PerFET™ Power Transistor

FEATURES

- Excellent FOM
- AEC-Q101 Qualified
- Wettable Flank leads for Enhanced AOI
- 100% UIS and Rg tested
- 175°C Operating Junction Temperature
- RoHS Compliant
- Halogen-Free

PRODUCT SUMMARY			
PARAMETER		**VALUE**	**UNIT**
V_{DS}		60	V
$R_{DS(on)}$ (max)	V_{GS} = 10V	3.8	mΩ
	V_{GS} = 7V	4.5	
Q_g	V_{GS} = 10V	52	nC

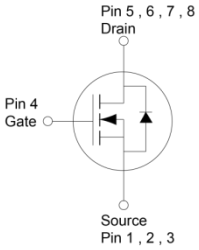
APPLICATIONS

- Automotive Applications
- Solenoid and Motor Drivers
- DC-DC Converters

Pb-Free RoHS COMPLIANT HALOGEN FREE

PDFN56U





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}	60	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current, Silicon limited	T_C = 25°C	I_D	144	A
Continuous Drain Current (Note 1)	T_C = 25°C	I_D	100	A
	T_C = 100°C		100	
	T_A = 25°C		19	
Pulsed Drain Current (Note 2)		I_{DM}	400	A
Single Pulse Avalanche Current (Note 3)		I_{AS}	27	A
Single Pulse Avalanche Energy (Note 3)		E_{AS}	109	mJ
Total Power Dissipation	T_C = 25°C	P_D	166	W
	T_C = 125°C		55	
Operating Junction and Storage Temperature Range		T_J, T_{STG}	- 55 to +175	°C

THERMAL RESISTANCE			
PARAMETER	**SYMBOL**	**MAXIMUM**	**UNIT**
Thermal Resistance – Junction to Case	$R_{\Theta JC}$	0.9	°C/W
Thermal Resistance – Junction to Ambient (Note 4)	$R_{\Theta JA}$	50	°C/W

Notes:

1. Package current limit.
2. Pulse Width ≤ 100μs.
3. L = 0.3mH, VGS = 10V, RG = 25Ω, Starting TJ = 25°C.
4. Device on a PCB FR4 with 1 in^2 (single layer, 2 oz thick) copper area for drain connection.

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 = 1mA	BV_{DSS}	60	--	--	V
Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	$V_{GS(TH)}$	2.4	3	3.6	V
Gate-Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Drain-Source Leakage Current	V_{GS} = 0V, V_{DS} = 60V	I_{DSS}	--	--	1	μA
	V_{GS} = 0V, V_{DS} = 60V T_J = 125°C		--	--	100	
Drain-Source On-State Resistance (Note 5)	V_{GS} = 10V, I_D = 50A	$R_{DS(on)}$	--	3.0	3.8	mΩ
	V_{GS} = 7V, I_D = 50A		--	3.6	4.5	
Forward Transconductance (Note 5)	V_{DS} = 10V, I_D = 12.5A	g_{fs}	--	81	--	S
Dynamic (Note 6)						
Total Gate Charge	V_{GS} = 7V, V_{DS} = 30V, I_D = 19A	Q_g	--	38	--	nC
Total Gate Charge	V_{GS} = 10V, V_{DS} = 30V, I_D = 19A	Q_g	--	52	--	
Gate-Source Charge		Q_{gs}	--	15	--	
Gate-Drain Charge		Q_{gd}	--	11	--	
Input Capacitance	V_{DS} = 30V, V_{GS} = 0V, f = 1.0MHz	C_{iss}	--	3432	--	pF
Output Capacitance		C_{oss}	--	1251	--	
Reverse Transfer Capacitance		C_{rss}	--	68	--	
Gate Resistance	f = 1.0MHz	R_g	--	1	--	Ω
Switching (Note 7)						
Turn-On Delay Time	V_{GS} = 10V, V_{DS} = 30V, I_D = 19A, R_G = 6Ω	$t_{d(on)}$	--	18	--	ns
Rise Time		t_r	--	51	--	
Turn-Off Delay Time		$t_{d(off)}$	--	42	--	
Fall Time		t_f	--	49	--	
Source-Drain Diode						
Diode Forward Voltage (Note 5)	V_{GS} = 0V, I_S = 50A	V_{SD}	--	--	1.1	V
Reverse Recovery Time	I_S = 19A, di/dt = 100A/μs	t_{rr}	--	60	--	ns
Reverse Recovery Charge		Q_{rr}	--	81	--	nC

Notes:

5. Pulse test: Pulse Width ≤ 300μs, duty cycle ≤ 2%.
6. Defined by design. Not subject to production test.
7. Switching time is essentially independent of operating temperature.

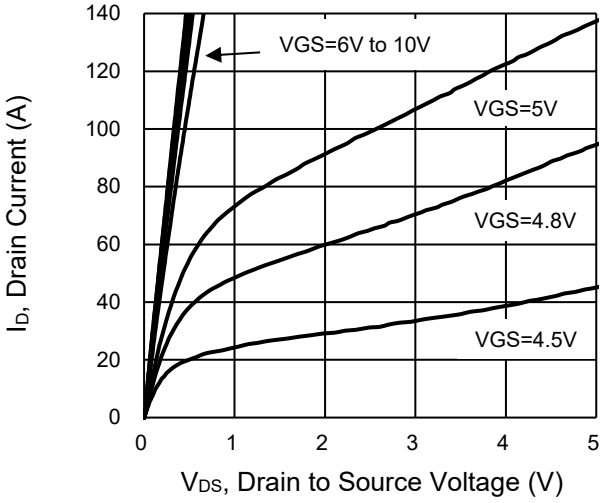
ORDERING INFORMATION

ORDERING CODE	PACKAGE	PACKING
TQM038NH06CR RLG	PDFN56U	2,500pcs / 13” Reel

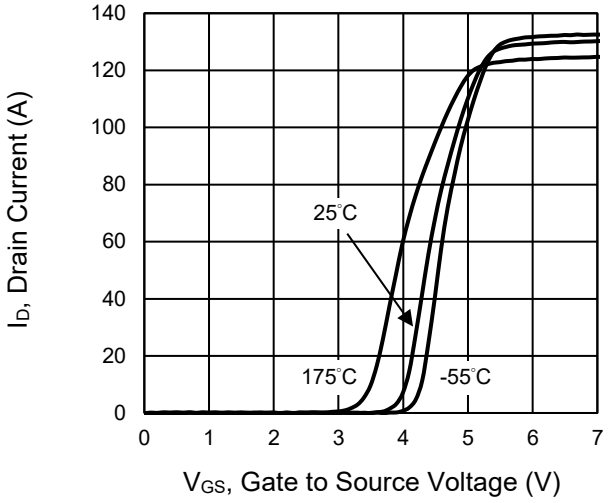
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

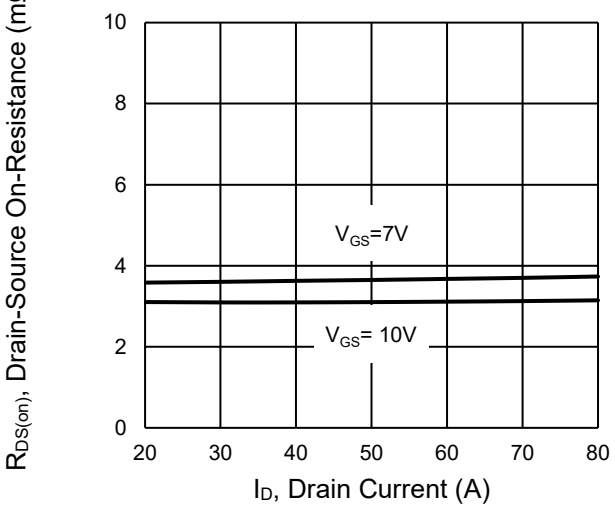
Output Characteristics



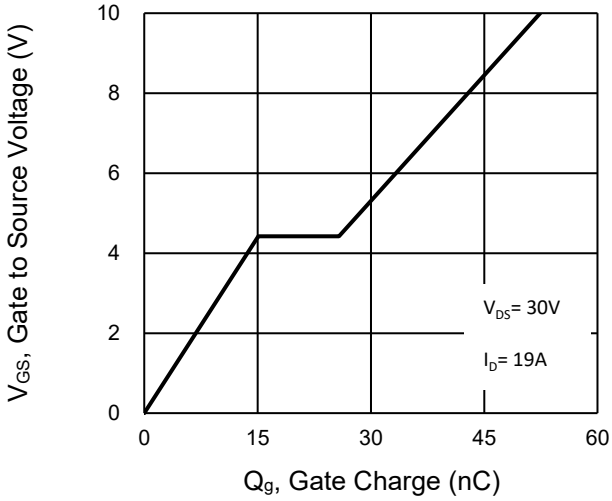
Transfer Characteristics



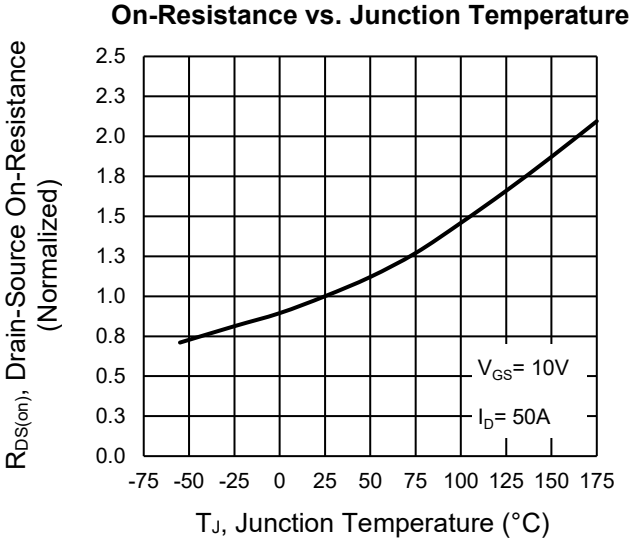
On-Resistance vs. Drain Current



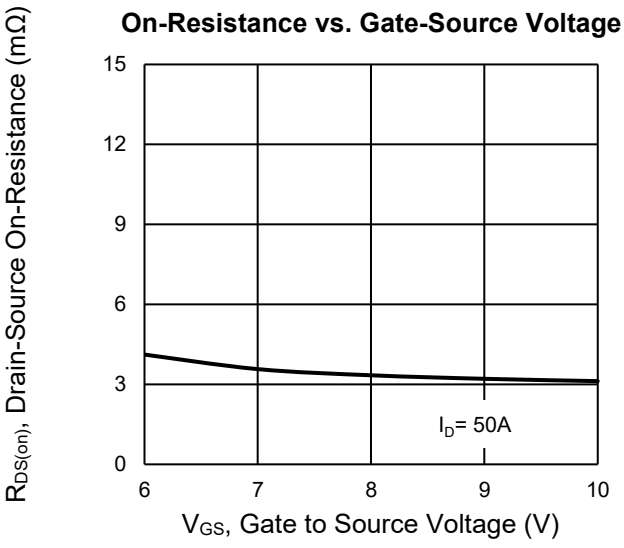
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



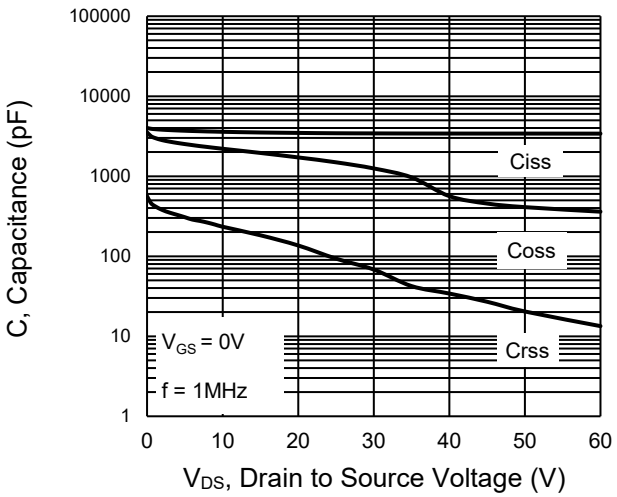
On-Resistance vs. Gate-Source Voltage



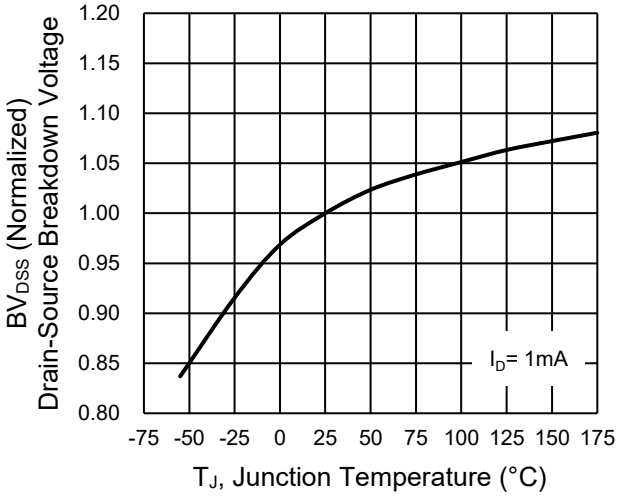
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

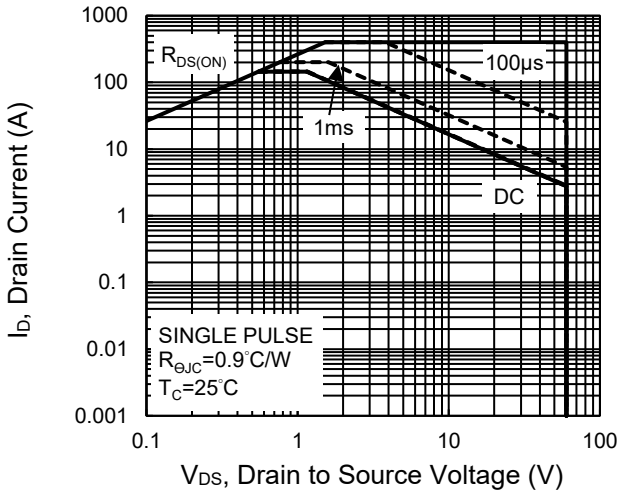
Capacitance vs. Drain-Source Voltage



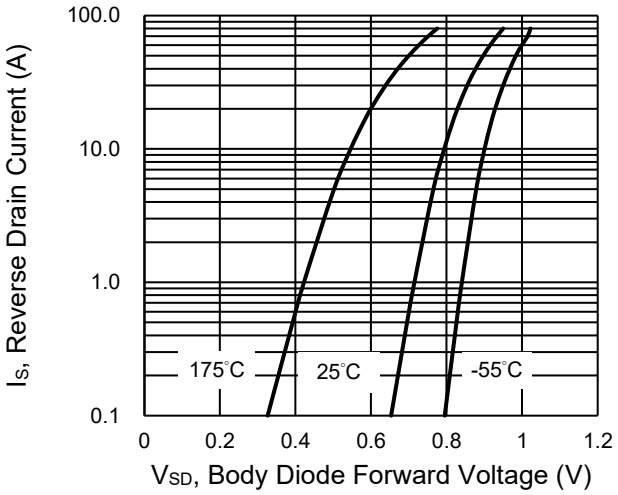
BV_{DSS} vs. Junction Temperature



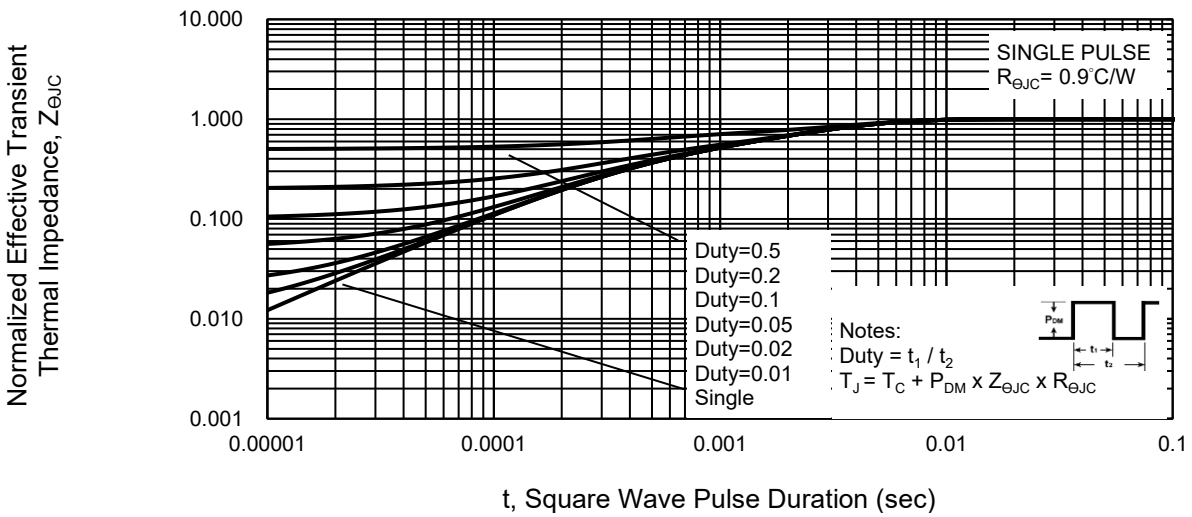
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage



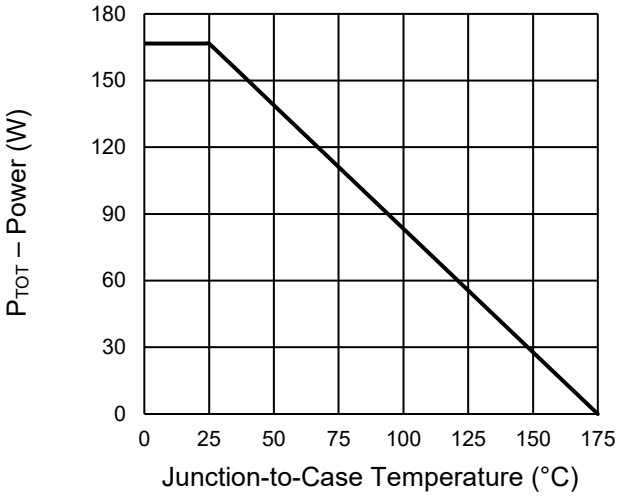
Normalized Thermal Transient Impedance, Junction-to-Case



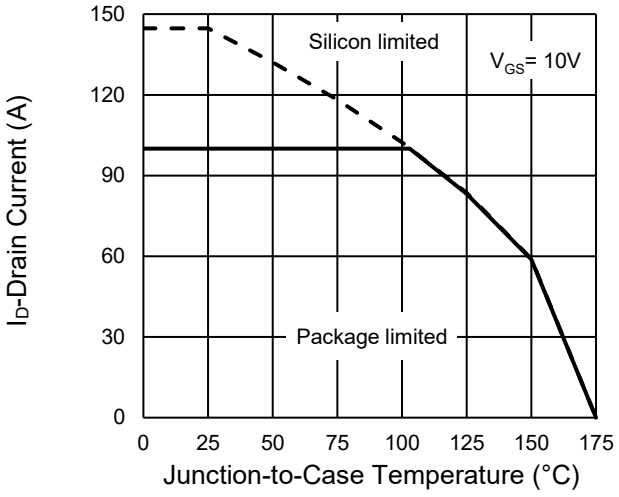
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

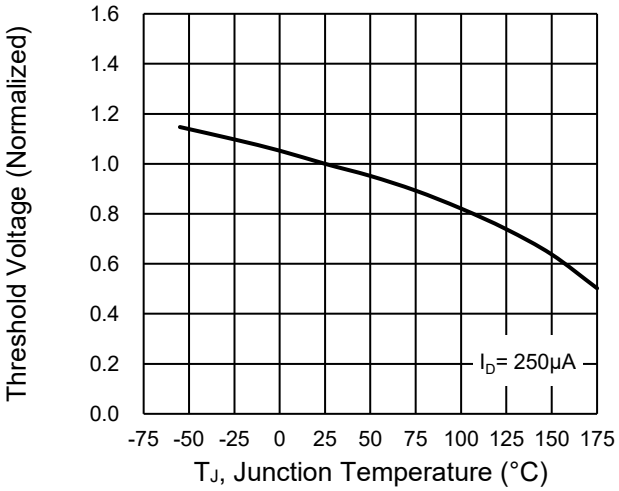
Power Dissipation



Drain Current

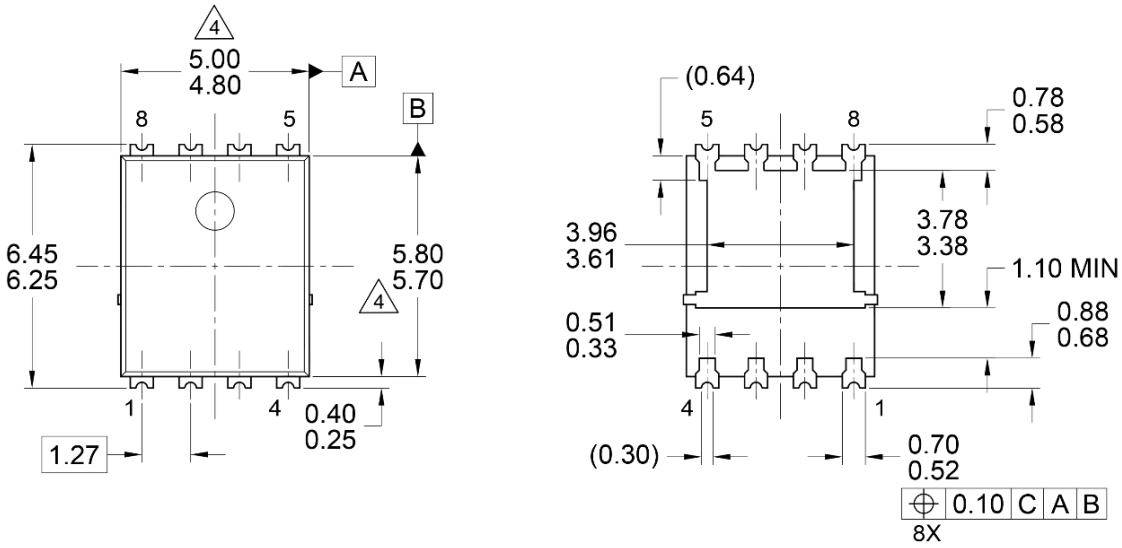


Normalized gate threshold voltage vs Temperature



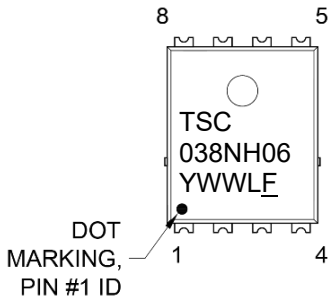
PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

PDFN56U



DETAIL A
(SCALE 2:1)

SUGGESTED PAD LAYOUT
(REFERENCE ONLY)



MARKING DIAGRAM

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. PACKAGE OUTLINE REFERENCE: JEITA ED-7500B, EIAJ SC-111BB.
4. MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
5. DWG NO. REF: HQ2SD07-PDFN56U-023 REV B.

038NH06	= Device marking
Y	= Year code
WW	= Week code (01~52)
L	= Lot code (1~9,A~Z)
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.

Purchasers are solely responsible for the choice, selection, and use of TSC products and TSC assumes no liability for application assistance or the design of Purchasers' products.

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.