P-Channel Power MOSFET

-40V, -51A, 16mΩ

FEATURES

- AEC-Q101 Rev-D Qualified
- Logic level
- 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

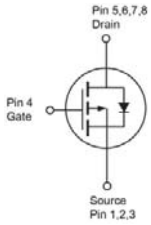
PRODUCT SUMMARY			
PARAMETER		**VALUE**	**UNIT**
V_{DS}		-40	V
$R_{DS(on)}$ (max)	V_{GS} = -10V	16	mΩ
	V_{GS} = -4.5V	22	
Q_g		23	nC

APPLICATIONS

- 12V Battery System for Automotive
- Battery Management System
- Infotainment

Pb-Free RoHS COMPLIANT HALOGEN FREE

PDFN56



Note: 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}	-40	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current (Note 1)	T_C = 25°C	I_D	-51	A
	T_A = 25°C		-10	
Pulsed Drain Current		I_{DM}	-204	A
Single Pulse Avalanche Current (Note 2)		I_{AS}	-27	A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	109	mJ
Total Power Dissipation	T_C = 25°C	P_D	69	W
	T_C = 125°C		14	
Total Power Dissipation	T_A = 25°C	P_D	2.6	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	$R_{\Theta JC}$	1.8	°C/W
Thermal Resistance – Junction to Ambient	$R_{\Theta JA}$	48	°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}	-40	--	--	V
Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = -250μA	$V_{GS(TH)}$	-1	-1.5	-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} = -40V	I_{DSS}	--	--	-1	μA
	V_{GS} = 0V, V_{DS} = -40V T_J = 150°C		--	--	-100	
Drain-Source On-State Resistance (Note 3)	V_{GS} = -10V, I_D = -10A	$R_{DS(on)}$	--	9.9	16	mΩ
	V_{GS} = -10V, I_D = -10A, T_J = 150°C		--	16.8	27.2	
	V_{GS} = -4.5V, I_D = -8A		--	13.5	22	
Forward Transconductance (Note 3)	V_{DS} = -5V, I_D = -10A	g_{fs}	--	31	--	S
Dynamic (Note 4)						
Total Gate Charge	V_{GS} = -10V, I_D = -10A, V_{DS} = -20V	Q_g	--	48	--	nC
Total Gate Charge	V_{GS} = -4.5V, I_D = -8A, V_{DS} = -20V	Q_g	--	23	--	
Gate-Source Charge		Q_{gs}	--	7	--	
Gate-Drain Charge		Q_{gd}	--	9	--	
Input Capacitance	V_{GS} = 0V, V_{DS} = -20V, f = 1MHz	C_{iss}	--	2712	--	pF
Output Capacitance		C_{oss}	--	270	--	
Reverse Transfer Capacitance		C_{rss}	--	150	--	
Gate Resistance	f = 1MHz	R_g	1.9	6.2	12.4	Ω
Switching (Note 4)						
Turn-On Delay Time	V_{GS} = -10V, V_{DS} = -20V, I_D = -10A, R_G = 2Ω	$t_{d(on)}$	--	6.8	--	ns
Rise Time		t_r	--	2.2	--	
Turn-Off Delay Time		$t_{d(off)}$	--	63	--	
Fall Time		t_f	--	32	--	
Source-Drain Diode						
Diode Forward Voltage (Note 3)	V_{GS} = 0V, I_S = -10A	V_{SD}	--	--	-1.2	V
Reverse Recovery Time	I_S = -10A, di/dt = 100A/μs	t_{rr}	--	19	--	ns
Reverse Recovery Charge		Q_{rr}	--	11	--	nC

Notes:

1. Silicon limited current only.
2. L = 0.3mH, V_{GS} = -10V, V_{DD} = -25V, R_G = 25Ω, I_{AS} = -27A, Starting T_J = 25°C
3. Pulse test: Pulse Width ≤ 300μs, duty cycle ≤ 2%.
4. Switching time is essentially independent of operating temperature.

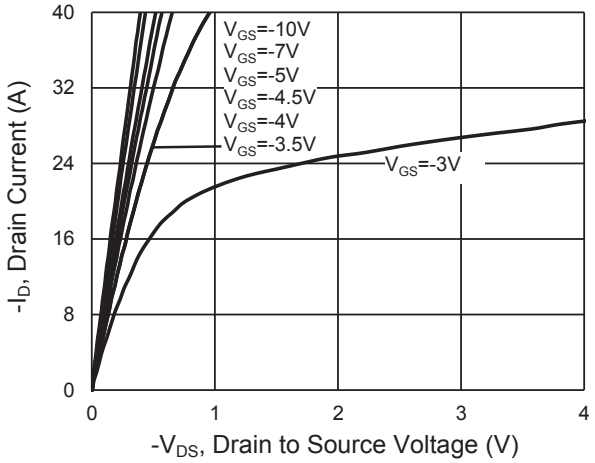
ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TSM160P04LCRH RLG	PDFN56	2,500pcs / 13” Reel

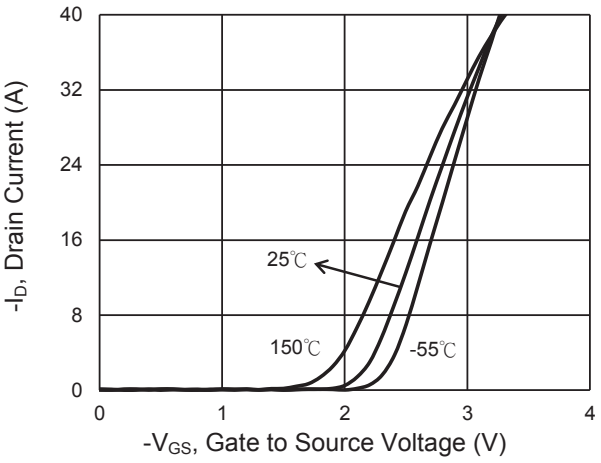
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

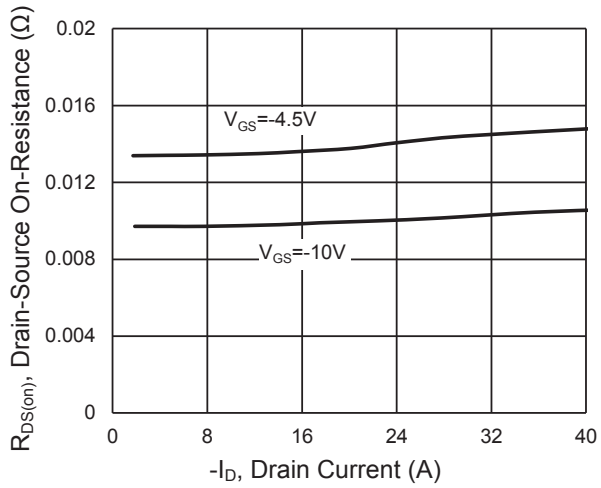
Output Characteristics



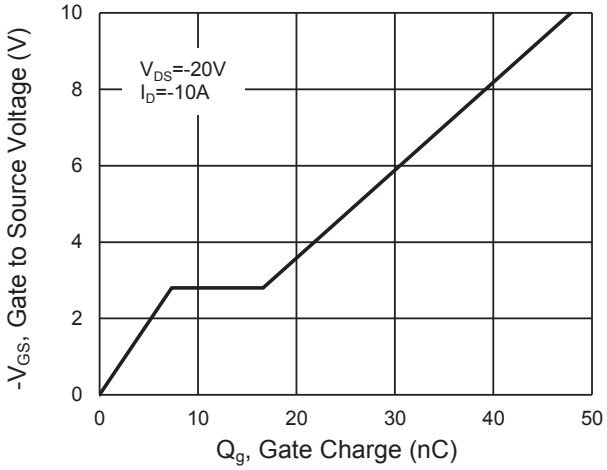
Transfer Characteristics



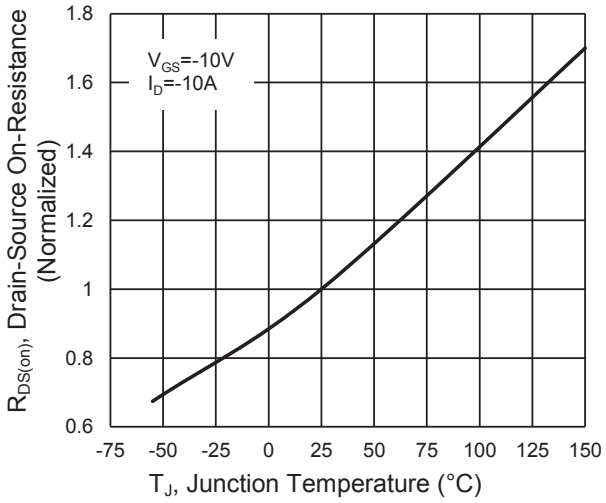
On-Resistance vs. Drain Current



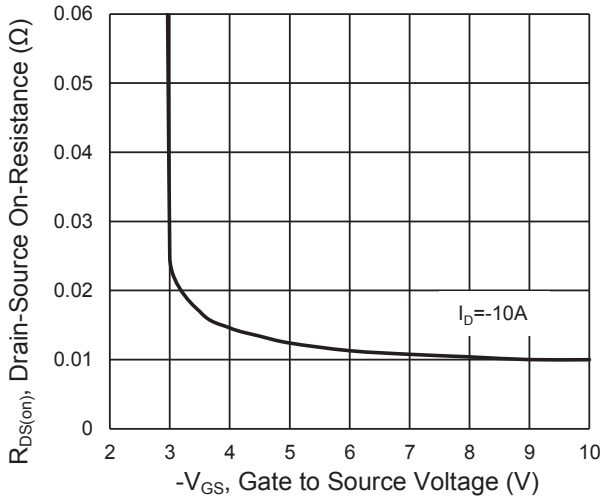
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



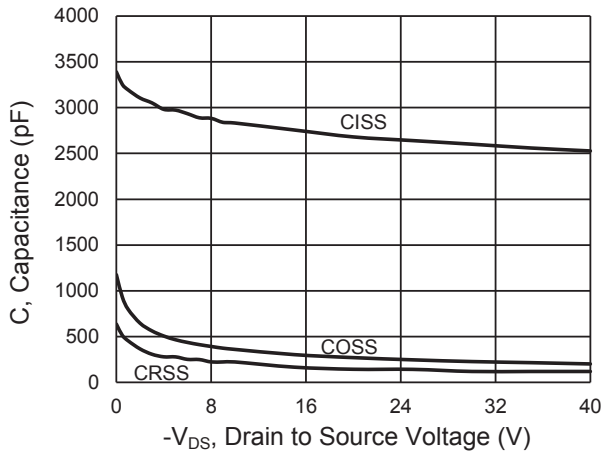
On-Resistance vs. Gate-Source Voltage



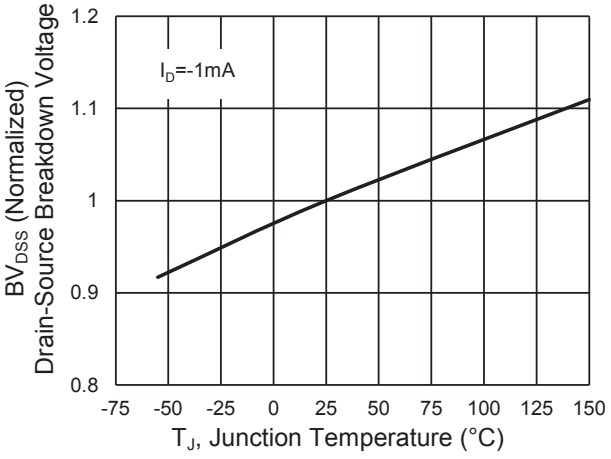
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

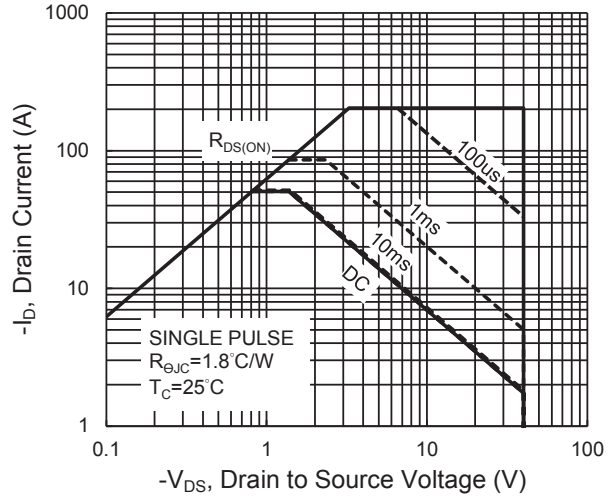
Capacitance vs. Drain-Source Voltage



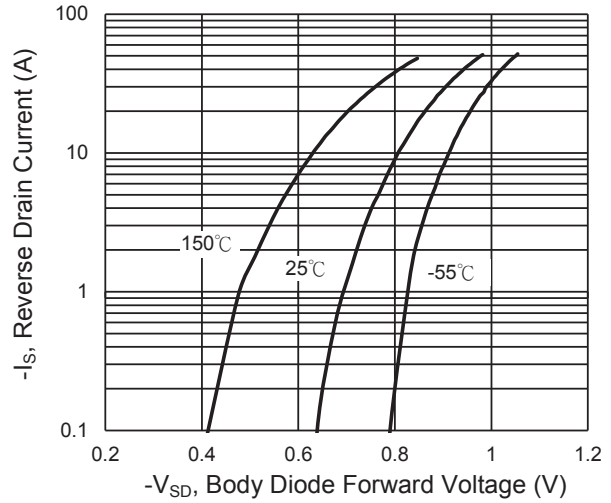
BV_{DSS} vs. Junction Temperature



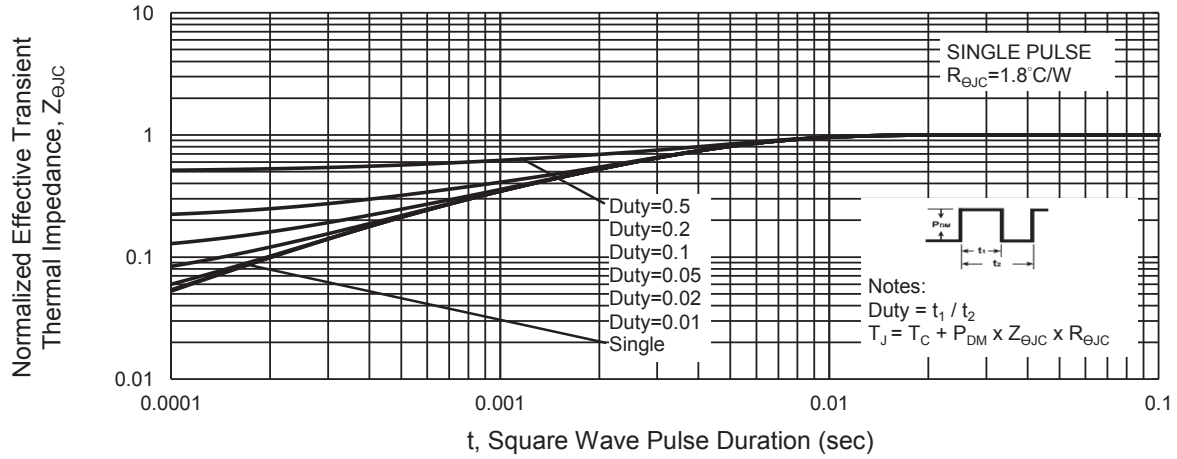
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage

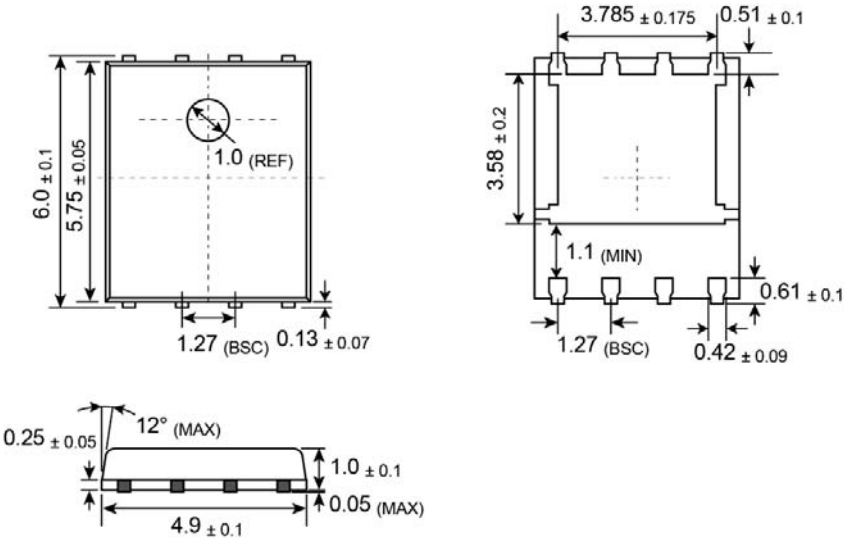


Normalized Thermal Transient Impedance, Junction-to-Case

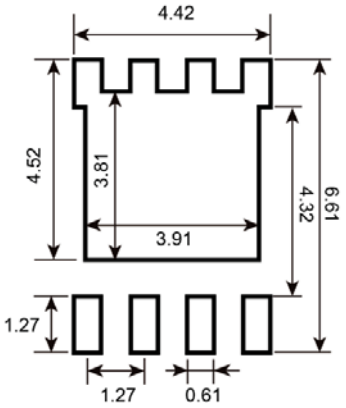


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

PDFN56



SUGGESTED PAD LAYOUT (Unit: Millimeters)



MARKING DIAGRAM

G = Halogen Free
Y = Year Code
WW = Week Code (01~52)
F = Factory Code
_ = AEC-Q101 Qualified

Notice

Specifications of the products displayed herein are subject to change without notice. TSC or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, to any intellectual property rights is granted by this document. Except as provided in TSC's terms and conditions of sale for such products, TSC assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of TSC products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify TSC for any damages resulting from such improper use or sale.SC