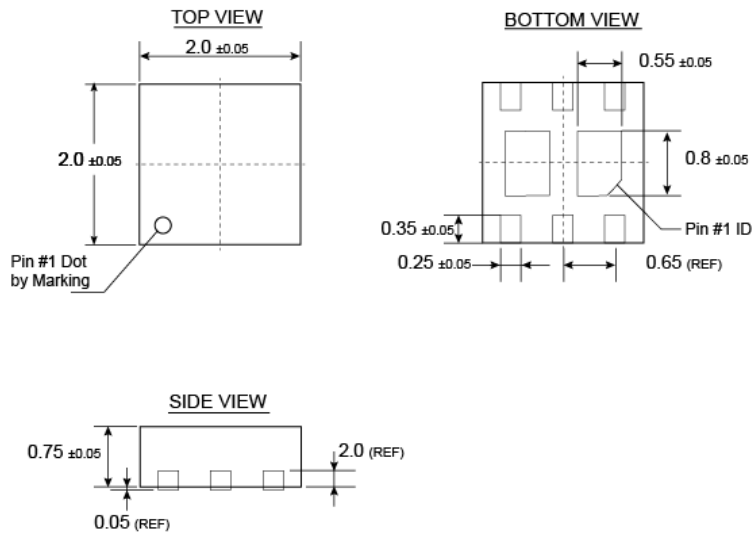


Maximum Safe Operation Area

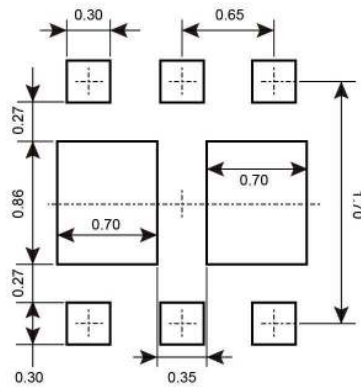


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

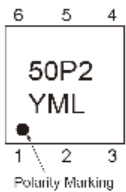
TDFN2x2



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 (1~9, A~Z)

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