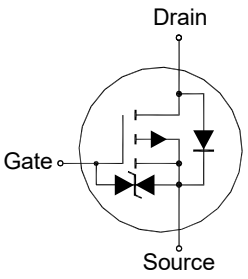
MU02P040UK

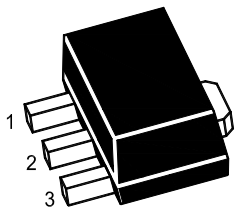
P-Channel Enhancement Mode MOSFET

Features

• Typical ESD Protection HBM Class 0A

Classification	Voltage Range(V)
0A	< 125
0B	125 to < 250
1A	250 to < 500
1B	500 to < 1000
1C	1000 to < 2000
2	2000 to < 4000
3A	4000 to < 8000
3B	≥ 8000





1.Gate 2.Drain 3.Source
SOT-89 Plastic Package

Applications

• Portable appliances
• High speed switch
• Battery management

Absolute Maximum Ratings(at T_a = 25℃ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$-V_{DS}$	20	V
Gate-Source Voltage	V_{GS}	± 12	V
Drain Current	$-I_D$	4	A
Pulsed Drain Current [1]	$-I_{DM}$	20	A
Power Dissipation [2]	P_D	0.85	W
Operating Junction and Storage Temperature Range	T_j ,T_{stg}	- 55 to + 150	℃

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient [2]	$R_{\theta JA}$	147	℃/W

[1] Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%, Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$ = 150°C.

[2] Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

Dated: 07/04/2021 Rev:01

Characteristics at T_a = 25℃ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at $-I_D$ = 250 µA	$-V_{(BR)DSS}$	20	-	-	V
Drain-Source Leakage Current at $-V_{DS}$ = 20 V	$-I_{DSS}$	-	-	1	µA
Gate-Source Leakage Current at V_{GS} = ± 4.5 V at V_{GS} = ± 10 V	I_{GSS}	- -	- -	± 3 ± 10	µA
Gate-Source Threshold Voltage at V_{DS} = V_{GS}, $-I_D$ = 250 µA	$-V_{GS(th)}$	0.4	-	1.0	V
Drain-Source On-State Resistance at $-V_{GS}$ = 4.5 V, $-I_D$ = 3.8 A at $-V_{GS}$ = 2.5 V, $-I_D$ = 3.3 A at $-V_{GS}$ = 1.8 V, $-I_D$ = 1 A at $-V_{GS}$ = 1.5 V, $-I_D$ = 0.5 A	$R_{DS(on)}$	- - - -	- - - -	54 70 104 120	mΩ
DYNAMIC PARAMETERS					
Forward Transconductance at $-V_{DS}$ = 10 V, $-I_D$ = 3.8 A	g_{fs}	-	7	-	S
Gate Resistance at V_{GS} = 0 V, V_{DS} = 0 V, f = 1MHz	R_g	-	4	-	Ω
Input Capacitance at V_{GS} = 0 V, $-V_{DS}$ = 10 V, f = 1 MHz	C_{iss}	-	960	-	pF
Output Capacitance at V_{GS} = 0 V, $-V_{DS}$ = 10 V, f = 1 MHz	C_{oss}	-	140	-	pF
Reverse Transfer Capacitance at V_{GS} = 0 V, $-V_{DS}$ = 10 V, f = 1 MHz	C_{rss}	-	125	-	pF
Gate charge total at $-V_{DS}$ = 10 V, $-I_D$ = 3.8 A, $-V_{GS}$ = 4.5 V	Q_g	-	10.5	-	nC
Gate to Source Charge at $-V_{DS}$ = 10 V, $-I_D$ = 3.8 A, $-V_{GS}$ = 4.5 V	Q_{gs}	-	0.9	-	nC
Gate to Drain Charge at $-V_{DS}$ = 10 V, $-I_D$ = 3.8 A, $-V_{GS}$ = 4.5 V	Q_{gd}	-	3.5	-	nC
Turn-On Rise Time at $-V_{DD}$ = 10 V, $-I_D$ = 3.8 A, $-V_{GS}$ = 4.5 V, R_g = 4.7 Ω	$t_{d(on)}$	-	18.5	-	ns
Turn-On Rise Time at $-V_{DD}$ = 10 V, $-I_D$ = 3.8 A, $-V_{GS}$ = 4.5 V, R_g = 4.7 Ω	t_r	-	63	-	ns
Turn-Off Delay Time at $-V_{DD}$ = 10 V, $-I_D$ = 3.8 A, $-V_{GS}$ = 4.5 V, R_g = 4.7 Ω	$t_{d(off)}$	-	21	-	ns
Turn-Off Fall Time at $-V_{DD}$ = 10 V, $-I_D$ = 3.8 A, $-V_{GS}$ = 4.5 V, R_g = 4.7 Ω	t_f	-	9.5	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $-I_S$ = 1 A, V_{GS} = 0 V	V_{SD}	-	-	1.2	V
Body-Diode Continuous Current	$-I_S$	-	-	4	A
Body Diode Reverse Recovery Time at $-V_{DD}$ = 20 V, $-I_S$ = 3.8 A, di/dt = 100 A / µs	t_{rr}	-	12	-	ns
Body Diode Reverse Recovery Charge at $-V_{DD}$ = 20 V, $-I_S$ = 3.8 A, di/dt = 100 A / µs	Q_{rr}	-	3.8	-	nC

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

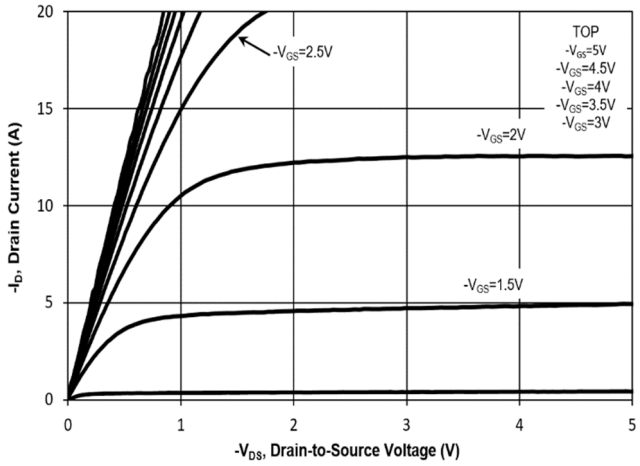


Fig. 2 Typical Transfer Characteristic

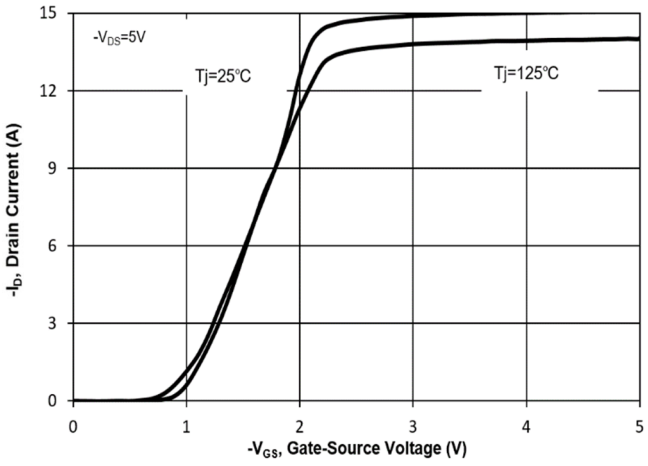


Fig. 3 on-Resistance vs. Drain Current

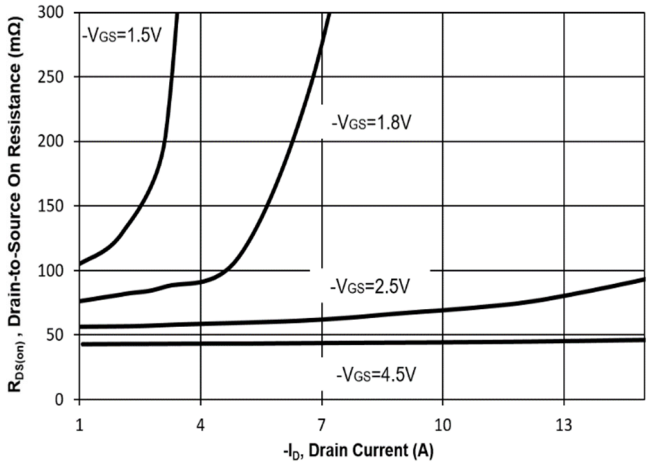


Fig. 4 on-Resistance vs. Gate Voltage

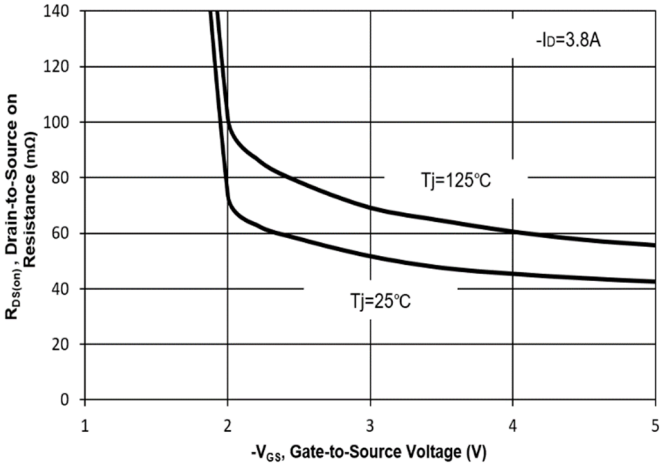


Fig. 5 on-Resistance vs.T_j

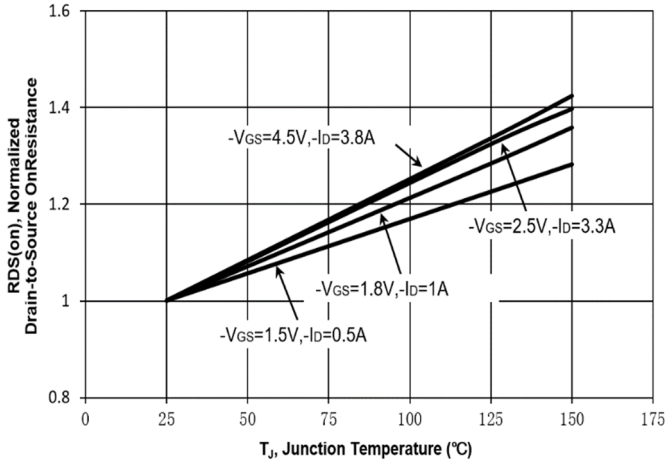
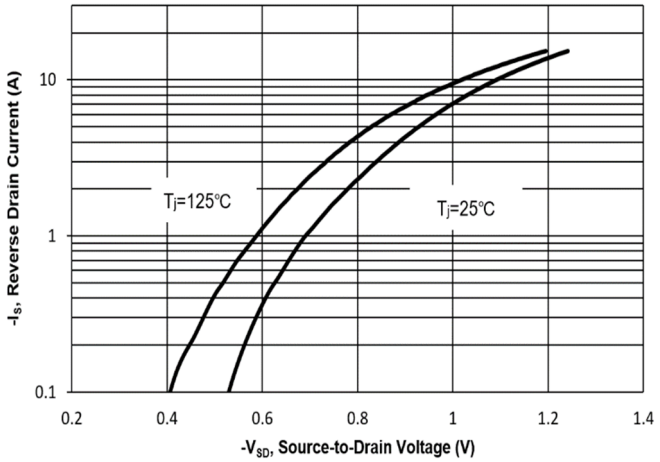


Fig. 6 Typical Forward Characteristic



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

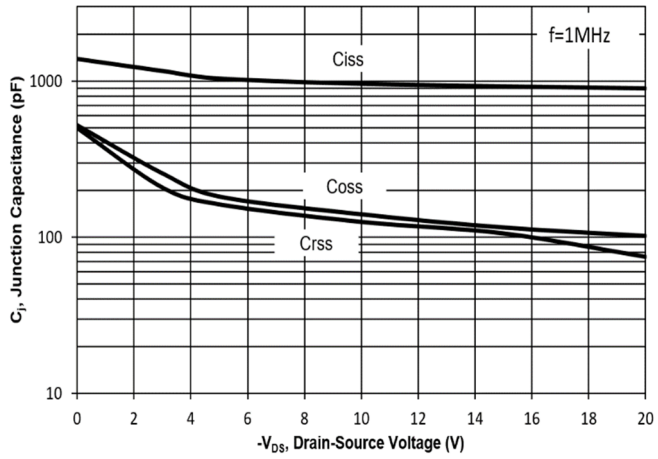


Fig. 8 Drain-Source Leakage Current vs. T_j

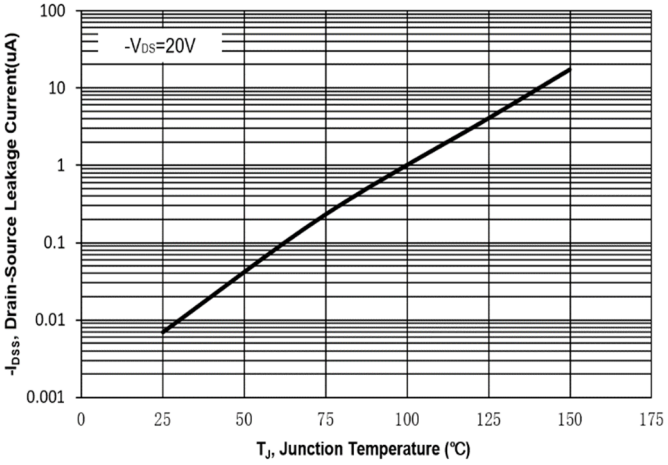


Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

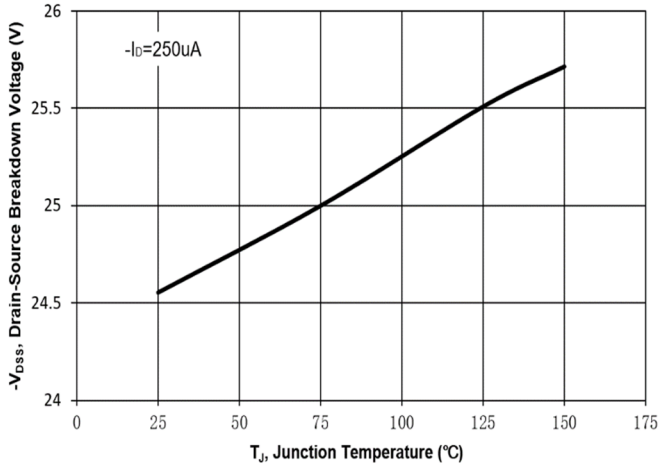


Fig. 10 Gate Threshold Variation vs. T_j

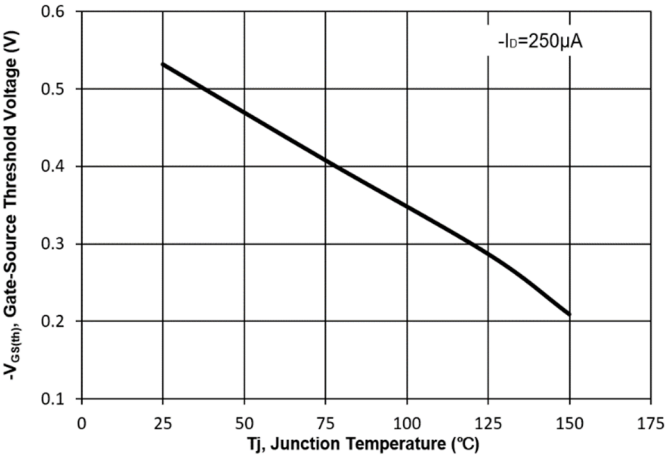
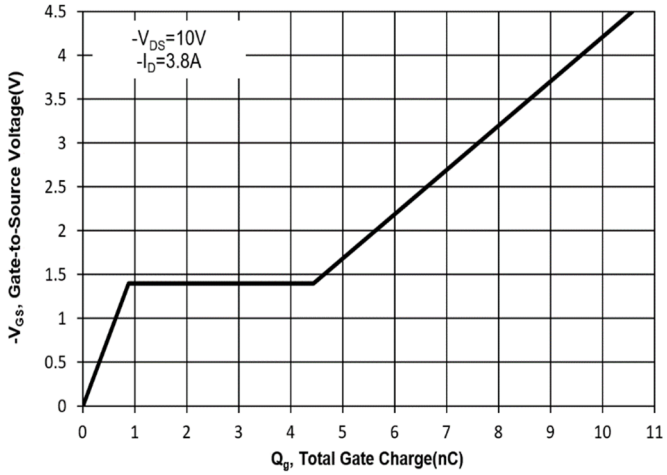


Fig. 11 Gate Charge



Test Circuits

Fig.1-1 Switching times test circuit

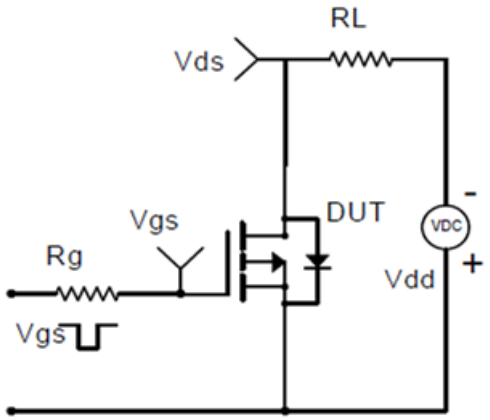


Fig.1-2 Switching Waveform

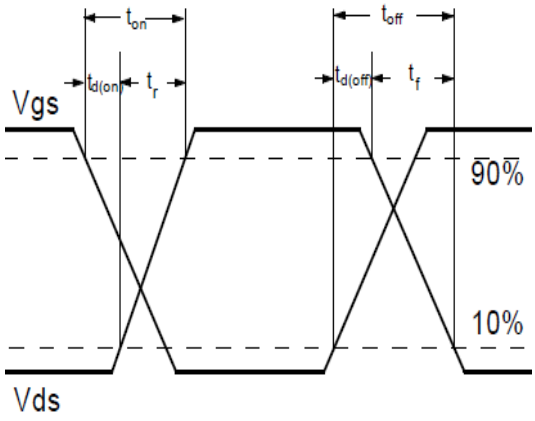


Fig.2-1 Gate charge test circuit

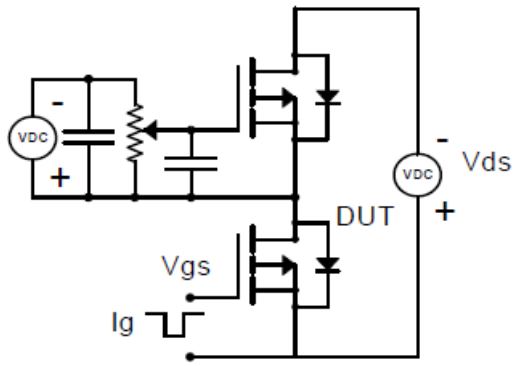
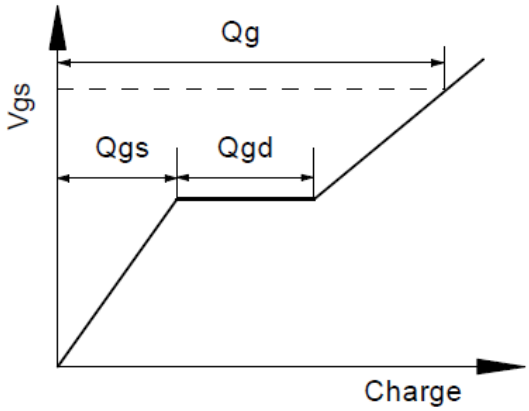
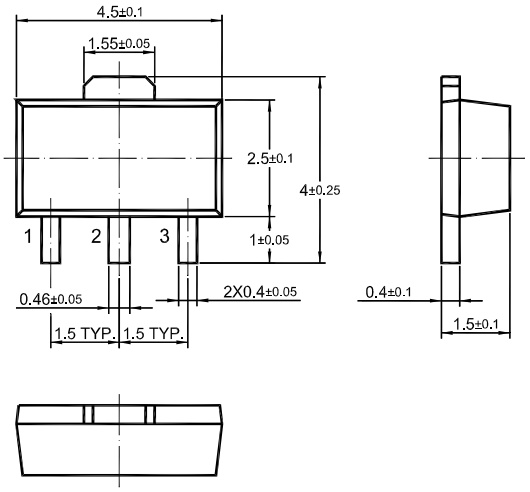


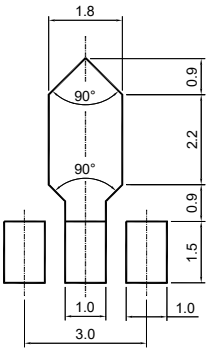
Fig.2-2 Gate charge waveform



Package Outline (Dimensions in mm) SOT-89



Recommended Soldering Footprint



Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
SOT-89	12	8 ± 0.1	0.315 ± 0.004	178	7	1,000
				330	13	4,000

Marking information

" MU02P040UK " = Part No.
"YM" = Date Code Marking
"Y" = Year
"M" = Month
Font type: Arial