N-Channel Power MOSFET

30V, 52A, 8.5mΩ

FEATURES

- Low $R_{DS(ON)}$ to minimize conductive Losses
- Low gate charge for fast power switching
- 100% UIS and R_g tested
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21 definition

PRODUCT SUMMARY			
PARAMETER		**VALUE**	**UNIT**
V_{DS}		30	V
$R_{DS(on)}$ (max)	V_{GS} = 10V	8.5	mΩ
	V_{GS} = 4.5V	13	
Q_g		7.2	nC

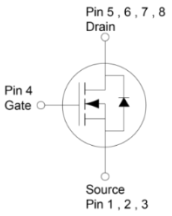
APPLICATIONS

- DC-DC Converters
- Battery Power Management
- ORing FET/Load Switch

Pb-Free RoHS COMPLIANT HALOGEN FREE

PDFN33





Notes: MSL 1 (Moisture Sensitivity Level) per J-STD-020

ABSOLUTE MAXIMUM RATINGS (T_A = 25°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 (Note 1)	T_C = 25°C	I_D	52	A
	T_A = 25°C		13	
Pulsed Drain Current (Note 1)		I_{DM}	208	A
Single Pulse Avalanche Current (Note 2)		I_{AS}	23	A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	26	mJ
Total Power Dissipation	T_C = 25°C	P_D	37	W
	T_C = 125°C		7	
Total Power Dissipation	T_A = 25°C	P_D	2.3	W
	T_A = 125°C		0.5	
Operating Junction and Storage Temperature Range		T_J, T_{STG}	- 55 to +150	°C

THERMAL RESISTANCE			
PARAMETER	**SYMBOL**	**LIMIT**	**UNIT**
Thermal Resistance – Junction to Case	$R_{\Theta JC}$	3.4	°C/W
Thermal Resistance – Junction to Ambient	$R_{\Theta JA}$	53	°C/W

Thermal Performance Note: $R_{\Theta JA}$ 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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)						
PARAMETER	**CONDITIONS**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	BV_{DSS}	30	--	--	V
Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	$V_{GS(TH)}$	1	1.6	2.5	V
Gate-Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Drain-Source Leakage Current	V_{GS} = 0V, V_{DS} = 30V	I_{DSS}	--	--	1	μA
Drain-Source On-State Resistance (Note 3)	V_{GS} = 10V, I_D = 13A	$R_{DS(on)}$	--	6.2	8.5	mΩ
	V_{GS} = 4.5V, I_D = 13A		--	9	13	
Forward Transconductance (Note 3)	V_{DS} = 5V, I_D = 13A	g_{fs}	--	27	--	S
Dynamic (Note 4)						
Total Gate Charge	V_{GS} = 10V, V_{DS} = 15V, I_D = 13A	Q_g	--	14.3	--	nC
Total Gate Charge	V_{GS} = 4.5V, V_{DS} = 15V, I_D = 13A	Q_g		7.2		
Gate-Source Charge		Q_{gs}	--	2.6	--	
Gate-Drain Charge		Q_{gd}	--	3.4	--	
Input Capacitance	V_{GS} = 0V, V_{DS} = 15V, f = 1.0MHz	C_{iss}	--	817	--	pF
Output Capacitance		C_{oss}	--	155	--	
Reverse Transfer Capacitance		C_{rss}	--	96	--	
Gate Resistance	f = 1.0MHz, open drain	R_g	0.8	2.8	5.6	Ω
Switching (Note 4)						
Turn-On Delay Time	V_{GS} = 10V, V_{DS} = 15V, I_D = 15A, R_G = 3.3Ω,	$t_{d(on)}$	--	4.8	--	ns
Rise Time		t_r	--	12.5	--	
Turn-Off Delay Time		$t_{d(off)}$	--	27.6	--	
Fall Time		t_f	--	8.2	--	
Source-Drain Diode						
Diode Forward Voltage (Note 3)	V_{GS} = 0V, I_S = 13A	V_{SD}	--	--	1	V
Reverse Recovery Time	I_S = 13A, di/dt = 100A/μs	t_{rr}	--	13	--	ns
Reverse Recovery Charge		Q_{rr}	--	6.3	--	nC

Notes:

1. Current limited by package.
2. L = 0.1mH, V_{GS} = 10V, V_{DS} = 25V, R_G = 25Ω, I_{AS} = 23A, Starting T_J = 25°C
3. Pulse test: Pulse Width ≤ 300μs, duty cycle ≤ 2%.
4. Switching time is essentially independent of operating temperature.

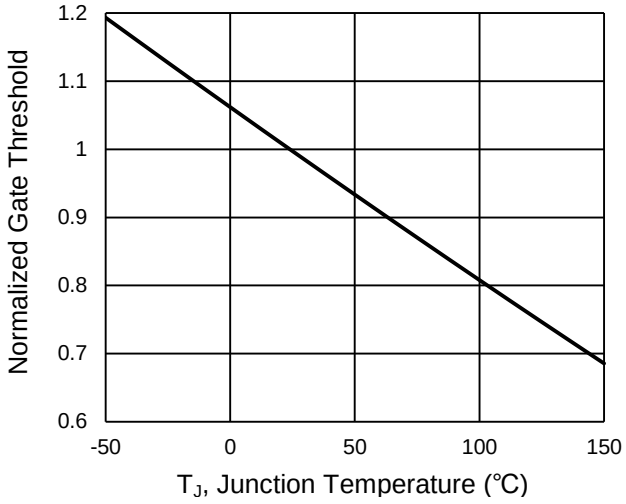
ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TSM085N03PQ33 RGG	PDFN33	5,000pcs / 13” Reel

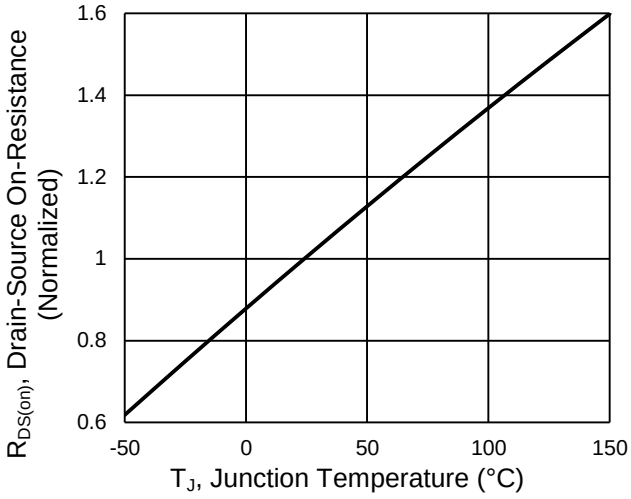
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

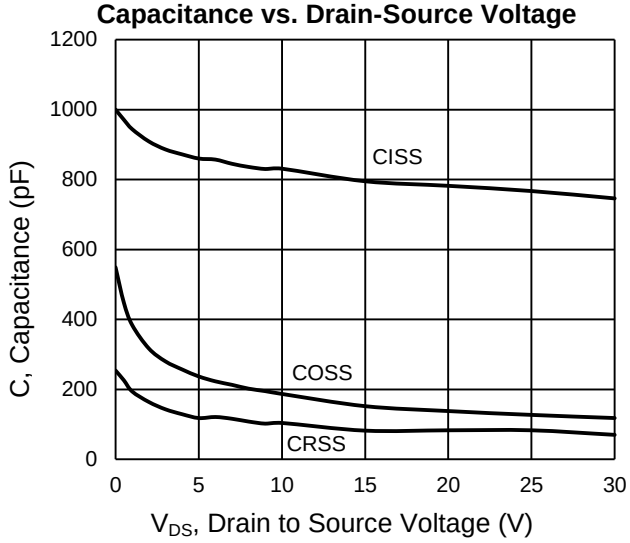
Normalized V_{th} vs. T_J



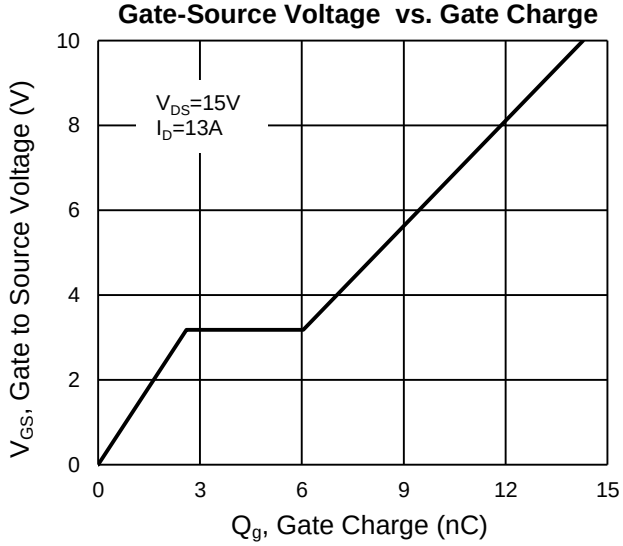
On-Resistance vs. Junction Temperature



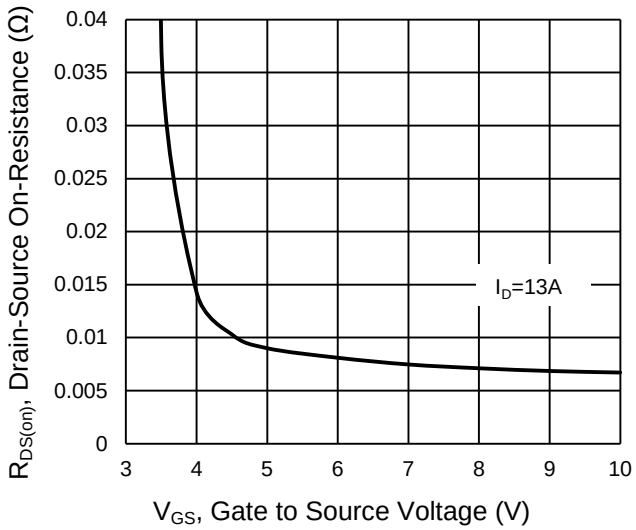
Capacitance vs. Drain-Source Voltage



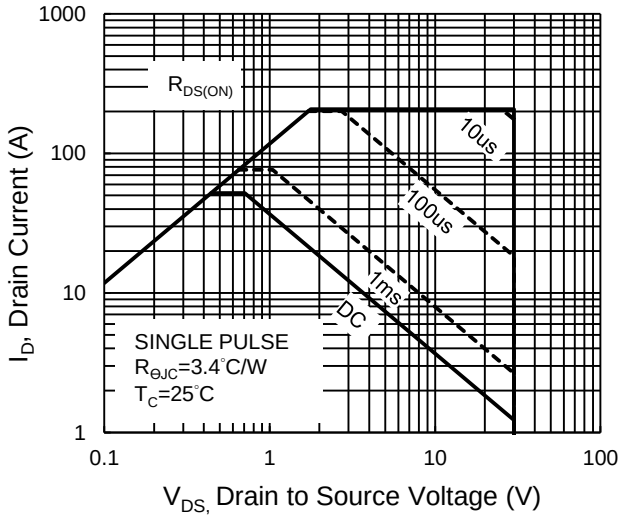
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Gate-Source Voltage

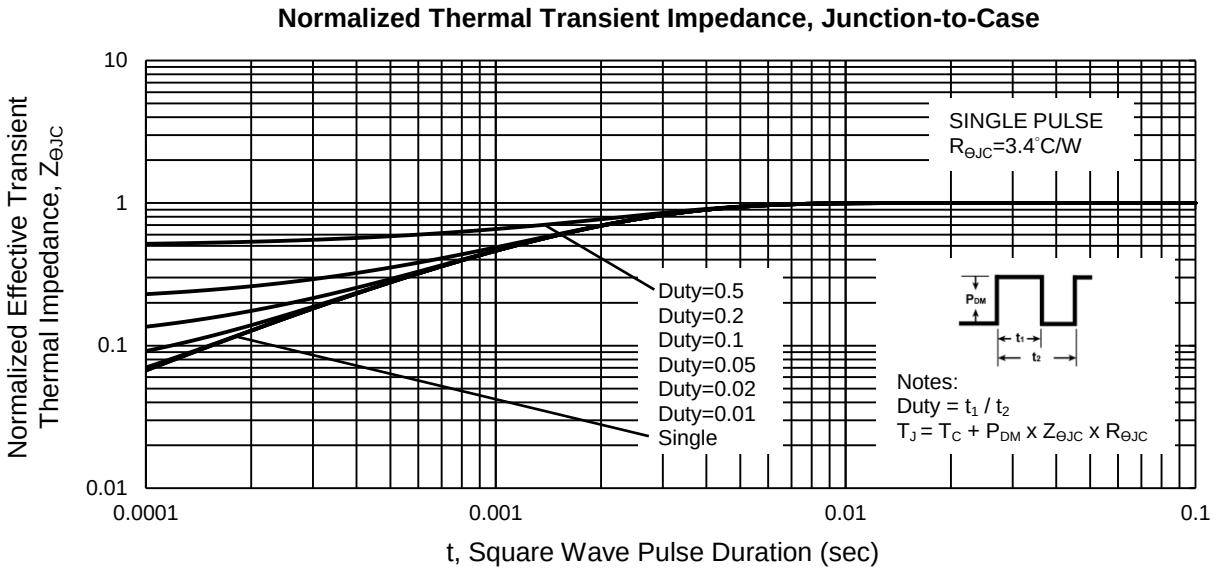


Maximum Safe Operating Area, Junction-to-Case



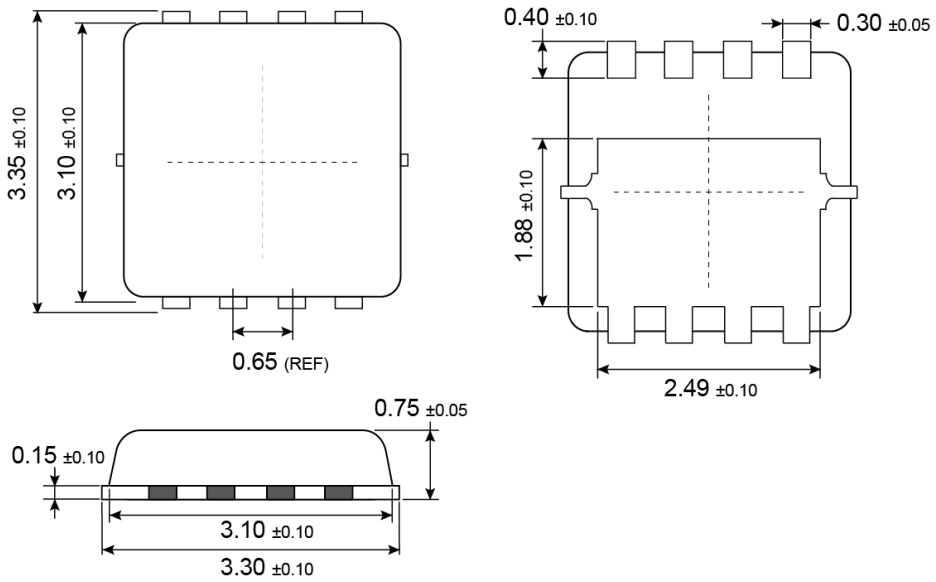
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

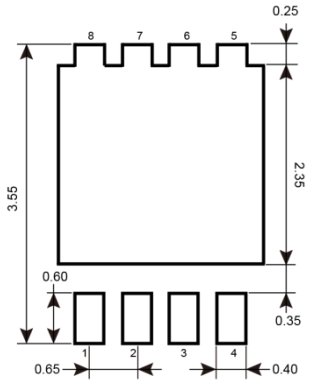


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

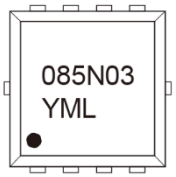
PDFN33



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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