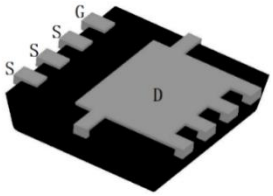
FEATURES

- Drain-Source Withstand Voltage: -60V
- Max. $R_{DS(on)}$: 52mΩ @ V_{GS}=-10V
  67mΩ @ V_{GS}=-4.5V
- Automotive applications
- AEC-Q101 Qualified
- Excellent ON resistance
- General footprint package PDFN3333-8L
- 100% Rg and Avalanche tested
- MSL1

PRODUCT APPEARANCE



PDFN3333-8L

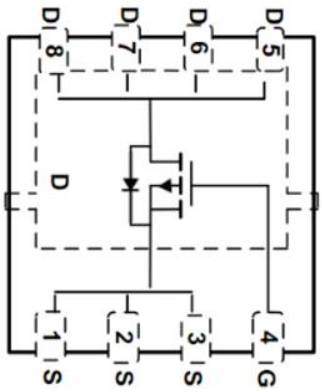
DESCRIPTION

The SPM0652DRAQ is P-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in high performance automotive DC-DC conversion, power switch and charging circuit. Standard Product SPM0652DRAQ is in compliance with RoHS.

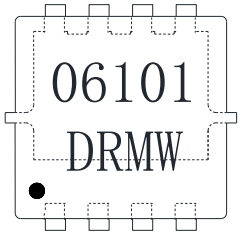
Applications:

- Automotive systems
- DC/DC converters
- Power supply converters circuit
- Load/Power Switching for portable device

PIN CONFIGURATION



MARKING



06101 = Device Code
DR = Special Code
M = Month
W = Week

LIMITING VALUES

Parameter	Symbol	Condition	Value	Unit
Drain-Source Voltage	V_{DS}		-60	V
Gate-Source Voltage	V_{GS}		±20	V
Continuous Drain Current (4)	I_D	T_C=25°C	-27	A
		T_C=100°C	-19	A
Pulsed Drain Current (3)	I_{DM}		-75	A
Continuous Drain Current	I_D	T_A=25°C	-5.0	A
		T_A=100°C	-3.6	A
Avalanche Energy L=0.3mH	E_{AS}		81	mJ
Power Dissipation (2)	P_D	T_C=25°C	75	W
		T_C=100°C	38	W
Power Dissipation (1)	P_D	T_A=25°C	2.6	W
		T_A=100°C	1.3	W
Operating Junction Temperature	T_J		-55 to 175	°C
Storage Temperature Range	T_{STG}		-55 to 175	°C

THERMAL RESISTANCE RATINGS

Single Operation					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Junction-to-Ambient Thermal Resistance (1)	Steady State	$R_{\theta JA}$	46	58	°C/W
Junction-to-Case Thermal Resistance (2)	Steady State	$R_{\theta JC}$	1.6	2.0	

ELECTRONICS CHARACTERISTICS

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0 V, I_D = -250μA	-60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	BV_{DSS}/T_J			-46		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-60V, V_{GS}= 0V, T_J=25°C			-1.0	μA
		V_{DS}=-60V, V_{GS}= 0V, T_J=125°C			-10	μA
Gate-to-source Leakage Current	I_{GSS}	V_{DS}=0 V, V_{GS}= ±20V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS}=V_{DS}, I_D= -250μA	-1	-2	-3	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			5		mV/°C
Drain-to-source On-resistance (4)	$R_{DS(on)}$	V_{GS} =-10V, I_D =-7A		35	52	mΩ
		V_{GS} =-4.5V, I_D =-7A		45	67	
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{GS} = 0V, f = 1.0MHz, V_{DS}=-25V		1968		pF
Output Capacitance	C_{OSS}			148		
Reverse Transfer Capacitance	C_{RSS}			93		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS}=-10V, V_{DS}= -48V, I_D =-7A		38.1		nC

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Total Gate Charge	$Q_{G(TOT)}$	V_{GS}=-4.5V, V_{DS}=-48V, I_D =-7A		19.1		
Gate-to-Source Charge	Q_{GS}			6.3		
Gate-to-Drain Charge	Q_{GD}			8.3		
Gate Resistance	Rg	f = 1MHz		8.6		Ω
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	td(ON)	V_{GS}=-4.5V, V_{DS}= -48V, I_D=-7A		27		ns
Rise Time	tr			57		
Turn-Off Delay Time	td(OFF)			42		
Fall Time	tf			33		
Body Diode Reverse Recovery Time	trr	I_F=-7A, dI/dt= -100A/μs		23		ns
Body Diode Reverse Recovery Charge	Qrr	I_F=-7A, dI/dt= -100A/μs		27		nC
BODY DIODE CHARACTERISTICS						
Forward Voltage	V_{SD}	V_{GS}=0V, I_S=-7A	-0.5	-0.8	-1.2	V

(T_J=25℃, unless otherwise noted.)

Note:

(1) FR-4 board (38mm×38mm×t1.6mm, 70μm Copper) partially covered with copper (645mm^2 area). The power dissipation P_{DSM} is based on Junction-to-Ambient thermal resistance value and the $T_{J(MAX)}$=175°C. The value is only for reference, any application depends on the user's specific board design.

(2) The power dissipation P_D is based on $T_{J(MAX)}$=175℃, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heat sinking is used.

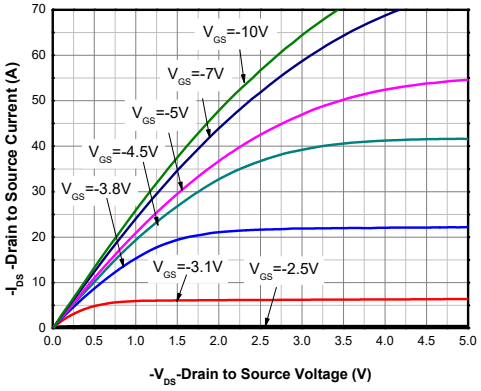
(3) Repetitive rating, pulsed, duty cycle ~1%, keep initial T_J=25℃, the maximum allowed junction temperature of 175℃.

(4) The maximum current rating by source bonding technology.

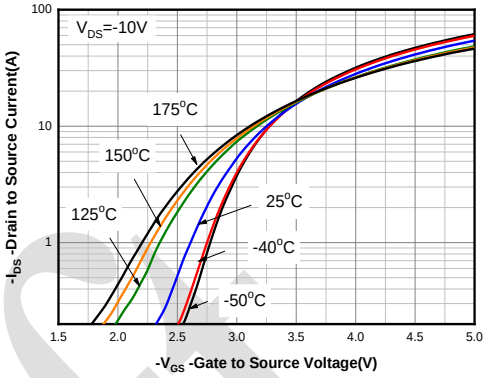
(5) The static characteristics are obtained using ~380μs pulse, duty cycle ~1%.

TYPICAL CHARACTERISTICS

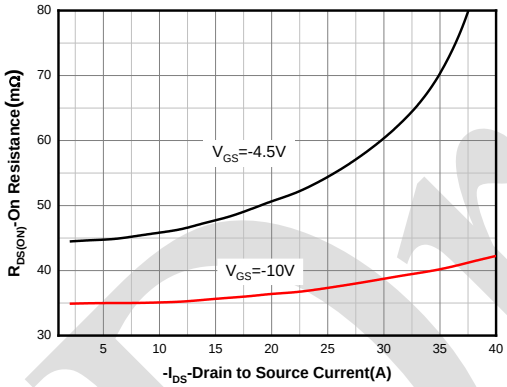
Ta=25℃, unless otherwise noted.



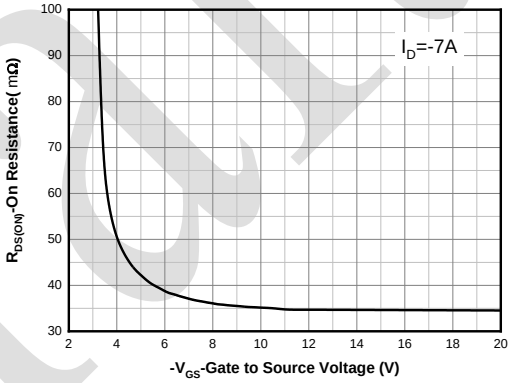
Output Characteristics (5)



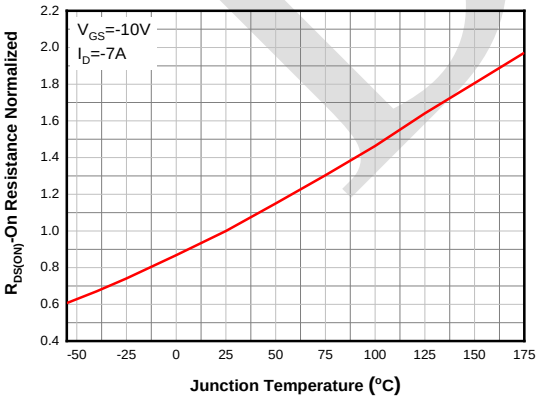
Transfer Characteristics (5)



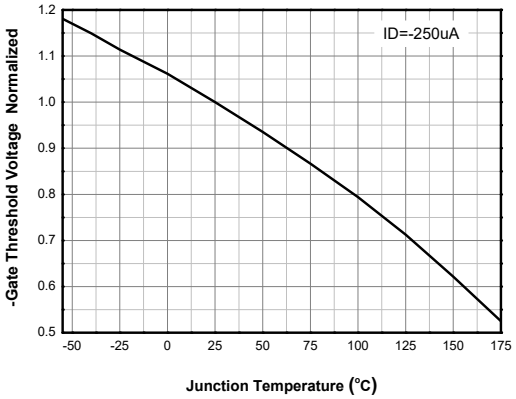
On-Resistance vs. Drain Current (5)



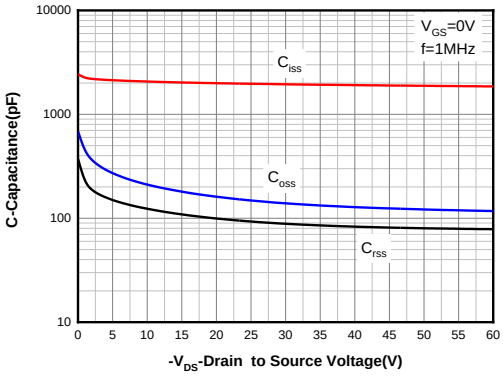
On-Resistance vs. Gate-to-Source Voltage (5)



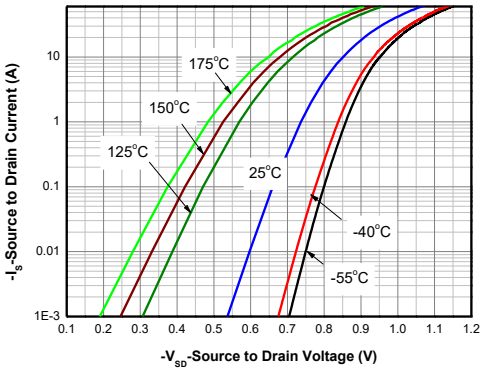
On-Resistance vs. Junction Temperature (5)



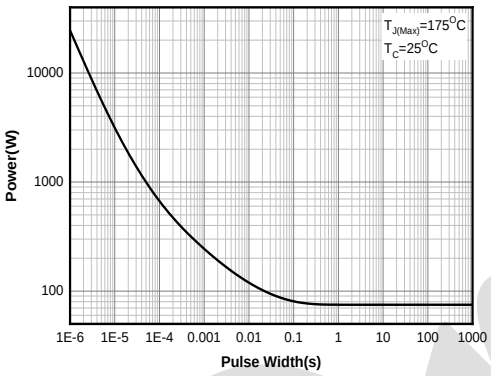
Threshold Voltage vs. Temperature



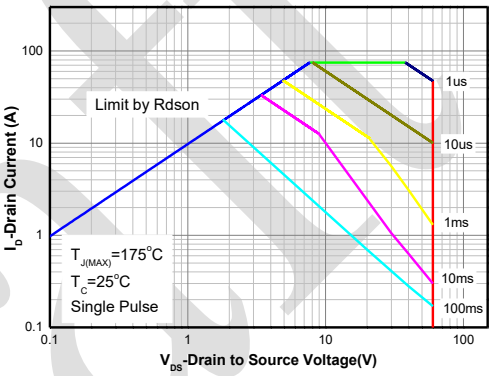
Capacitance



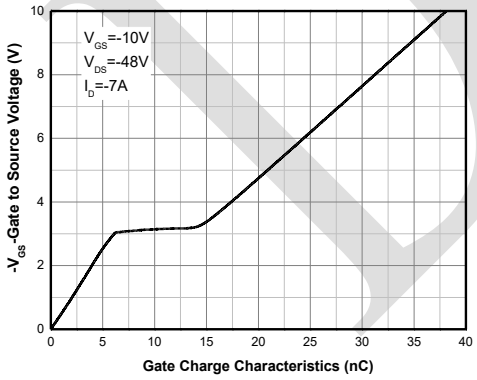
Body Diode Forward Voltage (5)



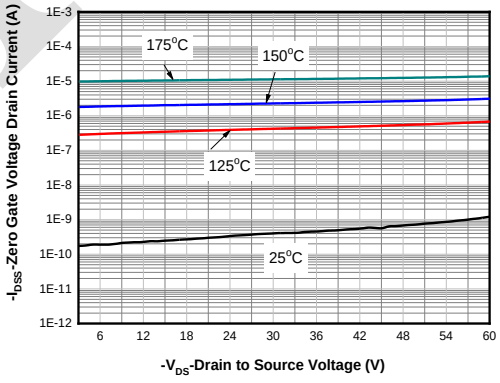
Single Pulse power



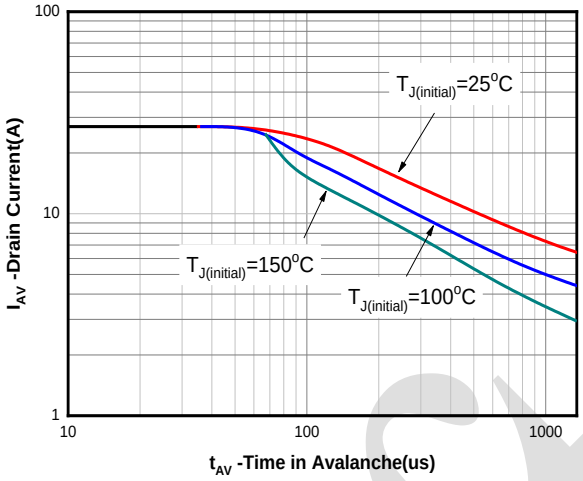
Safe Operating Area



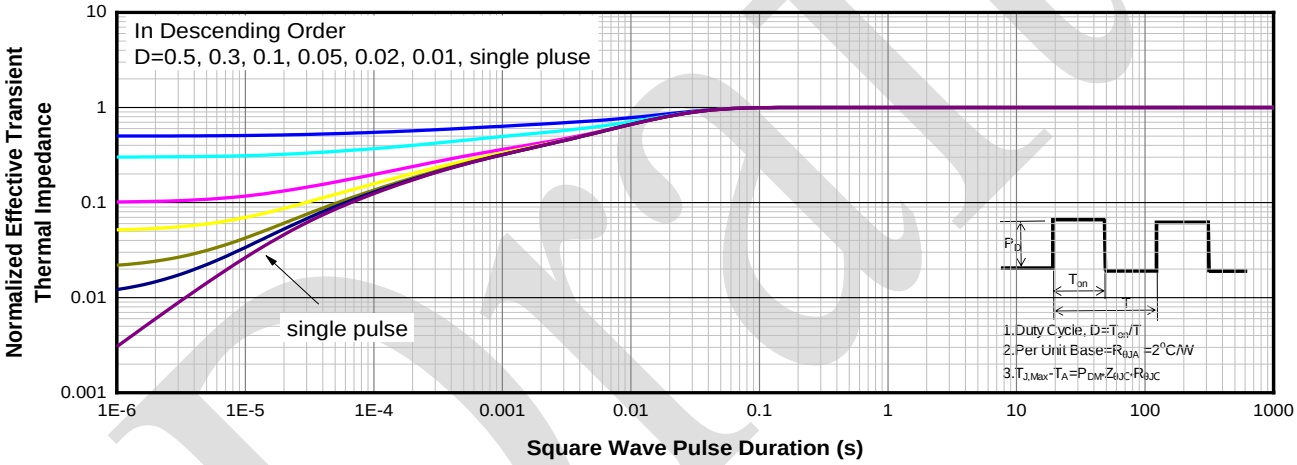
Gate Charge Characteristics



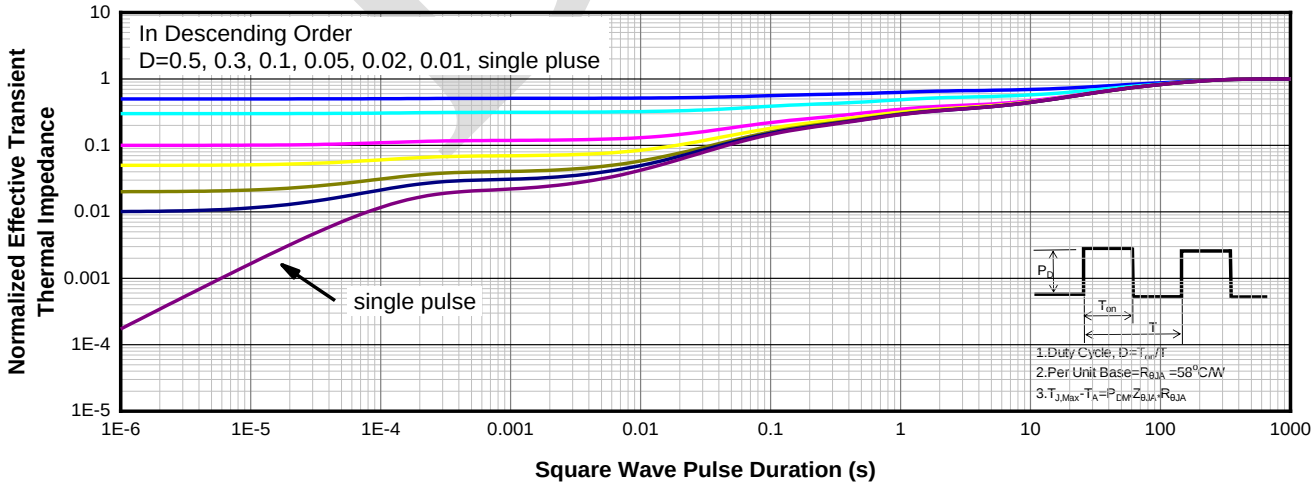
Drain Current vs. Drain Voltage



Avalanche characteristics



Transient Thermal Response (Junction-to-Case)

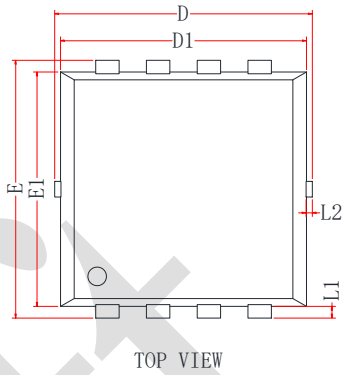


Transient Thermal Response (Junction-to-Ambient)

PDFN3333-8L DIMENSIONS

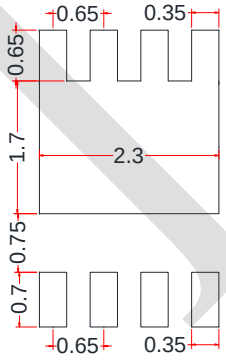
PACKAGE SIZE

Symbol	Min.	Typ.	Max.
A	0.70	0.80	0.90
A3	0.14	0.15	0.20
b	0.25	0.30	0.39
D	3.10	3.30	3.50
D1	3.05	3.15	3.25
D2	2.15	2.25	2.35
e	0.55	0.65	0.75
E	3.10	3.30	3.50
E1	2.90	3.00	3.10
E2	1.60	1.70	1.80
H	0.25	0.40	0.55
K	0.65	0.75	0.85
L	0.30	0.45	0.60
L1	0.05	0.15	0.25
L2	-	-	0.15
θ	8 °	10 °	12 °

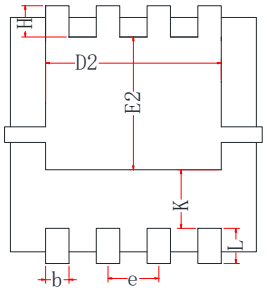


TOP VIEW

SIDE VIEW



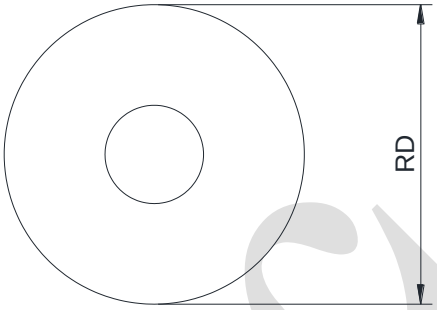
RECOMMENDED LAND PATTERN(Unit:mm)



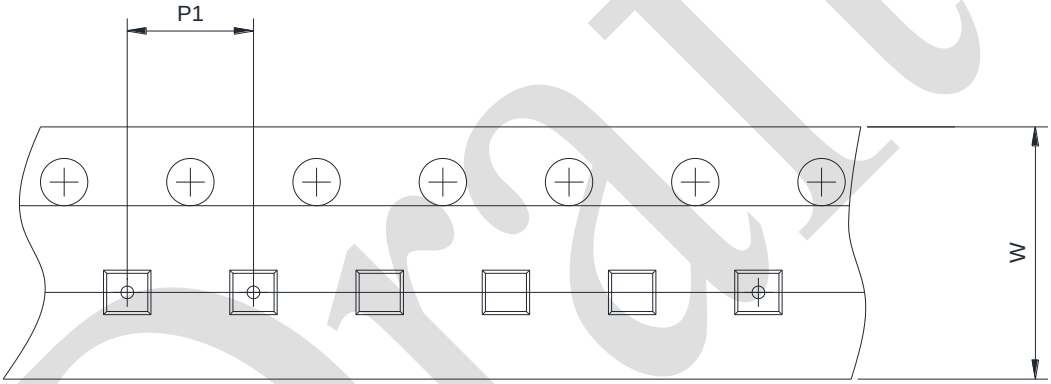
BOTTOM VIEW

TAPE AND REEL INFORMATION

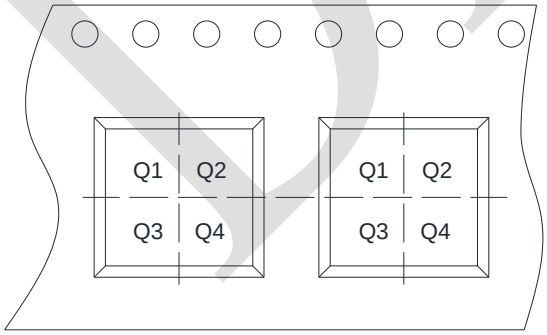
Reel Dimensions



Tape Dimensions



Quadrant Assignments For PIN1 Orientation In Tape



User Direction of Feed

RD	Reel Dimension	☐ 7inch ☑ 13inch
W	Overall width of the carrier tape	☐ 8mm ☑ 12mm ☐ 16mm
P1	Pitch between successive cavity centers	☐ 2mm ☐ 4mm ☑ 8mm
Pin1	Pin1 Quadrant	☑ Q1 ☐ Q2 ☐ Q3 ☐ Q4

ORDERING INFORMATION

TYPE NUMBER	PACKAGE	PACKING
SPM0652DRAQ-8/TR	PDFN3333-8L	Tape and reel

PDFN3333-8L is packed with 5000 pieces/disc in braided packaging.

Important statement

SIT reserves the right to change the above-mentioned information without prior notice.

REVISION HISTORY

Version number	Datasheet status	Revision date
V0.4	Draft version.	May 2024